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'Torch Plan' Major Tasks in 1990

90FE0146A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 10 May 90 p 1

[Article by Han Yuqi [7281 3768 3825]]

[Text] Nanjing, 9 May—The Second All-China 'Torch Plan' Work Conference was held in Nanjing today. Deputy Director of the State Science & Technology Commission (SSTC) Li Xu'e chaired the meeting and made the principal report. Li said the emphasis on this year's 'Torch Plan' work is placed on the following four missions: The establishment of the plan's supporting systems, the expansion of the high-tech enterprise development zones, the implementation of the 'Torch Plan' product items, and the internationalization of high-tech industry. Li continued with the following instructions. The establishment of the plan's supporting systems must include the further strengthening of the macro-economic guidance and the continual improvement of the surrounding conditions. The editing work of the "Eighth 5-Year Plan Torch-Plan Development Guide" and the plan's product items directory must be completed soonest. Better coordination must be achieved with the SSTC in attacking many problems, in the drafting of the "863" Plan and the "Results Expansion Plan." He urged the publication of a high-tech products catalog, based on the State Council's enterprise policy, to give a trend for future expansion. The same official instructed the participants to work with the state's taxation organizations and to conduct thorough research and investigation to come up with a unified high-tech enterprise development zone favorable-treatment policy, requirements, approval procedures, and governing regulations. He directed the thorough implementation of the State Council's decision to simplify the procedure for certain high-tech enterprise personnel to travel abroad and to delegate the approval authority with the publication of the applicable regulations. He said that the establishment of the high-tech enterprise supporting system must include the following fields: patents, markets, capital, materials, information, consultation, evaluation of products, personnel exchange, import-export, personnel training as well as other necessary "hardware" supporting systems such as tools and dies, chips etc.

Li Xu'e urged the close coordination of the high-tech enterprise development zones with the local industrial structure and the local economic development plans. He suggested the submission to the State Council for review and approval 20 new development zones based on the State Council's established zone favorable-treatment policies, requirements, and review/approval procedures. As for the three SSTC and local government joint high-tech-enterprise development zone projects located at Zhongshan, Xiamen,and Weihai, Li asked for continual hard work in their improvement. He promised to give assistance to all lower-level science & technology commissions (STC's) and other development zones setting up the proper management regulations and the establishment and improvement of their supporting and servicing systems. Plans are being made to mobilize and organize various ministries, commissions (including the Chinese Academy of Sciences and the military equivalent organizations), their subordinate institutes, higher-education units, and large and medium-size industries to begin their part in launching new high-tech enterprises in these high-tech enterprise development zones. Similarly, local-level STC's are urged to take advantage of the rich experience and the strong ability of these senior and well-established organizations in jointly carrying out the 'Torch Plan.' What remains to be accomplished in the near future are the tasks of organizing the All-China High-Tech Enterprise Development Zone Exhibition, which is scheduled for the latter part of this year. On the plan's software research side, Li directed that efforts be centered on the drafting of development zone strategy, direction, policy, regulations, operational structure, and management systems, and assistance be continued on the establishment of new and improvement of old high-tech enterprise start-up service centers, as this is one of the major work goals. This is to be included in the "Eighth 5-Year Plan Torch-Plan Development Guide."

Li pointed out that the 'Torch Plan' product items approved for 1988 and 1989 must be subjected to timely reviews in accordance with the applicable contracts. This is necessary in order to determine the product acceptance, evaluation, and adjustment. There must also be corresponding product acceptance management regulations, so that after the acceptance review the enterprise management and control can be tightened to ensure proper quality control, domestic and overseas market development, product sales, after-sales service and other necessary measures. Li asked for good product review work for 1990. Li predicted that the nation's financial situation this year favors the possibility that a large part of the expenditure would be shouldered by the central government. Detailed plans will be sent down to lower-level STC's for implementation. Subsidies are also possible for provincial and city STC's and the development zones. This year, 280 'Torch Plan' product items are planned with a newly added output value expected to reach 10 million yuan. The 1990 'Torch Plan' preparatory product items list will be sent down soonest.

Li also asked for strong cooperation with the Ministry of Foreign Economic Relations and Trade and its import-export companies, better relations with foreign counterparts and participation in overseas exhibits and trade negotiation in order to get more international market information to develop product markets. Not to be neglected are the science and technology offices in our foreign diplomatic missions and commercial companies. Li urged the selection of several product items as models for cooperation with foreign companies, and the successful conclusion of these cooperation projects based on China's technical ability and foreign companies' sales and service networks. He wanted more efforts in researching the internationalization of high-tech enterprises and in drafting suitable policy and management methods to promote the penetration of the international market by Chinese high-tech products and by senior-level Chinese high-tech working personnel.

Over 300 officials from the provinces, cities, central ministries, universities, academies, and research institutes took part in the conference, including SSTC Deputy Director Zhu Lilan, State Nationalities Commission Deputy Director Wu Jinghua, Beijing Vice Mayor Lu Yucheng, Guangxi Zhuang Autonomous Region Vice Chairman Li Zhenqian, Jiangsu Vice Governor Wu Xijun, Nanjing Party Committee Deputy Secretary Dai Shunzhi and Nanjing Mayor Wang Rongbing.

Progress of 'Torch Plan' Reviewed

90FE0146D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 11 Apr 90 p 1

[Article by Han Yuqi [7281 3768 3825] and Tang Juan [0781 3197]]

[Text] Work on the implementation of the 'Torch Plan' begun 1 and ½ years ago, is now in full swing. Many 'Torch' product items have been launched and many 'Torch' loans granted. Environments conducive to the development of high-tech industry have been created. Important bases for the further implementation of the plan, the high-tech enterprises development zones and S&T industries start-up service centers have also been established. The basic objectives of the 'Torch Plan' 3-Year Development Guide have been realized.

The plan's implementation has received much support from the central and local governments. Many provincial and city government leaders have taken part in attending briefings, chairing work conferences, organizing construction, planning policies, drafting regulations, and raising capital. 'Torch Plan' guidance teams have been set up in 29 provinces, autonomous regions and independent cities as well as in 14 'Torch Plan' designated cities. Many governors, provincial Party secretaries, and mayors are taking a personal interest in all matters relating to the 'Torch Plan.'

The progress of the plan cannot be separated from the tremendous support given by the State Council and its ministries and commissions. Other State Council subordinate units giving support include: the Executive Office, the Foreign Affairs Office, the Special Zone Affairs Office, the Machine-Building & Electronics Office, the State Planning Commission, the Ministry of Finance, the Taxation Administration of China, The People's Bank, the Industry & Commerce Bank, and the Construction Bank. Actions creating environments conducive to the implementation of the plan include the promulgation of the following regulations: Income Tax Exemption for Trial Production by S&T Units, which was drafted jointly by the State S&T Commission, Finance Ministry, and Taxation Administration; Product Value Tax Exemption for All 'Torch Plan' product Items; and the Simplification of Overseas Travel Procedures for Certain High-Tech Enterprise Personnel.

Over the past year, many high-tech enterprise development zones have been established in Beijing, Tianjin, Shanghai, Wuhan, Nanjing, Shenyang and other cities. There are a total of 30 now. Many local governments give preference and financial support to the establishment of these zones and include them as a part of their economic development strategy. they are generally regarded as an important measure in building up the provinces and cities through S&T efforts.

According to statistics from 15 early established development zones, 2,065 firms have been recognized as high-tech enterprises with a total employment of 47,000 persons, of whom 40 percent have higher education in S&T fields. These enterprises' gross 1989 income was 2.62 billion yuan. Of this amount, 70 percent came from high-tech products and others of an S&T nature.

The establishment of the S&T enterprise start-up service center is the result of learning about Western nations' small business and S&T business incubators. The purpose of these centers is to get S&T enterprises started by helping personnel from research units and universities to launch their enterprises and to strengthen them after launching so that they will be strong enough to stay in the market. Currently there are 25 S&T enterprise start-up service centers in Shenyang, Harbin, Beijing, Wuhan, and Tianjin. Others, such as the Shenzhen Enterprise Start-up Service Center, Sichuan Biomedical Enterprise Start-up Service Center, Wuhan Tonghu Enterprise Start-up Service Center, have also incubated a number of high-tech enterprises.

Another important implementation feature of the 'Torch Plan' is the production of 'Torch Plan' product items: 272 national-level 'Torch' product items have been designated with a total investment of 1.5 billion yuan (from the central and local governments and private sources). With the production of these products, annual newly added output value is expected to be 5.6 billion yuan, newly-added profits tax to be 1.35 billion yuan, and the resultant savings in foreign exchange to the US$580 million. At the same time as these national-level products are being produced, various areas and units are also planning to manufacture 528 local-level 'Torch Plan' product items with a total investment of 1.27 billion yuan. When these products are produced, annual newly added output value is expected to be 4.86 billion yuan, the annual newly added profits tax to be 1.33 billion yuan, and the foreign exchange savings to the US$520 million.

With the help and coordination of all levels of the Industry & Commerce Bank plus the efforts of all levels of S&T commissions, the major portion of 1989 national-level 'Torch Plan' product item loans has been disbursed. Manufacture of a number of these products is well under way; a few of them are even beginning to be batch-produced which will, of course, bring greater economic benefits.

Special Report on State High-Technology R&D Plan (863 Plan)

Editorial Introduction

90FE0073A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Editorial remarks: "Fair, Dedicated, Realistic, Coordinated, Innovative"]

[Text] Since China's high-technology research and development plan (the 863 Plan) was instituted in 1987, it has made gratifying progress. With the guidance and support of the State Science and Technology Commission, this paper produced its first special full-page 863 Plan report on 17 November 1989; today's report is its third such report.

While the first of these special reports was general in nature, the second began coverage of specific fields of technology. These special reports have been welcomed by numerous readers concerned about high-technology research in China. We have also received letters of encouragement from many readers. In order to further improve these special reports, we hope that our readers will send suggestions. The headline "Fair, Dedicated, Realistic, Coordinated, Innovative" expresses the spirit that the 863 Plan has created.

Advances in Automation Technology

90FE0073B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article by Jiang Xinsong [2293 2450 2646], Scientific Chairman of Automation Technology Area: "Progress in the Automation Technology Area"]

[Text] Automation technology occupies a prominent and important place in high-technology competition. Since the 1970's, with the development of very-large-scale integrated circuits [VLSI] and such fields as computer science, systems science and artificial intelligence, the range of applications of automation technology has extended to almost every area of human society and has become a powerful means of increasing labor productivity.

At present, the three foundation technologies of automation technology are sensor technology, integration technology, and artificial-intelligence technology. Sensors of all kinds are the medium and means by which a system acquires internal and external information; their importance hardly needs explanation. Integration technology can be divided into two areas. The first is information integration, which brings about the mutual transfer and mutual intelligibility of the information from various "historically developed" particular automation systems (of essentially different structure). The second consists of the optimization or quasi-optimization of: establishment of a system model, hierarchical organization, and further decision making; of task specification and analysis; of planning in the temporal and spatial domains; and of operations sequencing and scheduling. Artificial intelligence technology involves the questions of how to use computers to generalize human experience and to simulate human inference and solution processes in order to solve categories of problems that are difficult to solve mathematically, such as optimizing the recognition of operating states, sequencing and scheduling, multilevel coordination and the like. The current and future stage and the leading edge of progress in automation technology consists of: first, the robotization of machinery, so that in addition to their being able to do things that are beyond human strength, eventually robots become able to do things that humans do easily but that machines cannot now do; the second is the automation of "social" intellectual labor. This is an extremely broad field.

The 863 Plan is a high-technology tracking plan that is geared to the main battlefields of the national economy at the end of this century and the beginning of the next. As the analysis above indicates, two representative main topics have been chosen in the automation area: one is computer integrated manufacture systems (CIMS), and the other is intelligent robotics. The two main strategic objectives that were approved at the Shenyang strategic objectives evaluation of last November [1989] are as follows:

1. In CIMS: By the year 2000, to independently develop automation products for machine-building plants that are at the 1990's state-of-the-art, to build demonstration production lines, to train an integrated contingent of high-technology engineers engaged in CIMS design, and to lay a solid foundation for CIMS and for the development of the plant automation industry in China.

2. In Intelligent Robotics: By the year 2000, to independently develop high-precision assembly robots, self-controlling cable-free underwater robots, and mobile intelligent robots for use in hostile environments.

We will set up a research and development environment and facilities for self-controlling intelligent robots and train and develop a continuous, stable contingent for research and engineering development of intelligent robots.

The key factor determining whether high-technology research in China will be able to achieve its tracking objectives is innovation; consequently, we must establish a rather generous research and engineering environment. In the past 2 years we have created two mutually supporting but mutually independent engineering environments and research environments and have organized tracking in hierarchical fashion. The two main topic areas take about one-fourth of total funding; a group of basic technology applications research programs have been set up around the country and the relevant developmental activities and theoretical studies are being pursued. The first group of contracts will conclude this year, and progress has been excellent on the great majority of topics. The first set of results may be expected this year. As a demonstration engineering project, during the Seventh 5-Year Plan about half the CIMS funding was concentrated on the establishment of a CIMS experimental project research center at Qinghua University; over the last 2 years an overall contingent has been put together. Recently, we also set up an overall group on applications plants, which has undertaken to select a small number of key applications plants on a national scale; this effort will be pursued comprehensively during the Eighth 5-Year Plan. In the field of intelligent robots, we selected five models belonging to three types as target products, with the ultimate objective to be achieved in two stages; we are now fully embarked on the initial-design and detailed-design stages, and in some areas implementation has begun. Work on most of these five robot models is being pursued as joint-support ventures or joint investments with the applications departments. In order to concentrate our limited funds, we have made thorough use of the state laboratories and engineering centers that the State Science and Technology Commission established during the Sixth and Seventh 5-Year Plans and have set up a group of state laboratories and two engineering centers with the existing facilities of various units. We expect that by 1992 they will all have been completed and opened, providing the country with a set of research and development bases that combine experimentation and engineering.

Development of Intelligent Robotics Technology

90FE0073C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article by Tan Dalong [6151 1129 7893]: "Develop Intelligent Robotics Technology Consistent With National Circumstances"]

[Text] There have been great changes since robots came into wide use in manufacturing during the late 1970's. These changes are expressed in technology, which is advancing from single mechanical arms and their control and from narrow electromechanical integration concepts to intelligent robots that can sense environmental information, independently make decisions and plans of action, and flexibly carry out operations in order to change the environment or adapt to it; and are also expressed in terms of applications, which are developing toward assembly and non-manufacturing fields that involve higher precision, more complex movements, and more dangerous or more hostile environments. In view of these changes and of the status of the field as a leading edge of high technology that integrates many sciences and technologies, the developed countries have proceeded, either jointly or independently, in accordance with their national circumstances, to draft government development plans guiding the development of intelligent robotics technology. We may expect that the 1990's or the beginning of the next century will be a time in which intelligent robots come into extensive use. China attaches major importance to the development of robotics technology. After including industrial robotics in the science and technology breakthrough plan for the Seventh 5-Year Plan, it lost no time in including intelligent robotics, as a leading edge of high technology, in the 863 high-technology plan, with the strategic objectives of investigating and developing precision assembly robots, non-cable underwater robots for operation at depths of 300 meters or less, and mobile robots for hostile environments.

1. Draft a Development Strategy Consistent with China's Circumstances

In view of the comparative weakness of China's economic and technological base, we determined that, contingent upon a strengthening of basic technology research, we would realize the strategic objectives in stages: the first stage involves the development of advanced robots, based primarily on computer-assisted remote control and off-line programming technology, with partial self-controlling capabilities, over a period of 4 to 5 years; in the second stage, the research results of the first stage will be developed into the corresponding target products, and in addition, by integrating the results of basic technology research and the research experience of the first stage, we will go on to develop robots with a rather advanced self-controlling ability and implement the ultimate strategic objective.

2. Strengthen Basic Technology Research, Track the World State-of-the-Art

We emphasize that the development of target products must rely on basic technology research, and that basic technology research must take the target products as its background: this will both provide clear goals for basic technology research and push product development toward higher levels.

Based on the main subject matter of research on intelligent robotics, the main topic area was divided into the seven special topics of system structure, mechanisms, control, visual and nonvisual sensors, artificial intelligence applications, and man-robot interaction technology. Several intermediate results have already been obtained in force transducers, robot simulation, and control devices. During the Eighth 5-Year Plan, we will further clarify the hierarchical structure, specifically identify development trends in robot technology and the needs of target product development, and organize key breakthrough projects in basic technology.

3. Step Up the Construction of an Experimental Network, Create a Good Tracking Environment

The key laboratories whose construction during the Seventh 5-Year Plan was arranged by the State Planning Commission have been used as the basis for a mutually complementary intelligent robotics experimentation network, centered on the Shenyang robotics research and development base, and including an intelligent robotics research center, a laboratory of artificial intelligence applications in robotics, a robotic vision laboratory, a robot mechanisms laboratory, a robot control theory and methods laboratory, a nonvisual robot sensor laboratory, and a robot assembly laboratory; these laboratories will be established and opened to the outside this year [1990] and next year.

4. Strengthen Ties with the Departments, Identify User Backgrounds, Promote the Development of Target Products

From the very beginning, the expert commission and the expert groups in the major product areas have realized that the development of target products requires a clear user background. They have cooperated closely with the users during the development process, with joint investment and joint-venture support. During this process, we focused on ties with various leadership departments and had conversations with seven or eight departments in the electromechanical industry in order to obtain their support and cooperation. By means of surveys and analyses of domestic and foreign circumstances and repeated expert studies, we identified the user background for five kinds of robots in three categories and assured a linkage between high-technology tracking and the state science and technology breakthrough plans so that the development of target products would be geared to domestic market needs.

5. Organize for United Breakthrough Efforts

Because intelligent robotics integrates many sciences and technologies, the expert group organized ten-odd units around the country into overall groups for the various target products; it implemented the overall-group leader responsibility system, made thorough use of individual expertise and special strong points, and carried on target product design and development in an atmosphere of technological democracy, obtaining rather good results.

6. Intensify International Cooperation, Raise the Point of Departure for Tracking Efforts

Strengthening international cooperation and exchange is a major factor that supports high-technology tracking. In the last 2 years, we have intensified our ties with the United States, Japan, Germany and France, and have gained an understanding of the state of research on intelligent robots and development trends in these countries; we have established preliminary cooperative ties, and we plan to further intensify such efforts in order to accelerate the pace of tracking in this topic area.

Artificial Intelligence

90FE0073D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article by Zhang Bo [1728 6876]: "Artificial Intelligence"]

[Text] Elucidating the nature of intelligence is a topic on which combined efforts have recently been made by cognitive psychologists, computer scientists, linguists and philosophers; it is also a leading-edge field in which these disciplines intersect. Research results in the area not only have far-reaching theoretical significance in revealing the secrets of the human brain, but also have major applications value for developing intelligent robots and the potential of producing immense social and economic benefits.

The research objectives in artificial intelligence can be divided into two major categories. The first aims primarily at elucidating the mechanisms by which the brain operates and understanding the nature of human intelligence; the other, although it too studies the principles of brain functioning, has the exclusive goal of borrowing these principles in order to create intelligent robots. The main foci of the two fields are obviously different.

Artificial intelligence research began abroad in 1956. In the ensuing 30-odd years there has been some progress in elucidating the mechanisms of brain functioning including the development of major hypotheses and experimental models dealing with the principles of memory, associative mechanisms, and methods of inference, but there have been no major breakthroughs. At present the focus of research in artificial intelligence has shifted to the second of the categories mentioned above. There has been major progress, both theoretical and practical, in the effort to build intelligent robots. For example, on the theoretical side, a problem-solving technique based on heuristic search has been established, and a set of knowledge-processing principles and an engineering method for building artificial intelligence systems based on them have been proposed. On the practical side, many systems with a certain level of intelligence and with practical value, such as expert systems, have been built, and the principles involved have been extended to such fields as industrial management, engineering design, and pattern recognition, with significant results.

The above achievements of artificial intelligence were accomplished with modern electronic computers, and they not only advanced computer applications to a new stage, but also provided a major impetus for the modernization of computer hardware and software. In recent years, for example, the concept of neural networks has posed a challenge to traditional artificial intelligence.

Artificial intelligence research in China began in the 1970's, and in the last decade many units have pursued research in knowledge expression, logical inference, machine learning and search techniques. Much of the work has focused on engineering implementation, and numerous kinds of practical expert systems, expert-system design tools and the like have been created, but we are still lagging behind other countries. Artificial intelligence is extremely closely related to research in the automation field. In computer integrated manufacturing systems (CIMS), there is a need not only to create automation of machining processes, but also to automate engineering design and plant management. Artificial intelligence technology is of course needed in these areas. We need to create a variety of types of data bases, and we must have the ability to process this knowledge and to use it for inference, decision making and the like. Research of this kind is currently being pursued under the 863 Plan. In order for intelligent robots to be able to operate in a complex environment, they must be able to adapt to the environment, i.e., to recognize and understand it. Robots must also have the ability to operate independently and to determine their own operating procedures with reference to the task and the environmental circumstances, and they must have natural man-machine interaction capabilities and the like. The artificial intelligence projects dealing with automatic planning by robots, environmental modeling and intelligent man-robot interaction and the like that we are pursuing under the 863 Plan were initiated in order to solve the above problems. This research is extremely critical to the accomplishment of tasks in the automation area.

State Experimental CIMS Project

90FE0073E Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article by Wu Cheng [0702 3397]: "Establishment of the State CIMS Experimental Project and Its Progress"]

[Text] In terms of both technology and benefits, integration is the key to CIMS. The functions of the experimental project in China's CIMS development strategy are: to solve problems of the overall implementation of CIMS in Chinese enterprises, including overall design, implementation, and the provision of key technologies for systems integration, and to lay the groundwork for the development of a high-technology integrated systems industry in China by establishing an engineering and design institute for integrated systems.

The completion of the experimental project will make it an experimental center, a systems integration methods and technologies research and development center, a training center for all types of personnel and a center for transfer of advanced foreign and domestic technology to Chinese enterprises.

The feasibility documentation was begun in June 1987, and in March 1988 the project passed state evaluation. As a result of careful analysis and comparison, it was decided to establish the state CIMS experimental project at Qinghua University. The experimental project is a multilayered hierarchical structure that includes the main capabilities of real plants (design, manufacture and management) and has a real manufacturing environment with detailed disposition of machining operations, in which real tooling and machine tools are used to manufacture usable parts and assemblies, but its main focus is on research and on mastering key technologies. It uses the open system concept, integrates the facilities of many plants (hardware and software), and is likely to provide better service to more enterprises in this country, but at the same time has also brought more difficult technological problems to the fore. The experimental project will focus on information engineering and will not aim at perfect layout of machines and equipment or the attainment of high levels of automation; information engineering is the key to CIMS and the major route to obtaining benefits, and the current needs of China's enterprises are in this area. We must gradually make the transition from the integration of existing mature technology to the development and integration of more advanced technology. We emphasize research on the gradual integration of enterprises with their existing facilities and under existing conditions and a gradual transition to the key technologies encountered in high-level CIMS.

The entire development and implementation of the experimental project will be guided by a combination of systems engineering, top-down design, and bottom-up implementation. Software engineering methods will be used for stringent quality control, and there will be an emphasis on standardization.

When the preliminary stage of the experimental project is completed in late 1992, there will be three types of operation:

Integration from parts design to machining manufacture, i.e., the integration of CAD/CAM and FMC's [flexible machining cells]; relatively stable batch-production operations, i.e., the integration of design, manufacture and management; and temporary introduction of the machining of a new design part in small-lot production, which tests one aspect of system flexibility.

The experimental project's overall design was completed in May 1989. We have now entered the implementation stage, and with the cooperation of the overall engineering group, we have signed several domestic associated hardware development and software development contracts with the relevant domestic units. Nearly 250 technological personnel in 11 units in the country are directly involved in establishing the experimental project.

Construction of the information systems laboratory has been completed. The plant computer network; the distributed data base; and the CAD/CAM, simulation, multilevel scheduling, control and other laboratory subdivisions have gone into operation. The renovation of the manufacturing system laboratory is under way and is expected to be completed in mid-1990. According to plans, linkup and system adjustment will be begun in 1991, and the entire system integration operation will be completed by the end of 1992.

After more than 2 years' work, the technological outlines of the experimental project have begun to take shape. They include complex engineering system design and analysis methods, the distributed management of various types of data bases, and networking methods for various types of low-level equipment. These areas represent key problems that must be solved in the course of the development of China's mainstay enterprises. Many plant projects have already established cooperative ties with the experimental project. The state CIMS experimental project research center will focus on building for domestic needs and will strive to produce a favorable leading and guiding effect on plant automation in China.

Principal Topics, Target Products in Automation Technology

90FE0073F Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article: "Main Topics and Main Target Products in Automation Technology"]

[Text] There are two main topics:

1. Computer-integrated manufacturing systems (CIMS);

2. Intelligent robotics.

The principal target products for the year 2000 are:

—Establishing demonstration CIMS technology production lines;

—Independently developing CIMS system technology or key technology products suited to Chinese circumstances;

—Training an integrated contingent of advanced technical and engineering personnel involved in CIMS design;

—Establishing a research and engineering environment for CIMS;

—High-precision intelligent assembly robots;

—Self-controlling cable-free underwater robots;

—Mobile robots for operation in hostile environments;

—Establishing an intelligent robotics research and engineering environment.

Development of CIMS to Strengthen Industrial Competitiveness

90FE0073G Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article by Ren Shouju [0117 1343 2829]: "Develop CIMS Technology and Increase the Competitiveness of China's Manufacturing Industries"]

[Text] Computer integrated manufacturing systems (CIMS) are a form of plant automation. In order to allow adaptation to dynamic, changeable market competition since the 1970's, they flexibly and organically integrate separate, partial automation technologies and subsystems under the guidance of new management models and manufacturing processes, with comprehensive use of information technology and systems technology, based on computers and their support software, forming an integrated system in order to increase enterprise adaptability. Integration and the use of intelligent technology are the main technological characteristics of CIMS; the former expresses the breadth of current plant automation technology, and the latter expresses its depth.

CIMS is indisputably a means for enterprises to compete successfully, but different countries and different plants must use different implementation routes. The central question is, based on one's particular technologies and economic capabilities, to find the most effective and most economical path of development. In the past 3 years, our approach has been, with strict adherence to limited objectives, to engage in comprehensive top-to-bottom planning and bottom-up implementation, moving from the particular to the general. This has meant concentrating our investment of the limited 863 Plan/CIMS funds on a relatively inexpensive area which is nonetheless the key to the success or failure of CIMS and to its cost-effectiveness, namely, information integration. As regards the material-flow and facilities level, we were to proceed in terms of China's circumstances, not placing undue emphasis on attaining particular levels of automation.

Our objective is to create a pioneering, cost-effective demonstration production line in order to promote the formation of a plant-automation industry in China. We have pursued this objective by setting up experimental projects, technology centers, research topics and key applications plants, thus gradually creating the industry.

The experimental project is the research center of 863 Plan/CIMS overall integration technology, the testing center of particular technologies, a personnel training center, and in addition the bridge by which specific technological results are used at the demonstration sites. Its point of contact is Qinghua University, and completion is planned for 1992. Overall design has been completed, and the systems development and implementation stage has begun.

The task of the technology network centers is to develop the 863 Plan/CIMS subsystems and the corresponding integration technologies, to provide advanced, integrable subsystems and corresponding technologies that they have developed. Such integrable, cost-effective plant automation subsystems are to be converted as quickly as possible into technology products. The seven technology network centers deal with: integrated design, manufacture and information processing technology; process planning and design integration technology; flexible manufacturing engineering; integrated quality control systems technology; integrated management and decision-making information systems technology; CIMS system technology; and CIMS network/database engineering technology. At present, the technology design has been completed, a linkup with the automation processes of the relevant factories has been made, and work is in full swing.

The research topic objectives focus on relatively independent problems which are distilled or inferred from the experimental projects, technology network centers, and key applications plants. The results are intended to be used in various stages and at various hierarchical levels by the technology network centers, experimental projects, and factory enterprises. Research topics are classified among the specialized topics, including the 863 Plan/CIMS general area, 863 Plan/CIMS-oriented computer support products, process engineering plants, flexible manufacturing units, quality control, management and decision making, data bases, networks, system engineering and artificial intelligence technology. Each specialized topic comprises a group of interconnected subjects.

At the main-topic level we are implementing the expert management mechanism. At the second level, consisting of main-topic subdivisions and specialized topics, we use a combination of objectives management and process management. We hope that the limited 863 Plan/CIMS funding will be able to serve as seed money to unite relevant scientific and technological personnel and policymaking and management personnel throughout the country for a joint effort to promote the development of a plant-automation industry in China.

List of Expert Commission Members in Automation Area

90FE0073H Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 90 p 2

[Article: "List of Expert Commission Members in the Automation Area"]

[Text] Scientific Chairman

Jiang Xinsong [5592 2450 2646], research fellow. Director of Shenyang Automation Institute, CAS.

Expert Commission

Wu Zheng [0702 3397], professor. Deputy Chairman of Automation Department, Qinghua University.

Zhang Zhao [1728 2507], research fellow. Chief Engineer, Beijing Machine Tool Institute, Ministry of Machine-Building And Electronics Industry.

Li Bohu [2621 0130 5706], research fellow. Director of Institute of Computer Applications and Simulation Technology, Ministry of Aeronautics and Astronautics Industry (Director of Institute No 204, Academy No 2, Ministry of Aeronautics and Astronautics Industry).

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Members

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Ge Yu [2047 3842], research fellow. Hefei Intelligent Technology Institute, CAS.

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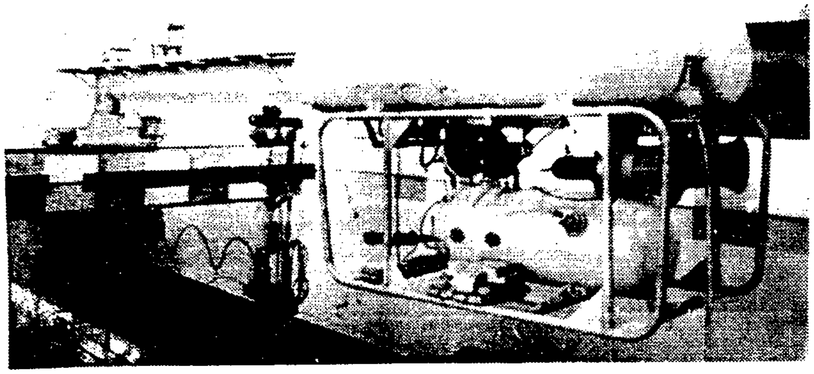
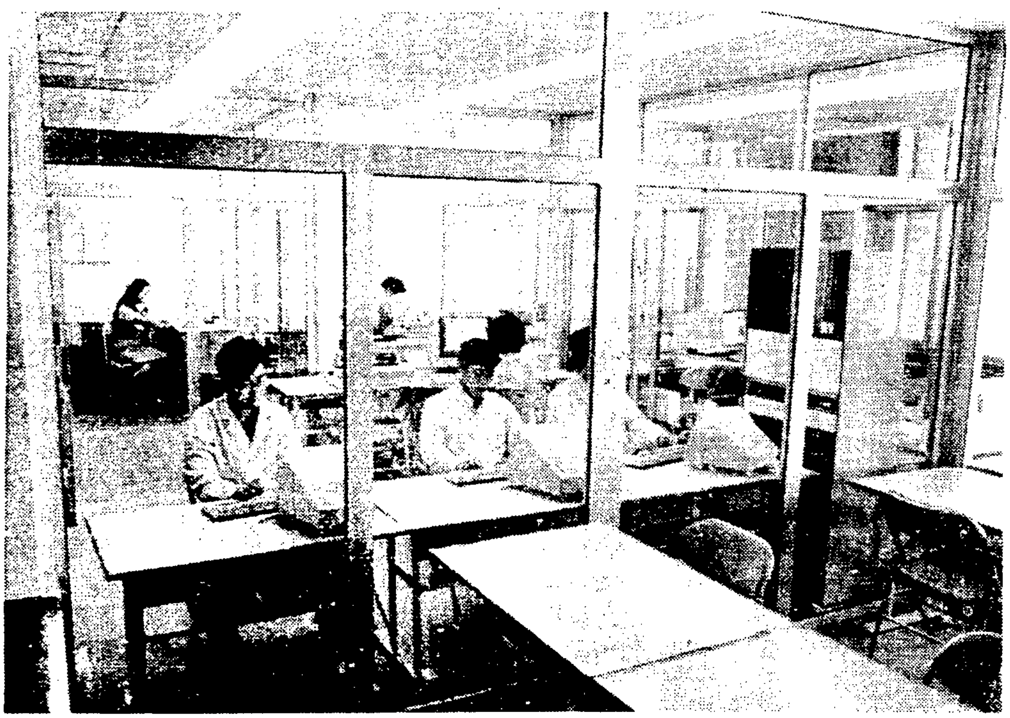


The cable-free underwater robot is an advanced underwater robot type with a wide range of activities, the ability to submerge to considerable depths and to pass through complex structures, and good concealment ability. Development of a cable-free underwater robot is included among the 863 Plan tasks. The photograph shows a cable-free underwater robot undergoing underwater tests.



The information system at the CIMS Experimental Engineering Center has been completed and is in operation at Qinghua University.

Roles of Key National Laboratories Studied

90FE0148A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 26 Apr 90 p 1

[Article by Xie Gengfa [6200 5087 4099]: "Promoting China's Scientific Progress and Economic Construction, Key National Laboratories Exploit Their Important Functions; A Number of Achievements Are World-Class, and a Group of Middle-Aged and Junior Personnel Have Been Educated and Trained"]

[Text] Beijing, 25 Apr (KEJI RIBAO)—From the Second Working Conference (inaugurated today) of Key National Laboratories, this correspondent learned that the competitiveness introduced into laboratory activities under the policy of openness, joint operations, and personnel- and equipment-sharing has gradually fostered vital functions aimed at progress and economic construction.

Over a span of 7 years from 1984 to the present time, a total of 71 key national laboratories were planned to be built; construction has been completed for 34 of these and they were accepted by the state after inspection with access for fellow researchers in China and abroad; another 17 laboratories are being built and open to outside researchers; and the balance of 20 are still under construction not suitable for access to outside staffers. Up to this year, in these laboratories the state has invested a cumulative sum of more than 500 million yuan. These key national laboratories are mainly deployed in fundamental disciplines and in newly developed fields of science and technology.

Since 1987, a number of world-class research achievements have been attained at these laboratories. More than 20 projects were rewarded first-level state prizes while more than 30 items rewarded second-level prizes. At the Biological Macromolecular Laboratory led by Zou Chenglu [6760 2110 7627], a breakthrough was obtained on flexibility research on the active sites of enzyme molecules, thus pioneering the comparative dynamics method of the denaturation and deactivation of enzyme molecules. The breakthrough ranks at a world-class level. At the Solid State and Microstructure Laboratory directed by Feng Duan [7458 4551], a regime of unshared phase transition was proposed in the study of the unshared ferroelectric phase; the proposal received great attention by fellow researchers abroad. In the investigation of micron-size superlattices, the laboratory researchers proposed the concept of acoustic superlattices; this is the first concept of its kind internationally. Thus, the theory of acoustic and nonlinear effects of a set of quasicyclic micron-size superlattices is being developed, opening up new vistas in the study of materials and devices. In addition, systematic work was begun in experiments on building acoustic resonators and transducers in the 300 to 800 Megahertz range. At the Organic Chemistry Laboratory directed by Li Yuming [2621 3768 6900], an important contribution was made in the study of active organophosphorus materials; using the epimerization method, chlorocyanogen chrysanthemic ester was prepared with the content of active principal agents raised to 95 percent and above, thus advancing pesticide production in China. In just the two years of 1988 and 1989, US$6 million in foreign exchange was saved for the state.

In these years, the key national laboratories educated and trained a number of middle-aged and junior talents, including more than 700 doctoral candidates and 3,000 master's candidates. Twenty-seven-year-old Lu Wei [7120 5898] of the Infrared Physics Laboratory scored a research achievement, "Doped, Disordered and Mixed-Crystal Semiconductor Lattice Oscillation Behavior," which was awarded a fourth-level state prize in natural science, and the first-level prize of the Chinese Academy of Sciences. During his student days, Lu wrote 15 papers, which were published in international symposia and major journals abroad; he was granted a doctoral degree 1 ½ years ahead of schedule.

Liu Zhongyi [0491 0022 0001], Zhou Guangzhao [0719 0342 0664], Zhu Kaixuan [2612 7030 6513] and other responsible persons of the related departments participated in the conference and gave speeches. The conference will summarize and exchange experiences in order to perfect management systems; thus, laboratory construction, operation and management will be on the road of greater standardization and systematization.

Sino-Soviet S&T Collaboration Plan Signed in Moscow

90FE0146C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 10 May 90 p 1

[Text] (Xinhua)—The Chinese Academy of Sciences and the Soviet Academy of Sciences signed in Moscow on 8 May an agreement on scientific cooperation for 1991 to 1995. Representatives for the two academies respectively were Directors Zhou Guangzhao and [Guriy] Marchuk. The items of cooperation include: ecology, microelectronics, magnetic fluid power generation, oxidation or organic matter, laser technology, plasmas, geotectology and plant physiology.

Nine High-Tech Development Zones Being Built in Eastern China

90FE0148F Shanghai JIEFANG RIBAO in Chinese 30 Mar 90 p 5

[Article by Hua Xiaoqing [5478 2556 7230]: "Science and Technology Serving New Industries, Nine High-Tech Development Zones Are Being Built in East China"]

[Text] (JIEFANG RIBAO)—At present nine high-tech development zones and parks are being built in East China, as follows: Pukou High-Tech Export-Oriented Development Zone in Nanjing in Jiangsu Province, Honglou High-Tech Development Experimental Zone in Jinan Municipality in Shandong Province, Qingdao Municipality High-Tech Development Experimental Zone, Weihai Municipality High-Tech Development Zone, Hefei Municipality High-Tech Industrial Park in Anhui Province, Science and Technology Industrial Park in the Fuzhou Municipality Economic and Technical Development Zone in Fujian Province, Hongshan High-Tech Park at Fuzhou, Xiamen Science and High-Tech Industrial Park, and Caohejing High-Tech Development Zone in Shanghai.

These high-tech development zones start with specific items in the priority development of high-cost-effective, high-tech products with inherent good prospects on a short time scale in order to require lower investment, high output and reinvestment, while gradually expanding the construction scale. Since the opening of the Pukou High-Tech Export-Oriented Development Zone (in Nanjing) in April 1988, a number of large- and intermediate-sized local key enterprises and institutes of scientific research were introduced into the zone. At present, there are 40 of these centers being founded in the zone.

Completion of the science zone (park) provides a setting for high-tech products to be developed by scientific research centers and manufacturing enterprises. At the Mawei site in the Science and Technology Industrial Park of the Fuzhou Municipality Economic and Technology Development Zone, a Fujian Keli High-Tech Industrial Park is being built as a joint effort of the involved Fujian departments and the China Keli Group; the joint effort was organized by the Fujian Provincial Science Commission. At present, first-stage investment has been preliminarily fixed at 10 million yuan. In addition, the following development items were selected: model B ultrasonic diagnosis instrument, Chinese and English word processor, high-resolution display, and PC learning machine, among others. The goal is an investment of 100 million yuan within 5 years in the entire industrial park area to generate an annual output value of about 1 billion yuan.

In the high-tech development zones (parks), prototype complexes marked by the achievements of groups of high-tech industries were formed. To the Caohejing High-Tech Development Zone in Shanghai there have streamed more than 50 plants in the electronics, instruments, meters, and fiber-optic communications areas, as well as specialized research institutes of biology, electronics and lasers; there are also seven enterprises founded with a total of US$143 million in foreign capital, whose gross output value has come to more than 2 billion yuan. Manufactured in the development zone, a high-tech item called a 32x64 platinum-silicide Schottky-barrier infrared focal-plane [array] has broad applicability in spacecraft guidance, early warning and thermal imaging, among other areas [see JPRS-CST-89-024, 1 Nov 89 pp 17-18]. At present, various technical indicators of this high-tech item have surpassed the technical level of similar products developed in the United States and Japan by 1982.

Wuhua High-Tech Development Zone Set Up in Yunnan

90FE0148D Beijing JINGJI RIBAO [ECONOMIC DAILY] in Chinese 30 Apr 90 p 2

[Article by Liang Yibin [2733 3085 3453]: "Wuhua High-Tech Development Zone Founded in Yunnan Province as a High-Tech 'Torch' Fired in the Yunnan-Guizhou Plateau"]

[Text] In the Yunnan-Guizhou Plateau Yunnan Province is ambitiously setting up its first high-tech concentrated development zone, the Wuhan High-Tech Development Zone.

The zone is situated in the Wuhua Ward of Kunming Municipality. In this area, called the Silicon Valley of Yunnan, there are concentrated half of the province's higher educational institutions, more than 20 scientific research centers at state or provincial levels, and more than 100 large and intermediate-sized enterprises. The area is the intelligence talent center for the most advanced scientific research, education and economy in the province. Supported by the provincial government, the Wuhua Ward Government invested more than 11 million yuan and appropriated 300 mou of land in building infrastructures of transportation, communications and power as well as leveling of site. Within this year and next, it plans to invest an additional sum of 30 million yuan to complete the unified layout of offices, communications and living facilities for an attractive development environment of high-tech industries in the development zone.

Some days ago, experts of the State Council Development and Research Center, the State Science & Technology Commission, and Yunnan Province officials reevaluated the construction of this high-tech development zone. In their view, the zone should rely on Yunnan's abundant mineral and biological resources by commencing with the high-tech intensive processing of these resources to develop new materials, biotechnology and information technology in order to fill technical voids in China's domestic products, and to manufacture import-replacement products.

It was reported that some civilian science and technology industrialists in metal-working and fine chemical engineering are vigorously taking part in the zone's construction program. Listed in the Torch Plan of the province and state, some enterprises aspire to be industrialized in the development zone. After completion of first-stage engineering in the zone, gross high-tech output value may rise to 300 million yuan. In the experts' view, considering that Yunnan, situated near China's southwest border, is the province with the most numerous minorities, setting up the high-tech development zone will reform the province's traditional industries and convert its backwardness: "Poverty-stricken even though holding a golden bowl." The development zone has major functions of demonstration and propagation.

High-Tech Development Zone Set Up in Chengdu

90FE0148C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 15 Apr 90 p 2

[Unsigned article: "New Chengdu High-Tech Manufacturing and Development Zone"]

[Text] The establishment of the Chengdu High-Tech Development Zone was approved by the people's governments of Sichuan Province and Chengdu Municipality in October 1988. The zone is located in Shenxianshu District in a southern suburb of Chengdu Municipality and has a planned area of 24.6 square kilometers.

The administrative organ of the development zone is the Chengdu High-Tech Development Zone leadership team, which is responsible for these development-zone aspects: unified leadership and administration of various operations, coordinated handling of major problems in the zone, guiding team activity in long-term planning, and formulating its policies. Under the leadership team, an office is responsible for day-to-day work in the zone.

Key development fields of the Chengdu Development Zone are new materials; optical, mechanical and electrical technology ["optomechatronics"]; biotechnology; microelectronics and computers; sensor technology; lasers; applications of nuclear technology; and fiber-optic communications. As a vital center of science and culture in China, Chengdu has relatively abundant resources in science and technology, with a high reputation in machinery, electronics, chemical engineering, biology, medicine and applications of nuclear technology.

Currently in Chengdu, there are 19 institutions of higher education and 207 research institutes employing 273,000 professional personnel. In the decade from 1978 to 1988, upwards of 2,700 achievements in science and technology were attained.

In the development zone, there are now 11 enterprises with 2,679 employees. The revenues for 1989 were 40.75 million yuan; 1.76 million yuan was paid out in taxes while 1.75 million yuan was the net after-tax profits for that year.

High-Tech Development Zone Near Hangzhou Approved

90FE0148E Shanghai WEN HUI BAO in Chinese 1 Apr 90 p 1

[Unsigned article: "A High-Tech Development Zone Will Be Built West of Hangzhou"]

[Text] Hangzhou (WEN HUI BAO)—A high-tech development zone will emerge in the Gudang and Xiqi areas, west of Hangzhou. Recently approved by the Zhejiang Provincial Government, this zone is 9 square kilometers in size. Within the zone and its vicinity, there are eight higher schools of science and engineering, such as Zhejiang and Hangzhou Universities; 18 research centers in the natural sciences, nine state-level key laboratories, and 29 electronics and data-processing enterprises. In the current development, it was decided to emphasize electronic data-processing technology, biotechnology, new materials and high-efficiency energy-saving technology.

Tibet Becomes a New S&T Development Zone

90FE0146F Beijing RENMIN RIBAO in Chinese 11 Apr 90 p 1

[Article by Yang Zhen [1135 3791]]

[Text] Lhasa, 10 Apr (XINHUA)—Tibetan S&T undertakings are beginning to be systemized and regularized for the purpose of developing Tibet into a region with a certain amount of S&T foundation and capability. A force of 25,000 S&T personnel is working hard in 14 independent S&T research and first-line production units. In this force, Tibetans account for more than half.

Under long-term Party and government cultivation, S&T personnel from minority groups have become an important component in this force. Currently national-minority S&T personnel with Tibetans forming the largest group, total 10,476 persons; this number amounts to 65 percent of the total S&T personnel in the Autonomous Region. Especially evident is the increase in the number of senior and middle-level S&T officials, from 171 in 1983 to 1980 now. Many Tibetan S&T officials have received national-level awards for their accomplishments.

Presently, Tibet has organized research systems in: agriculture-forestry-stock breeding, transportation, electric power, geology, energy, medicine/public health, highland biology, ecology, astronomy/almanacs and S&T information. These activities, based mainly on hard work in combining old knowledge with new S&T information, are beginning to bring in a new environment to the Tibetan Plateau.

In the agriculture field, researchers have selected over 70 species of grains and cash crops for testing. There are indications that if the suitable ones are widely planted, there may be a 15-30 percent increase in yields. Among them a better species of winter wheat, for which widespread planting was begun in the 70's, has accounted for a cumulative increase of over 1 billion kilograms of grain. Others such as barley, rape, broad beans, and cabbage have also shown increase in production.

Animal breeding researchers have begun improving the quality of yellow ox, sheep, yaks, lambs, Lhasa white chickens, etc. They have also conducted research in the treatment of many animal diseases and have produced vaccine to counter them. Their efforts have reduced the destruction of thousands of head of livestock. The forestry workers, using information gained from satellites, calculated with a 90 percent accuracy the Tibetan lumber reserve as 1.4 billion cubic meters, ranking it as number two in China. This is a landmark discovery for the future development of the Tibetan lumber industry.

In the medical field, researchers found parasites seldom seen in China and have conducted experiments in treating tuberculosis and in preventive methods. Over the past 30 years many Tibetan native treatment methods of medications have been studied for either retention or elimination. The Tibetan Autonomous Region Traditional Medicine Institute is a good base for further research in this activity.

In the field of energy resources development and utilization, the number of solar cooking stoves in use has increased to over 10,000 units. The use of geothermal resource has also gained good results. presently, the Yang Bajain Geothermal Field is listed as one of the 10,000-kilowatt-level power stations. According to statistics, Tibet has received a total of 347 S&T Achievement Awards; among them, 21 were awarded at All-China S&T Conventions. The two national-level S&T Progress Awards are "The Success and High Yield of Winter Wheat Introduced to the Tibetan Plateau" and "Yang Bajain Geothermal Experimental Power Station." "The

Tibetan Utilization of Solar Energy" was given a national S&T Spark Award, 2nd Class. "Iodine Ointment for the Treatment of Open Wounds In livestock" and five other items were officially promoted for wide use when they were included as valuable S&T applications for rural villages.

Science Commission Approves Baotou Rare Earth Zone

OW1408082890 Beijing XINHUA in English 0758 GMT 14 Aug 90

[Text] Hohhot, August 14 (XINHUA)—A program to set up China's first rare earth hi-tech development zone in Baotou City in north China's Inner Mongolia Autonomous Region has recently been appraised and approved by the State Science and Technology Commission.

Baotou is the country's largest center for the research and production of rare earths. In 1989, Baotou's output of rare earth concentrates was 70 percent of the country's total. One-third of the country's rare earth research personnel are located in the city.

Experts say the new zone will further promote research and the production of rare earth in the city and the rest of the country.

Patterns of High-Tech Development Zones Studied

90FE0148B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 16 Apr 90 p 1

[Article by Han Yuqi [7281 3768 3825] amd Xie Ning [6200 1380] of KEJI RIBAO: "High-Tech Development Zones Rapidly Developing in China; With 2,065 Enterprises Employing 47,000 Workers, 30 Zones Have Been Established"]

[Text] China's high-tech development zones have rapidly progressed. Since the State Council approved a high-tech development experimental zone in Beijing Municipality in May 1988, the number of high-tech development zones in China has now reached 30. Based on statistics from 15 major development zones, there are now 2,065 high-tech enterprises with 47,000 employees. Since the State Science Commission in August 1988 designated this activity in the "Torch Plan," the high-tech development zones have been regarded as a vital base for executing the project. At present, China's high-tech development zones have gradually formed in the following four patterns:

In the first pattern, the zones were started in the field, with centralized administration but with distributed management. This pattern emphasizes production goals without specifying zonal boundaries, along with limited investments in unsophisticated equipment. Thus, capital risks are low while results are rapidly realized. This pattern can be seen in the development zones at Changsha and Harbin, among other locations.

In the second pattern, the zones have well-defined boundaries with centralized administration and management. In this pattern, priority is assigned to high-tech enterprises after a zone has been delimited. In addition, a policy of integrating technology, operation and trading is pursued in building up an avenue of science and technology, traveling the route of self-contained development and profit accumulation. These zones are in Beijing, Wuhan and Shenyang, as well as elsewhere.

In the third pattern, construction is carried out under a unified plan with centralized administration and management once a new zone has been delimited. This pattern involves opening up new zones at appropriate sites for unified planning and construction while development gains momentum. The advantages of this pattern include forming a healthy environment based on the requirements of high-tech industrial development. In this pattern, starting conditions are favorable and industries will take root rapidly. These zones are in Nanjing and Chengdu, and elsewhere.

In the fourth pattern, a high-tech industrial park is set up in an economic development zone. Features of this pattern include taking full advantage of the favorable conditions of the economic development zone and creating an attractive climate for investment, thus attracting capital and advanced technology from abroad in operating an export-oriented development zone, such as those at Shanghai and Shenzhen, and in other locations.

After more than a year's progress, the 20-plus development zones throughout China now constitute a healthy administrative system.

In 1989, the gross revenues of China's major development zones were 2,610 million yuan. Revenues from the Beijing development zone were 1,780 million yuan while revenues from development zones in Wuhan, Shenyang, Changsha, Changchun and Shanghai approached or exceeded 100 million yuan.

Machinery Ministry Puts 98 Items on Priority List for Industry Readjustment

40100066 Beijing CHINA DAILY in English 16 Jul 90 p 2

[Article by staff reporter Ren Kan: "98 Items on Priority List"]

[Text] China's machinery and electronics industry is engaged in readjusting its product mix for a steady development during the Eighth Five-Year Pan period (1991-95).

The Ministry of Machinery and Electronics Industry has announced that it will make development of 98 items a priority, and limit or ban the production of other 105 products.

As one of the steps to further the industry readjustment, the new product mix is aimed at securing the limited funds, energy and raw materials for development of products the country urgently needs.

The 98 products on the priority list include combine harvesters, farm tractors with imported technology, wind power generators, petrochemical equipment and food processing machinery.

Optical fire communication equipment and broadcasting transmitters are also on the list, according to the ministry.

China this year is planning to increase the export value of machinery and electronics by 15 to 20 percent over last year.

The ministry also promised to guarantee the production of equipment for the country's key projects, metallurgical and kmilitary industries, airports and ports.

The ministry is to concentrate on the production of 600,000-kilowatt and 300,000-kilowatt thermal power generators for large power stations, sources with the ministry said.

Computers, software, instruments for industrial automation and electronic air control systems aref also on the ministry's priority list.

To speed up the development of the software industry, the ministry will set up several development and production bases during the coming years.

Meanwhile, the ministry will also guarantee market supplies of products in high demand including color TV sets and video cassette recorders.

Preferential treatment will be given to enterprises producing those products in terms of capital construction, technical innovation, loans, interest rate and import quotas, according to the ministry.

To ensure the smooth development of products on the priority list, the ministry has determined to push down or ban the production of products which are of low level and cost more energy and raw materials, according to the ministry.

These products include furnace with less than 300 cubic metres' capacity, ordinary machine tools, low level bearings and film machine.

Capital construction and technical innovation funds and importing of equipment will not be permitted for these products.

Song Jian on Trend of High-Tech Development Plan

90FE0146b Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 10 May 90 p 1

[Article by Han Yuqi [7281 3768 3825]]

[Text] Nanjing, 9 May—At the Second All-China 'Torch Plan' Work Conference, State Council member and Director of the State Science & Technology Commission (SSTC) Song Jian emphasized the need for the development of high-tech enterprise to be on the road of internationalization. Song said one of the important reasons why the Chinese people in the past suffered many defeats is the backwardness of Chinese S&T development, which resulted in the weakness in China's economy and national power. He attributed the rapid development to the world's capitalist countries in the same time period to their ability to monopolize the world's markets. He said that the foreign powers employed gun-boat diplomacy, forced open China's front gate, looted China's resources and dumped their goods on China. He vowed that the Chinese people will never forget this bitter period of history.

Song continued that with the establishment of the present government under the leadership of Chairman Mao, Premier Zhou and other senior revolutionary leaders, China broke through the blockade in the short period of 20 years to develop the two bombs and one satellite. These drastically changed China's position and image in the international world. Song vowed that China will also not forget these achievements.

Song pointed out that since the reform, China has made no small achievements. The most outstanding is the successful launching of the "Asiasat-1" Communications Satellite by the Long March III booster. According to Song, this clearly demonstrates China's presence in the world's commercial space market. Song listed other achievements, including: superconductivity research the [Beijing], electron-positron collider, the [Lanzhou] heavy-ion accelerator, a laser photo-typesetting machine, urokinase, man-made crystals and hepatitis-B vaccine, all at a world-class level. Song believed that China has the ability to rely on its own efforts to build up the high-tech enterprises.

Song acknowledged that in high-tech product development, much remains to be done in mass-production techniques and market development. He also said that while China is strong in S&T research, it is weak in converting research results into high-tech products, which is, therefore, its most important mission for the near future.

According to Song, the 'Torch Plan' had been studied and prepared for many years before it was launched with central government approval in August 1988. The purpose is to expand China's S&T abilities into high-tech commercial products so that by the end of this century and the beginning of next, high-tech products will account for a higher percentage as well as monetary value in comparison with other industrial products in GNP and in total amount of export. Song believed that the reason the 'Torch Plan' is making good progress under adverse conditions is because it fits the needs of society. Consequently, the plan's progress must be untiringly and resolutely maintained.

Song continued that in the process of making adjustments in the enterprise structure, China's economic construction is shifting from expansion to consolidation, from an extensive model to an intensive model, from large-scale acquisition from the outside to the development of capabilities inside. Song urged the use of high-tech products to transform traditional industry, and a multifold increase in worker productivity. Furthermore, Song also urged the combining of the 'Torch Plan' with agricultural production through S&T methods. High-tech products must include activities in the fields of agriculture, forestry and stock breeding.

Song emphasized that to develop high-tech industry, enterprises must be on the road to internationalization and that there must be openness in reform. Song warned that if the products are only on the domestic market but have little or no international market potential, the development of high-tech enterprises will meet with great difficulties. Since this is a strategy affecting the Chinese people's basic interests, it deserves the support of all elements of society.

In conclusion, Song urged that the potential of China's over 10 million S&T personnel be fully developed to accomplish this task for China.

Impact on Environment of Increased Burning of Coal Assessed

90FE0060A Beijing ZHONGGUO HUANJING BAO [CHINA ENVIRONMENTAL NEWS] in Chinese 22 Feb, 6 Mar 90

[Article by Jiang Xiangli [1203 6272 7642]: "Energy Shortage and Pollution From the Use of Coal"]

[22 Feb 90 p 3]

[Text] Energy "feeds" our industry. It is an essential ingredient for our "four modernizations" program, and an essential element towards satisfying the increasing demands of the population for material and cultural needs. Energy shortage and pollution caused by using coal as fuel have now resulted in severely limiting our country's economic and social growth. In the past few years, power failures have accounted for a loss of 200 billion yuan in our industrial and agricultural sectors. While hydroelectric power and solar energy are clean types of energy, coal, petroleum, and natural gas are polluting types of energy. Coal is the main source of energy in China, and as such it seriously pollutes our environment. In the Eighties alone, our loss due to atmospheric contamination was on the order of seven to ten billion yuan.

Different countries have different energy structures and consumption patterns. The per capita energy consumption in the United States of America is about eight times that of the world, and tens of times that of developing countries. Japan has 3 percent of the world's population and yet it consumes approximately 10 percent of the world's petroleum output. Developed countries produce mostly petroleum and natural gas while developing countries produce mostly coal and organic matter. The up-and-coming type of energy is nuclear energy, which forms about 7 percent of the world's energy make-up. However, in a few countries such as France and Belgium, nuclear energy is their major energy form, making up about 70 percent of these countries' total output.

1. Energy Shortage

China gets 95 percent of her energy from mineral sources. As far as mineral resources are concerned, China ranks sixth in the world both in quantity and in variety. Of the 45 varieties of important minerals, China's reserves are second in abundance only to the Soviet Union and the United States. However, China's per capita share is less than half the world's per capita value, and ranks 80th on the world scale. Our per capita share of mineral resources (coal, petroleum, natural gas) is only one third of the world's per capita share, less than one-seventh of the per capita share in the USSR, and approximately one-tenth of the per capita share in the United States of America.

In 1988, China produced 970 million tons of coal, 137 million tons of crude oil, and 108 billion kilowatt-hours of hydroelectric power; the total primary energy resources output was approximately 950 million tons of standard coal. While our total production is the most abundant in the world, our per capita production is very low. Our per capita share of primary energy resources is only 0.86 ton of standard coal.

The major problems in energy utilization in China are as follows:

The first problem is that we waste a tremendous amount of energy. To start with, our recovery rate of deposits is low. When half of the deposits are harvested, the other half goes to waste. The recovery rate of coal is only approximately 40 percent. Our second problem is our low thermal efficiency. In China, the thermal efficiency for coal is less than 30 percent, in comparison with 57 percent in Japan, 51 percent in the United States, 40 percent in Western Europe, and 36 percent in India. A low coal thermal efficiency means that for every 100 tons of coal deposits harvested from the ground, only a few tons are used effectively; the rest is lost in the various stages of mining, processing, transportation, and burning. In China, only 12 tons per hundred are efficiently used.

Energy consumption is too high. China's industrial sector suffers from low economic efficiency because we consume too much raw material and energy. Analysis shows that the energy consumption for every U.S.$100 million of our GNP is more than any other country in the world. The energy consumption for every additional U.S. dollar of GNP is about three times higher than the world average, seven times higher than that of Japan. Our energy consumption per unit of GNP has been monotonically increasing. Statistics show that the energy consumption per 100 million yuan of national income was 178,000 tons of standard coal in 1979, a value much higher than the 91,800 tons in the "First 5-Year Plan" and 136,000 tons in 1965. When we compare our energy consumption per each U.S. dollar of industrial output value it is 5.8 times the Japanese value, 4.2 times the GDR value, 2.7 times the U.S. or Indian value. In 1986, China consumed 809 million tons of standard coal while Japan consumed 567 million tons. However, China's GNP for that year was only 1/6 that of Japan.

The way our economy operates is such that it uses large quantities of energy resources while producing very little output; it wastes a lot of energy while at the same time consumes a lot as well. As a result, we have energy shortages and a seriously contaminated atmosphere. Our per capita income has always been low. Our economy has become "hollow," meaning we have little increasable public wealth. It is becoming increasingly difficult to support the population with the material we have. Social economical crisis looms; environmental crisis looms. In 1988, an independent accounting put the net worth of fixed-assets in our industrial institutions and enterprises at 604.04 billion yuan. At the same time, the total amount of money in savings accounts and in currency held by our citizens totaled 700 billion yuan. There are not enough assets to be bought by the amount of money available. Our economy is indeed "hollow."

Other reasons for our energy shortage are as follows: (1) low energy flexibility coefficient. "Flexibility coefficient" is defined as the ratio between the rate of increase in energy to the rate of increase in GNP. It is generally agreed that the energy requirement of the various economic sectors is guaranteed and the national economy may grow smoothly when the flexibility coefficient is greater than 0.5 and the flexibility coefficient of electricity is greater than 1. In 1988, our national growth in primary energy resources was 4.2 percent over 1987, while industry grew by 20.7 percent over the same period. This gave a flexibility coefficient of only 0.20 for primary energy resources and a flexibility coefficient of less than 0.6 for electricity. (2) The second reason for our energy shortage is that our electrical equipment consumes more electricity than we can generate, in a 3:1 ratio. This results in an annual deficit of 200 billion kilowatt-hours. From 1986 on, we have added a lot more electricity-generating facilities and have added several tens of millions of kilowatt-hours to our disposal. By the end of 1988, the total electric-generating installed capacity reached 120 million kilowatts, generating 543 billion kilowatt-hours of electricity. The fact remains that towns and villages still suffer from electricity shortages and there is a major gap between supply and demand. (3) The third reason for our energy shortage is that we do not use our energy efficiently. This is true of the manufacturing industry, where our unit production cost is high and our production consumes a lot of energy. This is also true in our tertiary industry and in our life styles. We have built more and more high-class hotels, domestic appliances, and motor cars. All these are high energy-consuming items and aggravate our energy shortage. Take the case of a medium-sized high-class hotel. Its annual energy consumption is approximately 10 million kilowatt hours. There are now more than 1500 hotels catering to foreign visitors across the country. Take the case of the Great Wall Restaurant in Beijing. Its annual electric consumption is the same as that of the entire Beijing municipality at the time of the liberation. Today, the annual energy consumption by domestic appliances is approximately 1/6 of the country's newly added electric generating capacity. It is estimated that by the year 2000, refrigerators alone will consume more than 6 billion kilowatt hours annually. In the year 1988, China exported 30 million tons of petroleum and imported 2 million video cassette recorders and a number of motor cars. Thus on the one hand we exported energy, and on the other we imported energy-consuming appliances and motor cars. This kind of goods exchange can only aggravate our energy shortage problems.

How, then, do we face the energy shortage? To start with, we should look for more energy sources. The country has to, and soon, accelerate the development of the energy industry by expanding on the exploitation of coal, petroleum, natural gas, and hydroelectric power. From a longer term point of view, we should eventually wean ourselves from our dependence on mineral energy. It is estimated that 80 years from now, the entire petroleum and natural gas reserves across the world will be exhausted, and that the supply of coal will last at the most another 200 to 300 years. The identified reserves in oil and gas in China shall be completely exploited before the year 2065, and the mining of coal shall become increasingly difficult in 40 years. Thus our motto of "do whatever is most appropriate for the local situation and develop various forms of energy to supplement one form with another" should be followed. We should work very hard to develop new sources of energy: solar energy, wind energy, tidal energy, geothermal energy, methane gas and nuclear energy, etc. Our second solution is conservation, that is, to use our energy resources efficiently. Energy conservation is the focal point of any energy policy. Statistics show that from 1973 to 1980, the GNP in Japan increased by 33.2 percent while the energy used per nit output value decreased 22.8 percent. China can benefit greatly from energy conservation. Just by increasing our thermal efficiency from the present value of less than 30 percent to, let us say, higher than 40 percent, the annual savings will be between 300 and 400 million tons of standard coal. This saving is enough to guarantee our energy needs for manufacturing purposes and for our day-to-day living. How do we go about conserving energy? To start with, enterprises must strengthen their management, and operational procedures must be improved. Then production techniques must be improved, manufacturing equipment must be updated. Sixty percent of the mechanical and electrical products in China are old and obsolete. These are huge energy guzzlers. We should rely on high technology to upgrade our equipment and save energy.

[6 Mar 90 p 3] [Text]

2. Exploit New Energy Resources

China has seen some success in the development and exploitation of new energy sources over the past years. However, more work remains to be done.

Solar energy: We are in the process of encouraging the use of solar energy in heating, air conditioning, greenhouses, sea water desalination, and power generation. The most frequently encountered solar appliances are solar stoves and solar water heaters. There are now 100,000 solar stoves in China, one million square metres of solar water heaters, several hundred thousand square metres of solar-heated rooms, 4000 square metres of solar-powered driers spread over 53 locations, more than 100 kilowatts of solar-powered photoelectric cells, and one million square metres of solar greenhouses.

Tibet is the one province in China where solar energy has been utilized the most efficiently. Solar stoves, solar baths, solar greenhouses, and solar-heated rooms are heavily promoted both in cities and in villages, thereby easing the energy shortage problems. Solar greenhouses enable us to grow several dozen varieties of vegetables on the plateau; large quantities of fresh vegetables may now be purchased in local markets.

Wind energy: Our total annual reserve of wind energy is 1.6 billion kilowatts, of which one tenth is exploitable. At the end of 1988, there were 80,000 wind-powered generators across the country, with a total installed capacity of 10,000 kilowatts.

Inner Mongolia leads the country in the use of wind energy. There are 70,000 small wind-powered generators, with a total installed capacity of 7,000 kilowatts. This is enough energy for illumination purposes and for television-viewing for 22 percent of the population in pastoral areas.

Tidal energy: There are now eight tidal-powered electricity generating stations across the country, with a total installed capacity of 11,000 kilowatts.

Geothermal energy: Yangbajing, Tibet, uses geothermal energy to generate electricity with an installed capacity of 19,000 kilowatts. Electricity generated by geothermal energy constitutes one half the electricity consumption in Lhasa. The approximately 380,000 kilowatts of low-temperature geothermal energy is used in raising aquatic products, agricultural breeding, and for medical and health purposes.

Methane: The use of methane has been heavily promoted in rural areas since the early Seventies. By the end of 1988, there were more than 4.7 million methane-generating pits across the country. The average daily production of methane is 1 to 1.5 cubic meters per pit, enough for cooking purposes for a family of five. In areas where there is an electricity shortage, methane can also be used for illumination. It is a clean fuel that is easy to use. In recent years, large, industry-sized methane-generating pits having capacities of the order of 1000 cubic meters have been built in towns and cities. Methane-generating pits use mostly highly concentrated organic solid and liquid wastes from breweries, sugar mills, pig farms, cattle farms, slaughter houses, and soya bean processing plants. The advantages of utilizing organic waste are many: recycling, elimination or reduction of wastes, and conversion of environmentally unfriendly by-products into useful products. The first half of 1989 saw the number of large methane-generating pits increase to more than 1000, with a total capacity of 220,000 cubic meters. This fuel supplies more than 2600 horsepower to power stations with a total installed capacity of more than 5200 kilowatts.

Nuclear energy: Nuclear energy is mostly used to generate electricity. This is a new, promising source of energy. At the end of 1988, the total global nuclear installed capacity was 310 million kilowatts, amounting to 16 percent of the world's electricity output. The Qinshan Nuclear Power Plant, located at the foot of Mount Qin, Haiyan, Zhejiang [Province], is the first nuclear plant researched, designed, and built by our countrymen. The State Council approved its construction in 1982, the design of the plant was completed in 1983, and construction formally began in March 1984. The first phase, a project designed to produce 300,000 kilowatts, is expected to be operational by the end of 1990. The second phase, involving two generators each producing 600,000 kilowatts, has already been planned. The third phase is on the drawing board. When completed, the Qinshan Nuclear Plant will be the biggest nuclear power plant in China. The electricity generated in this plant will greatly alleviate uneven power distribution in our country. We shall find relief from the present obligation of moving coal from southern China to northern China and transmitting electricity from eastern China to western China. The Daya Bay Nuclear Plant is a joint venture between China and foreign investors. Installation of two 900,000-kilowatt generators is proceeding rapidly. It is expected that the plant will be operational in 1992. China uses pressurized water reactors (PWR's) in her nuclear plants. PWR's have been used all over the world in the last 50 years, and are recognized internationally as a safe method, economical, and mature. They are used in over 70 percent of the world's nuclear plants. In China, we incorporate safety and preventive measures in every step of the procedure, from site selection, plant design, plant construction, to operation. We adhere to strict rules to comply with our motto "First in safety, first in quality."

3. Pollution from Coal Combustion

Coal is our main source of energy. It formed 70 percent of our total primary energy resources in 1980, and 76 percent in 1986; our dependence on this fuel seems to increase with time. Coal presents environmental hazards at all stages, be it mining, processing, transportation or combustion.

The major source of our atmospheric pollution comes from the combustion of coal for both industrial and domestic purposes. Dust and sulfur dioxide are the biggest pollutants. Since the Eighties, we annually generate 23 million tons of dust, 73 percent of which comes from the combustion of coal. Our sulfur dioxide emission amounts to a total of 14.60 million tons, of which 90 percent comes from the combustion of coal.

In 1981, five cities in China, Beijing, Shanghai, Guangzhou, Shenyang, and Xi'an, participated in a global atmosphere observation project organized by the World Health Organization. In the 5-year period from 1981 to 1985, 350,000 data measurements were gathered and the health of our population was evaluated. We found that suspended particles and sulfur dioxide are generally higher in concentration in northern China than in southern China, higher in concentration in cities than in rural areas, higher in concentration in winters than in summers, higher in concentration in residential and commercial areas than in industrial areas, and that the concentrations peak in the mornings and in the evenings. If more than 70 percent of the harmful components in the pollutants, such as lead and benzo(a)pyrene, adhere to particles which are subsequently inhaled, they may seriously jeopardize the health of the population.

The basic solutions to combat pollution from the burning of coal are as follows:

—Put emphasis on city planning. Residential areas should be placed away from the summer winds blowing from industrial areas.

—Diversify energy resources, make the best of what is available locally, and use energy efficiently; improve on gas supply to cities, try supplying gas in bulk to cities and to regions.

—Encourage the use of processed coal, which has a higher thermal efficiency than unprocessed coal, and does not pollute the atmosphere as badly.

—Control smoke and dust. Set up dust-controlled areas. Significant measures in smoke control include upgrading our boilers, improving their design and operating conditions, thus allowing for complete fuel combustion. Examine the nature of the exhausts, be they in gaseous form or in powder form, and install appropriate devices to remove them economically, practically, and appropriately.

—Desulfurization, which includes desulfurizing the fuel as well as desulfurizing the exhaust from the combustion of the fuel. This is an important step in stemming the release of sulfur dioxide as a byproduct when using mineral fuel. To recover sulfur is to recover another natural resource and to prevent environmental pollution. Petroleum refineries, ammonia production plants, coal-gas manufacturing plants, and ferrous metal refineries all produce gaseous sulfur compounds. These plants should be equipped with sulfur-removing equipment. Coal-fuelled or oil-fuelled electric-generating stations, industrial boilers, and kilns all produce low-level sulfur dioxide contaminants. At this time, it would be impractical to clean up sulfur emissions from these sources because of the cost involved. However, we may attempt to do so in some plants.

4. Energy Supply in Rural Areas

In developing countries, the main source of energy is from organic matter. There are 95 countries, with half the world's population (totalling 2.5 billion people), facing this predicament. They rely on organic matter to supply energy for their daily functions such as cooking, heating, etc. At least 100 million people in this group do not get enough energy to satisfy their "daily necessary requirement," and 1.3 billion people get less energy than they need. Without appropriate measures, by the year 2000, 3 billion people will experience serious energy shortages.

Of these 2.5 billion people who rely on organic matter for their energy needs, 60 percent (63 countries and 1.5 billion people) do so by cutting down trees and harvesting the wood for fuel. In so doing they destroy the forests and create timber shortages. With trees in short supply, an alternate organic source of energy comes from plant stalks and animal manure. It is estimated that in developing countries, about 400 million tons of manure is burned for fuel annually; this leads to a decrease of 14 million tons in grain production. The annual loss of grain production due to the loss of fertilizer through burning manure is even greater than the amount of grain relief handed out by the United Nations. In the United States, more than 70 percent of plant stalks is returned to the soil, thus making the land more fertile. However, in developing countries, more than 75 percent of plant stalks is burned for fuel. Without the stalks the land does not retain water as easily and eventually loses its nutrients, particularly the organic components.

Eighty percent of our population lives in rural areas, where most of the energy comes from organic matter. While organic sources constitute 90 percent of the energy, thermal efficiency is a dismal 12 percent. The annual fuel consumption in our rural areas comprises 200 million tons of wood, 400 million tons of stalks, an unspecified amount of coal, petroleum, and animal manure to a total of 350 million tons of standard coal. Of this amount of energy, 270 million tons of standard coal are used for day-to-day living purposes and 80 million tons for production purposes. In a 12-month period, an average of 80 million rural families suffer wood shortages for 3 to 6 months. This shows that our energy crisis is more serious in rural areas than in cities.

The rural practices of cutting down trees and burning stalks for fuel destroys our forests and eventually turns soil into sand. Such behavior strongly threatens our agricultural ecology.

To ease the rural energy-shortage problem, we must encourage the use of efficient stoves, plant more trees, encourage the use of methane, and build small hydroelectric power plants. One may be short-sighted, and seek only short-term benefits by building small furnaces, mining only rich deposits, mining indiscriminately, etc. This will only relieve our energy crisis temporarily; it does not provide a long-term solution.

Plans Made To Alleviate Shortage of Scientists

90FE0146E Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 9 Apr 90 p 1

[Article by Liu Yuan [0491 1254]]

[Text] Recently, various elements in society have been reflecting strongly on the problem of the "talent gap" among China's professional S&T personnel. Many National People's Congress representatives and committee members have made comments and proposed solutions. A few days ago, the State Personnel Ministry called the "All-China Professional S&T Staffing and Management of Senior Officials Work Conference." At this conference, this reporter learned that the ministry has devoted much effort to investigating and studying the problem and has proposed a preliminary solution to alleviate the problem.

According to the responsible official of the ministry, the so-called "talent gap" problem is manifested in the following three situations: (1) The basic professional S&T cadres are aged. Most senior members of the professional S&T staff are over 50 years old; within the next 5 to 10 years, they will all reach retirement age. (2) The 36-45 or middle-aged group, though young and physically strong, because of the "Cultural Revolution" interruption are very weak in basic professional S&T knowledge. (3) The remaining young S&T professionals are still growing and have not yet matured enough. The 1988 statistics show that about half of China's professional S&T personnel is in this under-35 group. In this group, a large number of them have been affected by the "going abroad fever" and the "business fever," and are not happy in their present positions.

The ministry's preliminary proposal suggests that leadership at all levels should set up a professional S&T personnel long-range staffing plan and short-term goals, in order to have a large force of "red and expert" personnel to take over from the older groups. The proposal also suggests that the first task is to create the proper environment and then to give help to the young people in solving their daily living problems. In addition it calls for the reduction of emphasis on "experience and seniority" during personnel qualification review and performance evaluation. Furthermore, the ministry urges that young professional S&T staff members who are capable of independent development in their work should be given financial assistance. As for the 35-45-aged groups, additional training should be given to allow them to expand their contributions. Similarly, the potential and the remaining abilities of the two older groups must not be overlooked. Ties with many staff members upon their retirement should not be "severed with a cleaver." On the contrary, the ministry urges all organizations to recruit post-doctoral research personnel into the active professional S&T units to make up for the shortage of young and middle-aged professional S&T personnel.

SCIENTISTS, SCIENTIFIC ORGANIZATIONS

Applied Optics Lab Open to Foreign Researchers

90P60036 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 6 Jul 90 p 1

[Unsigned article: "Applied Optics Key State Laboratory Completed"]

[Text] (XINHUA) Having recently passed the state's acceptance check, the Applied Optics Key State Laboratory built by the Chinese Academy of Sciences' (CAS) Changchun Institute of Optical & Precision Machinery is now formally open to foreign researchers. Eight sub-labs, for basic research and for high-tech research, are included in this Applied Optics Lab. Noted optics specialist [Professor] Wang Daheng [3769 1129 3801], member of the CAS Academic Committee and Director of the Division of Technical Science, will direct the lab's academic committee.

Additional Details on Badr-A, Other International Satellite Launches

90P60030 Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE] in Chinese No 7, Jul 90 p 2

[Unsigned article: "China to Launch Several Foreign Satellites"]

[Text] According to information released by a XINHUA spokesman on 18 May, China's successful launching [in April] of Asiasat I marks the nation's formal entry into the international satellite launch market. The launch is to be followed by that of several foreign satellites. Launch contracts now signed with the China Great Wall Industry Corporation are detailed below.

In June [actually occurred on 16 July] 1990, China will launch the Badr-A [Badr-1] experimental satellite developed by the Pakistani Space and Upper Atmosphere Research Commission [SUPARCO]. This 3.5-cubic-foot satellite, weighing 65-70 kilograms, is a 26-sided spherical object with a diameter of 48.3 centimeters. It will be used for conducting digital communications and data storage experiments throughout a Pakistani network of small low-cost ground tracking stations. The Badr-A will pass over Pakistan four to six times per day.

At the end of 1991 or in 1992, China will launch two HS-601 satellites for AUSSAT [the Australian Satellite Organization]. This contract was signed in November 1988 by the Great Wall Corporation and by the U.S.'s Hughes Aircraft (Satellite Manufacturing Division).

At the end of 1991, China will launch a geosynchronous communications satellite for the Arab Communications Satellite Organization.

In June 1992, China will launch the Swedish Space Corporation's Freja satellite piggybacked [with a larger payload] onthe Long March II-C. This small scientific experiment satellite will be used for conducting research on the Earth's magnetic field. The Freja and Pakistan's Badr-A will both be sent aloft in a Chinese retrievable satellite capsule.

ADVANCED MATERIALS

Low-Temperature Super-High-Vacuum Pump Developed

90P60042 Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 18 Jul 90 p 1

[Caption to photograph by Fang Xiliang [2455 6932 5328]

[Text] A low-temperature super-high-vacuum pump, a new high-tech product developed by the Chengdu Electro-Vacuum Design Institute, can achieve a temperature of 253 °C below zero and a maximum vacuum of 1.333224×10^{-4} Pa [pascals]. This is one of the most advanced pumps in China; it has broad development potential for applications to equipment manufactured with vacuum electronics clean-room technology. Having undergone various parametric tests, this low-temperature pump has met the design requirements.

New Hardware Products Announced

Sino-U.S. Joint Venture to Produce SPARC Coprocessors

90P60040a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 27, 11 Jul 90 p 1

[Article by Tang Baoxing [3282 1405 5281]: "Sino-U.S. Joint Venture Shenyang Shenlong Company Set Up: Will Produce SPARC Coprocessor Boards for PCs"]

[Summary] An agreement to set up the Sino-U.S. joint venture Shenyang Shenlong [4377 7893] Computer Systems Company—the first Sino-foreign high-tech joint venture to be established in the Shenyang area—was recently concluded in Shenyang. North Computer Application and Development Corporation (NCAD) and the U.S. firm Definicon International Corporation each are investing US$600,000 to form the joint stock company. The joint venture plans to market an 80386 PC coprocessor board with SPARC [scalable processor architecture]-based microprocessors in the second half of this year, and to market a first-generation Shenlong microcomputer—to be sold domestically and abroad—in the Spring of next year. In its first year, the joint venture intends to manufacture 1000 boards, with annual output to gradually rise to 5000 boards. In addition, the new firm will combine NCAD's software expertise with Definicon's coprocessor boards to develop various applications software products that should increase the board's market potential at home and abroad.

First RISC-Based Intelligent Workstation

90P60040b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 29, 25 Jul 90 p 1

[Article by Du Cai [2629 6846]: "Nation's First RISC Intelligent Workstation Debuts in Beijing"; cf. JPRS-CST-90-019, 23 Jul 90, p 41]

[Summary] China's first intelligent workstation incorporating reduced instruction set computing (RISC) technology—the EST [i.e., Eight Six Three]/IS 4260 intelligent workstation system—passed the expert technical appraisal sponsored by the State Commission of Science, Technology & Industry for National Defense [CSTIND] in Beijing on 17 July. The testing shows that the system's main performance indicators meet international standards for the late eighties.

The EST/IS 4260 RISC-based workstation, a key item in the State's 863 Project, was developed via the reverse-engineering method by the Chinese Academy of Sciences' [CAS] Institute of Computing in cooperation with Nanjing University, Qinghua University, Wuhan University, Beijing Institute of Information Engineering, Beijing Systems Institute, and Zhejiang University. The system comes with an 8Mbyte on-board memory (expandable to 128Mbytes), a hardware system with its own intellectual property rights, 12 expansion slots, a high-resolution monitor, and abundant software. Software includes an intelligent man-machine interactive system (which can take voice commands), a knowledge engineering development tool and environment, an intelligent software development tool and environment, and an intelligent applications demonstration program. The workstation, which has a central clock speed of 16.67 MHz and a fixed-point operating speed of 10 MIPS [million instructions per second], runs under the UNIX operating system and is designed to be easily incorporated into an Ethernet network as the central node computer or server for up to 16 terminals.

This system will be an extremely useful tool for furthering domestic research into artificial intelligence, information processing, and office automation.

More on First Intelligent Workstation

90P60040c Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 18 Jul 90 p 1

[Article by Wang Jianmin [3769 1017 2404] and Han Yuqi [7281 3768 3825]: "Nation's First Large Intelligent Workstation Debuts: Key Item in High-Tech Information Area"]

[Summary] Beijing, 17 July—The EST/IS 4260, China's first RISC-based intelligent workstation, is a supermicrocomputer workstation that is designed to easily connect to a free-standing erasable optical disk subsystem for theoretically unlimited external memory. The hardware system, less than 1 cubic meter in size, is lightweight, has a high performance-to-cost ratio, and has a convenient man-machine interaction interface.

According to an expert spokesman, the development of this system, a project assumed by the CAS Institute of Computing, is the greatest achievement to date in the information field within the State's High-Tech R&D Plan (the 863 Plan), for which the system was named, and will create a favorable environment for further domestic research into artificial intelligence.

Four Sinicized Utility Software Programs Marketed

90P60028b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 25, 27 Jun 90 p 22

[Article by Gao [7559]: "Shanghai Electronic Computer Plant Markets Four Sinicized Utility Software [Programs]"]

[Summary] Shanghai Electronic Computer Plant recently put out a new series of Sinicized utility software products. The Donghai dBASE-IV V1.0/CEGA database management software is a product based on Ashton Tate's dBASE-IV V1.0. It preserves all the features of the original, and adds Chinese-character information processing functions. The program may be run on a Donghai 0530 or 0540 microcomputer (1Mbyte memory) with a CEGA [Chinese enhanced graphics adapter] Chinese card.

Donghai's WORD word-processing software system is the company's version of the U.S. firm Micropro's WORDSTAR 2000 V1.0, with Chinese-character information-processing functions—such as file names, document editing, etc.—added. The system requires a CEGA card and M1724 printer such as is provided with the Donghai 0530 microcomputer, and runs under the DHCEGA [Donghai CEGA] BIOS 3.00 operating system.

Chinese/English FOX BASE+ V2.1/CEGA, developed upon the U.S. firm Fox Software Company's FOXBASE+ V2.1 software product, has a very high run speed (20 percent faster than Chinese/English MFOXBASE+ V2.0 and over 800 percent faster than dBASE-III PLUS), comes with abundant utility programs, and runs with the Donghai 0530 or 0540's CEGA Chinese card.

Chinese/English FRAMEWORK II V1.1 integrated software is the firm's version of the original FRAMEWORK II software, with Chinese-character windows added. It runs under the DHCEGA BIOS 3.00 operating system, with a CEGA Chinese card and appropriate monitor such as those provided with the Donghai 0530B microcomputer.

Laser Optical Filing System Developed

90P60028a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 25, 27 Jun 90 p 2

[Unsigned article: "New Advance in Laser Optical-Disk File Management Systems"]

[Summary] Backed by the technical talent of Qinghua University's Fine Engineering Research Institute, the Beijing Gaodian ["High-Tech Electronics"] Optical Disk Company recently developed an optical-disk file management system. Consisting of a microcomputer (such as an IBM PC AT), an optical disk drive, an image scanner, a laser printer, a high-resolution graphics monitor, a mouse, and a line printer, the system can also be used for text editing, and is designed for easy incorporation into a small local area network. Several terminals can be simultaneously accommodated, to permit resource sharing, editing, document retrieval, etc. The company has also developed an integrated software product, called OFS, for optical disk file management. From 18 to 25 July, Qinghua University will conduct a special course in the basic theory and application of this new system.

3.5-Inch Floppy Disk Drive Production Line Operational

90P60026 Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 23, 13 Jun 90 p 1

[Article by Chang Ming [2490 2494]: "3.5-Inch Floppy Disk Drive Production Line Put into Operation; Soon to Have Production Capacity of 200,000 Units"]

[Summary] The 3.5-inch floppy disk drive (FDD) production line set up by the Hangzhou-based China Magnetics Company (CMC) passed its technical appraisal and economic feasibility evaluation sponsored by the Ministry of Machine-Building & Electronics Industry (MMEI) in May. MMEI is supporting the company's plan to reach a production capacity of 200,000 units in the near term, as well as to gradually increase output beyond that, in order to take advantage of economies of scale.

The MD series of 3.5-inch 1-Mbyte and 2-Mbyte thin-type FDDs, jointly developed by CMC and the Hong Kong firm Ergo Computers International, Ltd., incorporates advanced technologies such as a rewrite phase-compensation circuit, programmable read-write filters, and oil dampers, as well as independently designed and developed LSI application-specific integrated circuits (ASICs). The specialists at the accreditation felt that the technical indicators for this series of products are on a level with those of similar Japanese-manufactured products.

Because of the high degree of domestic assembly and the high percentage of Chinese-made components used in manufacturing, these FDDs have a very attractive cost-performance ratio, and should therefore be quite competitive on the world market, for which they are primarily intended. This production line not only will generate products to replace imports, it also will become the first Chinese magnetic-recording-equipment production line to incorporate economies of scale.

Data Communications Software and Systems Described

Status of Packet Switching in China

90P60041a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 27, 11 Jul 90 p 40

[Article by Xue Xinghua [5641 5281 5478]: "Bright Prospects for Development of Data Communications and Packet Switching"]

[Excerpt] [Passage omitted] In an effort to catch up to the world state-ot-the-art in information technology, China is now vigorously developing its data communications. Recently, the DPS25-II packet switching system imported by the Ministry of Posts & Telecommunications (MPT) from France's SESA Co. was incorporated into China's first public packet switching data network, which became operational in November of last year—a network designed to open up to society data communications traffic. In the project's first phase, three node exchanges—one in Beijing, one in Shanghai, and one in Guangzhou—have been built; remote concentrators have been set up at Wuhan, Nanjing, Shenyang, Xian, Chengdu, Tianjin, and Shenzhen; and the network control center (NCC) and the International [Equipment] Transit Office [Guoji Chukou Rukou Ju] have been set up in Beijing. The system uses CCITT-recommended

X.25, X.75, X.28, X.29, and X.121 international standard protocols, and can run under IBM's SNA/SDL [Systems Network Architecture/Synchronous Data Link Control] protocol, for easy link-up with IBM computers. The NCC utilizes the DPS6/450 (2Mbyte internal memory capacity) minicomputer manufactured by France's Bull [HN Information Systems] Inc. In addition to network software supervisory functions, hardware maintenance and support, and user and network data management, the system can also monitor data and track expenses for national surveys, and permits man-machine dialogue through color menu screens. The system can function as a domestic network or international network, and can be interconnected to any worldwide public packet switching network. In this way, the user can retrieve and share the abundant data resources of computers at home and abroad, and thereby enjoy a greatly augmented range of computer applications.

Domestically Made Packet Assembler/Disassembler

90P60041b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 28, 18 Jul 90 p 1

[Article by Shao Yan [6730 3601]: "Domestically Made Data Communications Equipment to Gradually Appear on Market: Packet Assembler/Disassembler Equipment Unveiled in Beijing"]

[Summary] MPT's Institute of Data Communications Technology has announced that its independently developed packet assembler/disassembler (PAD) equipment has successfully passed the ministry's technical appraisal. This equipment for public and dedicated packet switching networks resolves problems with user network entry, line multiplexing, and expansion of network coverage.

The PAD equipment has the following features: (1) its modular software and hardware structure permits easy maintenance, expansion, and series production; (2) processing power is very high and a full range of functions is included: in addition to its basic PAD function, the equipment can be used to augment local switching, telephone network outward/inward dialing, and telegraph terminal call-in/call-out equipment; (3) equipment interfaces and traffic functions comply with international standards and the network-hookup demands of China's public packet switching data network; (4) network entry may be via single machine, cascade connection, or independent group; and (5) the charge [i.e., expense-tracking] functions comply with network requirements.

The experts at the accreditation felt that the equipment's performance matches that of international products of like kind and recommended that the equipment be put into batch production as soon as possible. It was also announced that the institute is currently developing even higher-performance packet switching equipment and that a whole series of Chinese developed and manufactured data communications equipment will soon be on the market.

Great Wall, Hitachi to Cooperate

90P60041c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 28, 18 Jul 90 p 1

[Article by Zhang Baishun [1728 4102 7311]: "Great Wall to Cooperate With Hitachi in Developing Communications Software"]

[Summary] China's largest microcomputer manufacturer, the Great Wall (GW) Computer Group, recently signed a letter of agreement with Hitachi, Ltd. and the Intecom Co. to jointly develop a Chinese-language version of communications software for interconnecting GW microcomputers with Hitachi's M-series general-purpose computers. A recent count shows that there are about 100,000 GW microcomputers and over 100 M-series general-purpose computers in use in business and industry throughout China, and numerous authorities and individual users have asked for a means to network the two kinds of computers; this has prompted GW and Hitachi to combine forces to develop such software. GW will assume responsibility for sales of the software product in China. It is predicted that the joint development will improve computer utilization and efficiency and increase the market share for GW microcomputers and for M-series general-purpose computers.

Vision-Controlled Intelligent Robot Hand-Eye System Developed

90P60025 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 14 Jun 90 p 1

[Article by Xu Jiling [1776 2623 3781]: "China Develops Vision-Controlled Intelligent Robot Hand-Eye System"]

[Summary] Nanjing, 13 Jun (XINHUA)—China's robotics technology has taken a major stride forward with the development of a vision-controlled robot hand-eye system by researchers at East China Institute of Engineering's Computer Department. Experts at the accreditation ceremony commented that in terms of recognition and positioning abilities, this system is at the world state-of-the-art. This system, whose development was one of the key National Defense projects in the Seventh 5-Year Plan, includes a pair of bright "eyes" for receiving images—especially changes in the position of external objects—which are then processed and used to control the robot's hand and eyes in coordinated fashion. The robot's recognition mode integrates two-dimensional qualitative information and three-dimensional quantitative information techniques. Positioning accuracy is at the 1-millimeter level.

Multi-Loop Parallel Robot Prototype Unveiled

90P60031 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 11 Jul 90 p 2

[Article by Xu Zhigang [6079 1807 0474] and Wang Zhongping [3769 0112 1627]: "Multi-Loop Parallel Robot Laboratory Prototype Debuts"]

[Text] China's first robot of a new structural type—a multi-loop parallel robot laboratory prototype—recently made its debut at Yanshan University. This computer-planned robot, via a hydraulic-pressure control system, can move independently with six degrees of freedom within a not-overly-large range. The robot can be employed in spatially constricted places such as the wheel mounting and engine mounting areas in automobile assembly lines, and can also be used in the navigation, aerospace, and related industries. Several difficult problems in the area of parallel robot structural theory—an area in which [domestic] research is at the international state-of-the-art—were given in-depth study in the realization of this research achievement.

New Frequency-Stabilized Radar System for Air Force

90P60037 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 14 Jul 90 p 4

[Article by Han Changguang [7281 2512 0342]: "Radar Analog-Digital Hybrid Frequency-Stabilized System"]

[Summary] The meter-wave radar analog-digital hybrid frequency-stabilized system developed by the [PLA] Air Force Radar Institute has passed the Air Force technical appraisal. This system is urgently needed equipment for improving the anti-jamming capability of the current meter-wave radar in active service. Testing of the prototype for this stable, reliable, easily maintainable, low-cost system has shown that the main technical indicator for visibility amid clutter has risen from the original 18dB to 30dB, greatly improving the radar's low-airspace detection ability.

Further X-Ray Laser Success at Shanghai Lab

90P60032 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 11 Jul 90 p 2

[Article by Li Xigen [2621 0823 2704]: "Shanghai X-Ray Laser Research at World's Forefront"]

[Text] Using its Shenguang ["Magic Light"] laser apparatus, the Shanghai Laser Laboratory recently conducted a successful experiment in achieving high-gain soft X-ray lasing with neon-like germanium [ions]. The most direct application of this result is that scientists and technicians will be able to take holographic photographs of biological macromolecules, and thus to obtain completely new scientific information previously inaccessible. This will be of inestimable benefit to China's research and production in the biological sciences and in materials science. This research will also aid the full resolution of certain theoretical and practical problems in the physical processes of X-ray lasers, and can enable the X-ray laser to be of practical value in the near future.

First Success With X-Ray Photolithography from Synchrotron Radiation

90P60023 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 28 Jun 90 p 1

[Article by Huang Yong [7806 0516] and Chen Jindai [7115 6855 0108]: "China's First Successful Experiment in Achieving Synchrotron-Radiation-Generated Soft X-Ray Optical Lithography: Will Have Significant Influence on China's VLSI Technology and Production"]

[Summary] Beijing, 27 Jun (XINHUA)—It has been learned from officials at the Synchrotron Radiation Laboratory at the Beijing Electron Positron Collider [BEPC] that Chinese researchers have scored their first success with soft X-ray optical lithography generated by the collider's synchrotron radiation. Specifically, they were able to etch clear lines with a resolution (line width) of one micron—an achievement indicating great prospects for China's development of VLSI circuits. Only a very few developed countries such as the U.S. and the FRG have mastered the technology of synchrotron-radiation-generated soft X-ray photolithography.

Using an independently developed mask, the researchers from the Chinese Academy of Sciences' (CAS) Institute of High Energy Physics (IHEP) scored this first success only a few days ago. Several other CAS-affiliated research units—including the Microelectronics Center, the Changchun Institute of Optical & Precision Machinery, and the Chengdu Institute of Optical and Electronic Technology—cooperated with IHEP in the design and development of the special-purpose photolithography beam, the optical lithography laboratory, a sub-micron optical lithography machine, and the X-ray masks.

Eight New ASICs Developed for Satellite Attitude-Control Gyroscope

90P60043 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 22 Jul 90 p 2

[Article by Zhao Yu [6392 2509]: "Miniaturized Satellite Printed [Circuit] Boards Just Around the Corner"]

[Text] Eight types of application-specific hybrid integrated circuits [hybrid ASICs] for a liquid-floated integrating gyroscope—a key component used in the attitude-control system for the new generation of high-capacity communications satellites—have been jointly developed by the Ministry of Aeronautics & Astronautics Industry's Xian Plant 691 and Institute 502. The first product samples passed acceptance check in mid June.

Used in gyro servomechanisms, these hybrid integrated circuits can permit a 1-to-10-fold reduction in volume and a 20-to-50-fold reduction in weight of some of the pc boards, thus permitting an increase in the satellite payload. These circuits have parameters indicating highly reliable, consistent performance and easy assembly and installation.

Sectionally Constricted Planar Common-Cavity Stripe-Geometry GaAs Semiconductor Laser Developed

90FE0076A Beijing WULI [PHYSICS] in Chinese Vol 19 No 2, Feb 90 p 80

[Article by Du Guotong [2629 0948 0681] and Gao Dingsan [7559 7844 0006] of the Department of Electronic Science, Jilin University, and Yang Delin [2799 1795 2651] of Chongqing Institute of Optoelectronics: "Sectionally Constricted Planar Common-Cavity Stripe-Geometry Semiconductor Laser"]

[Text] The sectionally constricted planar common-cavity stripe-geometry laser is a new structure of semiconductor double heterojunction (DH) laser developed to meet the ever-demanding needs in this information era. It has a low threshold and excellent linear output and can operate at high power in single mode. Before this invention, many semiconductor DH lasers have been developed abroad. Based on the transverse waveguide mechanism parallel to the p-n junction, there are two major categories of such lasers: the gain guided type and the built-in real index-of-refraction guided type. Earlier lasers developed are mostly gain guided; the active region of this type of laser is flat and uniform in thickness. The advantage is that the technique is relatively simple and it is easy to establish a fundamental lateral transverse mode oscillation because of better choices of lateral spatial mode. The disadvantage is that it does not have a stable lateral mode waveguide mechanism, leading to poor lateral mode stability. The optical field can easily move laterally, which causes the twisting of the optical power vs current curve. This is an enormous obstacle in fiber-optic communications and information processing. In order to overcome this effect, lasers with various built-in real index-of-refraction guided structures have been developed. Most of them have been fabricated using liquid phase epitaxy (LPE) on a non-planar substrate to vary the thickness of the active region laterally to cause the effective index of refraction to change and form the waveguide structure. The advantage of this structure is better lateral mode stability and a linear optical power vs current curve. However, most of these lasers have very strong waveguide mechanisms and the choices of spatial modes are poor. It is easy to create higher-order lateral transverse mode oscillation, which is not desirable in actual use.

In order to develop lasers with a good linear optical-power-to-current relationship and high-power fundamental mode oscillation without adding the degree of difficulty in fabrication and raising the threshold, we propose to construct along the direction of light propagation a resonance cavity which includes both waveguide structures to complement each other. The sectionally

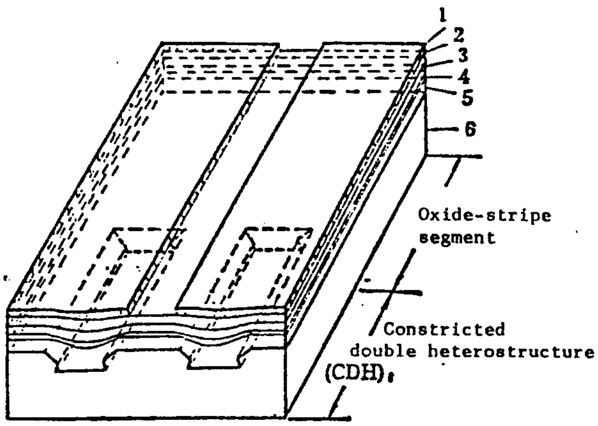


Figure 1. Structure of Sectionally Constricted Planar Common-Cavity Stripe-Geometry Laser

Key: 1. SiO layer 2. p-GaAs 3. p-$Al_xGa_{1-x}As$ 4. GaAs active region 5. n-$Al_xGa_{1-x}As$ 6. n-GaAs substrate

constricted planar common-cavity stripe-geometry laser shown in Figure 1 was designed based on this concept. This resonance cavity consists of two sections; one is the CDH (constricted double-heterostructure) structure developed by RCA and the other is the oxide stripe structure developed earlier. The CDH structure employs a waveguide based on index of refraction [i.e., "index-guided"]. The presence of such a structure can stabilize the lateral optical field. The oxide-stripe structure is a gain-guided structure. The presence of this type of structure can increase the gain difference between the fundamental mode and higher-order modes to improve the selectivity of spatial mode and expand the fundamental mode oscillation power range. From Figure 1 we can see that it would be no more difficult to fabricate such devices. It can completely use the CDH technology. The only difference is to etch the double channel on the substrate in sections, instead of across the entire substrate. By doing so, without raising the threshold and the degree of difficulty in fabrication, problems associated with the selectivity and stability of the transverse mode of a DH semiconductor laser can be resolved effectively. In addition, due to reflective interference between the two sections, the device will have some longitudinal mode - temperature locking effect.

The single-mode operation and linear output range of the device described above has been extended to 15 - 20 mW. The spectrum has a locking effect within a certain temperature range. With the proper choice of structural parameters, threshold current can be reduced (to as low as 29 to 30 mA, usually 40 - 60 mA). Compared to the simple ridge-waveguide CDH laser developed by RCA, this laser shows significant improvement in threshold current and mode characteristics.

This laser is easy to fabricate, has practical applications and can be manufactured in quantity. It is suitable for a wide variety of applications in information processing, such as fiber-optic communications, laser video disks, laser printing and sensors. Chongqing Institute of Optoelectronics can produce this device in quantity. This advances the production of semiconductor lasers (0.85-μm wavelength) one step forward from the earlier proton-bombarded structure to a higher level in order to partially meet domestic demand.

High-T_0 Large-Optical-Cavity InGaAsP Semiconductor Laser Developed

90FE0076B Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 10 No 3, Mar 90 pp 206-212 (MS Received 4 Jul 89, revised 25 Aug 89)

[Article by Zhong Jingchang [6988 2529 2490], Zhu Baoren [2612 1405 0088], and Li Ronghui [7812 2837 2547] of Changchun Institute of Optics and Fine Mechanics: "High-T_o Large-Optical-Cavity InGaAsP Semiconductor Laser Developed"]

[Text] Abstract

A LOC (large optical cavity) InGaAsP-InP laser has been designed and fabricated by taking all factors affecting its temperature characteristics into consideration. Experimental results show that its temperature stability is improved. A low threshold current (J_{th} = 2.5 kA/cm^2 for broad area contact), high power (3 W in pulsed operation) and high characteristic temperature (T_o = 150 K) device has been developed.

Key Words: semiconductor laser.

I. Introduction

The 1.3-μm InGaAsP-InP semiconductor laser is somewhat troublesome in actual use due to the sensitivity of its threshold current to temperature. This thermal effect becomes more significant particularly for high-power devices. Therefore, many researchers are interested in the mechanism that causes this temperature sensitivity and in finding a solution to this problem.[1-3]

In general, the temperature dependence of the threshold current of a semiconductor laser can be expressed as $J_{th}(T) = J_{th/o} \exp(T/T_o)$. T_o is the characteristic temperature which marks the temperature sensitivity of the laser. In order to raise T_o, we designed and fabricated a five-layer LOC laser based on theoretical analysis. By improving the epitaxial and diode fabrication processes, the superiority of this structure has been verified experimentally.

II. Device Analysis and Structural Design

1. Carrier Leakage

Carrier leakage is an important factor affecting the temperature behavior of the InGaAsP-InP laser. Yano, et al., conducted detailed theoretical studies on the temperature dependence of the threshold current of an InGaAsP-InP double heterojunction (DH) laser.[4,5] As far as the 1.3-μm InGaAsP-InP laser is concerned, because the state density of InP is higher in the valence band than in the conduction band, the donor energy level in P-type InP is deeper than that in N-type InP. Hence the electron leakage current density is larger than the hole leakage current density. Especially above room temperature, electron leakage is the primary factor determining the temperature characteristics of the device. We adopted the LOC structure for our device. In addition to confining carriers in the active layer, light confinement is extended into the active layer and waveguide layer in order to lower the power density inside the cavity. Thus, the output saturation effect is improved and the device can operate steadily at above room temperature. Compared to the conventional DH structure, the LOC structure improves the temperature behavior of the device by expanding the light confinement area and by utilizing the intrinsic waveguide layer to cool down some carriers. Therefore, thermal deterioration of the device is alleviated and the characteristic temperature is raised.

2. Auger Recombination

Auger recombination is an important factor affecting the temperature dependence of the threshold current of the InGaAsP-InP laser. In a DH device, a non-radiation recombination process can explain the threshold - temperature data. The rate of recombination is proportional to the square of the injected carrier density.[6] It is generally believed that light output saturation when the carrier density is of the order of 1×10^{18} cm^{-3} is caused by the decline of internal quantum efficiency resulting from Auger recombination.

In III-V semiconductors, the Auger process primarily involves the interaction of two holes and a conduction-band electron, resulting in a hole in the spin-split valence band. This is the so-called CHHS process. There are two other possible processes. However, their probability is one or more order of magnitude lower than that of the CHHS process in a non-degenerate semiconductor.[7] All Auger recombinations involve more than two carriers. After taking carrier scattering into consideration, the CHHS band-to-band Auger recombination rate is

$$R = 2\left(\frac{V}{8\pi^3}\right)^4 \iiint\!\!\int T_{if} P(1, 1', 2, 2')\, dK_1 dK_2 dK'_1 dK'_2$$

where T_{if} is the transition probability of a two-carrier scattering process, V is the volume and P is the statistical weight function.

In a well-designed LOC structure, the light flux in the active and waveguide layers is lower than that in the active layer of a conventional DH structure. The active layer in the ideal LOC laser is thicker than that in an ordinary DH laser. Its carrier scattering probability is lowered. Consequently, the probability that carriers will participate in an Auger process is also reduced. Therefore, the temperature dependence of the threshold current is improved.

3. Optical Absorption Loss

The threshold condition for a semiconductor laser is that the maximum mode gain is equal to the total loss in the optical cavity. The total loss in a LOC device is

$$A = (1/L_c)\ln(1/R) + \Gamma\alpha_{ac} + (1-\Gamma)\cdot\alpha_{ex}$$

where L_c is the length of the cavity, R is the reflectivity of the mirror, Γ is the light confinement factor in the active layer, α_{ac} is the loss in the active layer, and α_{ex} is the loss outside the active layer, including confinement layer and waveguide layer. Here, α_{ac} also includes the absorption loss α_1 due to the electron transition from the spin-split band to the heavy hole band and the absorption loss α_2 due to the electron transition from the split band to the empty acceptor energy level. This process is shown in Figure 1.

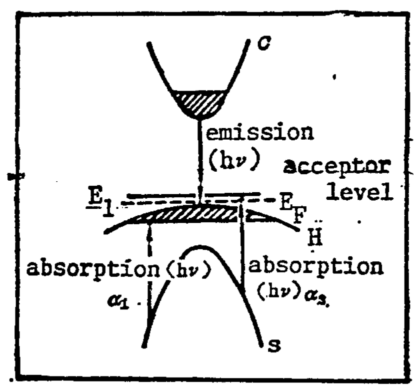


Figure 1. Electron Transition Model for the Inter-Valence-Band Absorption

$$\alpha_1 = B_1/\{1+\exp[(E_1 - E_{FV})/kT]\}$$
$$\approx B_1 \exp[(E_{FV} - E_1)/kT],$$
$$\alpha_2 = B_2\Big/\left\{1 + \frac{1}{2}\exp[(E_A - E_{FV})/kT]\right\}.$$

In general, $E_A - E_{FV}$ is small and $E_1 - E_{FV}$ is several hundred percent of kT. Therefore, the temperature dependence of α_1 is more obvious than that of α_2. In the LOC structure, α_{ex} is not the same as that in a conventional DH structure; the latter only includes the loss in the confinement layer. As far as the former is concerned, the loss in the waveguide layer is considered more important than that in the confinement layer. Therefore, in a LOC laser with reasonable design parameters and using intrinsic InGaAsP as a waveguide layer, it is possible to improve its temperature behavior by a lower α_{ex}.

A LOC laser, as shown in Figure 2, was specifically designed after taking the above factors affecting its temperature behavior into consideration. An intrinsic

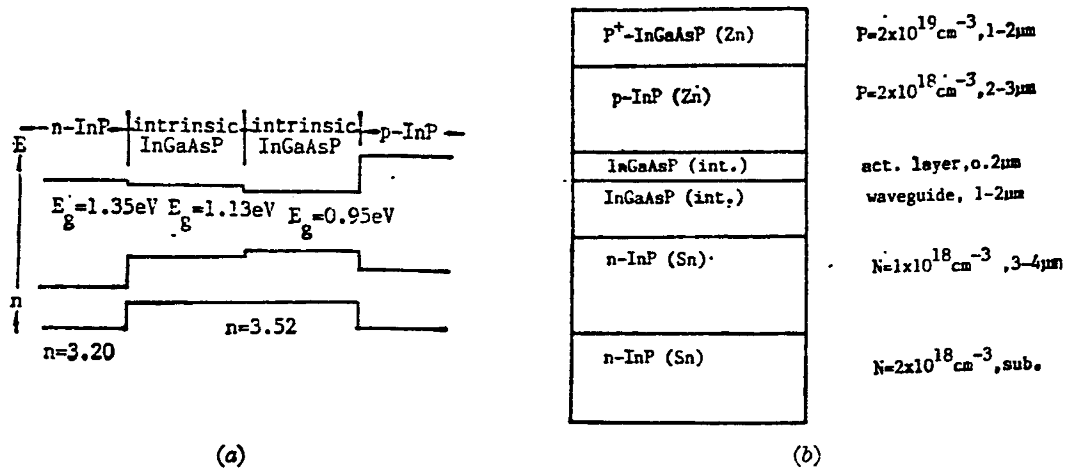


Figure 2. (a) Schematic Diagram of Energy Band and Refractive Index in the Laser. (b) Schematic Diagram of the Laser Structure.

active layer and waveguide layer are used to reduce optical absorption loss. Through theoretical calculations and epitaxial experiments, we obtained the optimal thickness and doping level for each layer shown in the figure in order to effectively confine the carriers, reduce scattering loss and minimize Auger recombination probability.

III. Epitaxial Growth of the LOC Structure

In order to realize the designed structure and to minimize effects due to factors such as impurities, defects and lattice mismatch to the extent possible, an epitaxial process involving both uniform cooling (UC) and sudden cooling (SC_2) was used. Because of its high driving force for growth, the epitaxial layer grown is smooth and the lattice mismatch between layers is small ($\Delta\alpha/\alpha < 10^{-4}$, from X-ray bicrystal diffraction measurement). Smoothness at the interface and surface can overcome scattering caused by interfacial roughness and plays an important role in the elimination of defects from the active layer and other epitaxial layers. Furthermore, it can improve the temperature characteristics of the device.

During the growth process, a programmable epitaxial furnace was used to provide various cooling rates. A sliding high-purity graphite boat was used to grow the crystal in an ultra-high-purity hydrogen atmosphere. The hydrogen was used directly from its generator; its purity is as high as 99.9999 percent. It was experimentally demonstrated that system contamination and oxidation could be effectively prevented by continuously supply hydrogen to the reaction vessel for several months. The melt was carefully prepared by precisely weighing ultra-high-purity indium, InP, GaAs, InAs, Zn and Te and followed by rigorous ultrasound rinsing and etching. Prior to use, it was deoxygenated for 2 hours at 700°C under hydrogen. An InP cover plate was used to maintain saturation and to create the appropriate phosphorus vapor pressure. The substrate should not be exposed to high temperature prior to growth, so as to avoid thermal decomposition.

The epitaxial process is shown in Figure 3. Before growing the first epilayer, the substrate was placed in contact with a pure indium melt for 15 seconds in order to heal any thermal and mechanical damage on the surface. Immediately afterward, the buffer layer, i.e., the first n-InP layer (doped with Te, N = 1 x 10^{18} cm^{-3}, thickness 3-4 μm), was grown. When temperature dropped to 637°C, the waveguide layer, i.e., $In_{1-x'}Ga_{x'}As_{y'}P_{1-y'}$ (un-doped, thickness 1-2 μm, corresponding to radiation wavelength of 1.1 μm), was grown. The third layer, i.e., the $In_{1-x}Ga_xAs_yP_{1-y}$ active layer (un-doped, thickness 2-3 μm), was grown at 630°C. It was followed by growing the p-InP confinement layer (Zn-doped, P = 2 x 10^{18} cm^{-3}, thickness 2-3 μm) and the heavily doped p^+-InGaAsP top layer (Zn-doped, P = 2 x 10^{19} cm^{-3}, thickness 1-2 μm).

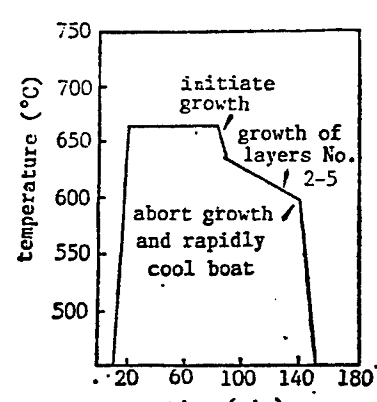


Figure 3. A Typical Cooling Schedule to Grow the LOC Laser Structure

The epitaxial wafer thus prepared was examined under a metallographic microscope. The interface between layers was found to be straight and the surface was smooth. A picture (Figure 4 [photograph not reproduced] of electron beam induction current (EBIC) obtained with a scanning electron microscope showed that the p-n junction fell in the unintentionally doped InGaAsP region. The position of the p-n junction was also confirmed experimentally by single-peak emission. Otherwise, the emission spectrum would show two peaks due to junction offset.

IV. Device Characteristics

1. Electrical Characteristics

Electrically, a LOC laser is similar to an ordinary DH laser. The current-voltage relation was measured at the p-n heterojunction. Because the contact resistance on the P side is low (approximately 5×10^{-5} Ω-cm^2), based on the typical current-voltage curve of a LOC laser, the forward differential resistance is under 3Ω.

2. Threshold Current and Its Temperature Dependence

The light output of a LOC laser was measured as a function of injected current in order to determine the threshold of the device. A germanium detector and a low-noise amplifier were used to determine the light power. A curve for typical light output power versus injected current is shown in Figure 5. The pulse width of the power supply is 200 ns, the repetition frequency is 5 KC, and the leading and trailing edge are less than 20 ns. The threshold values for 62 LOC lasers were measured and the results are shown in Table 1. The threshold current for most of these devices lies in the range of 1.5-2.5 A and the peak is distributed between 2.3-2.5 A. THe current density corresponding to the threshold current is 1.6-2.6×10^3 A/cm^2.

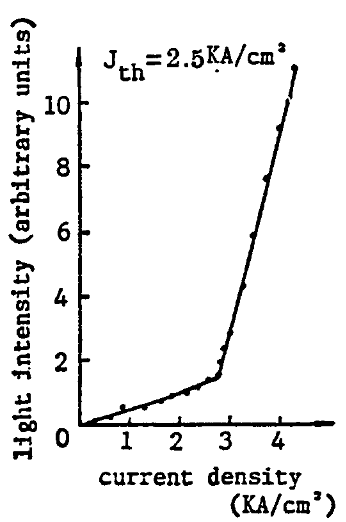


Figure 5. Plot of Light Intensity vs. Injection Current Density for a LOC Laser

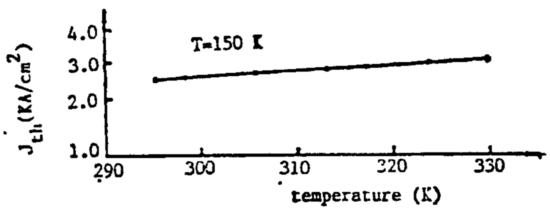


Figure 6. Threshold Current Density as a Function of Temperature for a LOC Laser

A LOC laser was designed and fabricated based on the analysis described in Section II. Its temperature behavior has been improved according to our expectation. Experimentally, it was found that laser #50 has the best temperature stability among the 62 lasers tested. Within the operating temperature range 295-330 K, its critical temperature T_o is 150 K (see Figure 6). However, the T_o for laser #6 is about 100 K. Although this value is much higher than that of a conventional DH laser, it is nevertheless significantly lower than that of laser #50. This effect indicates that laser #6 might have a considerable leakage current.

3. Output Power

The power output of each laser was determined by using a calibrated device consisting of an InGaAs detector for the 1.3-μm laser and its associated amplifier and indicator. The same power source parameters were used. After considering the duty cycle and waveform coefficient of the laser pulse, the peak power values measured are shown in Table 1.

Table 1. Threshold Current and Peak Power of the LOC Lasers

	thr. c. power (W)		
No.	(A)	$I = 2.0I_t$	$I = 2.5I_t$
1	2.29	3.18	3.92
2	2.5	3.48	4.34
3	2.08	4.08	4.96
4	2.5	3.78	4.46
5	2.08	3.64	4.34
6	2.08	3.18	3.78
7	2.29	3.84	4.64
8	1.88	2.56	3.06
9	2.5	3.48	4.08
10	2.5	3.48	4.16
11	2.29	3.06	3.72
12	2.5	3.54	4.40
13	2.08	3.0	3.6
14	2.5	3.06	3.64
15	2.5	3.98	4.64
16	2.5	3.00	3.78

Table 1. Threshold Current and Peak Power of the LOC Lasers (Continued)

	thr. c.	power (W)	
No.	(A)	I = 2.0It	I = 2.5It
17	2.5	2.56	3.12
18	2.5	3.60	4.40
19	1.67	3.18	3.92
20	2.5	3.06	3.60
21	2.5	3.36	3.98
22	2.08	2.62	3.30
23	2.5	3.0	3.48
24	2.5	3.60	2.28
25	2.29	2.74	3.36
26	2.08	3.54	3.92
27	2.08	3.60	4.16
28	1.67	2.56	3.18
29	2.5	3.06	3.60
30	2.5	2.68	3.18
31	2.5	3.64	4.40
32	2.5	3.54	4.22
33	2.5	3.12	3.64
34	2.5	3.72	4.34
35	2.29	3.06	3.84
36	2.08	2.12	3.06
37	2.5	3.72	4.78
38	2.5	3.72	4.34
39	2.5	2.62	3.12
40	1.88	3.18	4.08
41	2.29	3.60	4.34
42	2.29	3.48	4.34
43	2.5	3.60	4.16
44	2.5	3.12	4.08
45	2.08	3.98	4.70
46	2.5	2.06	3.12
47	2.5	2.24	3.00
48	2.5	3.18	3.60
49	2.5	3.18	3.92
50	1.88	3.72	4.52
51	1.2	3.0	3.48
52	2.5	2.56	3.06
53	1.88	3.0	3.24
54	2.08	3.54	4.22
55	2.08	3.84	4.46
56	2.08	3.18	3.78
57	1.88	4.02	4.46
58	2.08	3.36	3.98
59	2.29	4.08	4.52
60	2.08	3.60	4.16
61	2.29	3.92	4.84
62	2.29	3.30	3.98

4. Spectral Characteristics of LOC Lasers

The laser spectra were measured with a Model 44W monochromator, a germanium photodetector and a phase-locked amplifier. Most devices were lasing in three or four longitudinal modes. Figure 7 shows a typical spectrum, which was automatically recorded. It is similar to the spectrum of a conventional stripe DH laser. When the injection current rises, the peak of the spectrum shifts toward a shorter wavelength. Laser #19 among the 62 devices fabricated was lasing in a single longitudinal mode when the operating current was 1.1 times the threshold, as shown in Figure 8. However, at a higher operating current, multiple modes were present simultaneously.

V. Conclusions

It has been demonstrated in this work that a LOC laser with good temperature stability can be designed by dealing with major factors affecting the temperature behavior of a quarternary semiconductor laser and can be fabricated by liquid phase epitaxy. Experimentally, it

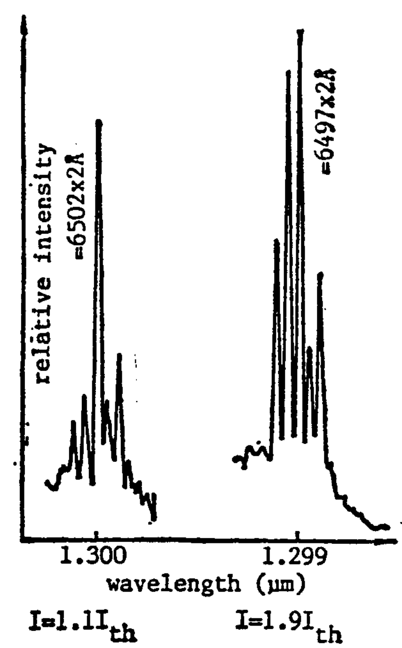


Figure 7. Emission Spectra for a LOC Laser at Different Injection Currents

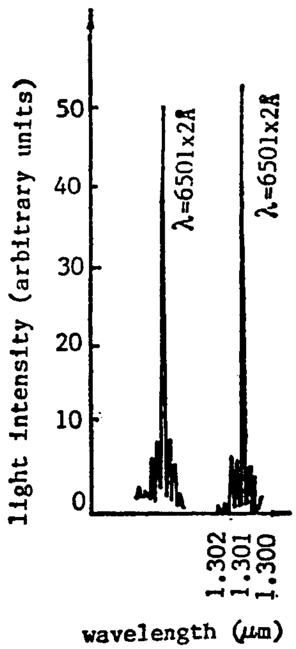


Figure 8. Example of a LOC Device Lasing in a Single Longitudinal Mode at Room Temperature

was found to have a high characteristic temperature T_o, as well as other features such as low threshold, high power and excellent spectral mode. It demonstrates the feasibility of the 1.3-μm InGaAsP laser array at high temperature.

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$Ti:LiNbO_3$ 1x4 Integrated Optical Switch Fabricated

90FE0076C Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 18 No 2, Mar 90 pp 119-120 (MS Received Jun 88, revised May 89)

[Article by Zheng Neng [6774 5174], Lu Rongxin [7120 2837 9515], and Cai Borong [5591 0130 2837] of the University of Electronic Science and Technology of China, and Cao Zehuang [2580 3419 3552] of Chongqing Institute of Optoelectronics: "$Ti:LiNbO_3$ 1x4 Integrated Optical Switch"]

[Text] Abstract

A 1x4 optical switch with three zero-gap directional couplers operating at a 1.3 μm wavelength has been successfully developed. The ON/OFF ratio is 12.7-16.7 dB, the switching voltage is 18-23 V, the electrode capacitance is 6 pF, and the theoretical bandwidth is 1 GHz.

I. Introduction

The high speed and compact size of an integrated optical switch network can satisfy the demands of fiber-optic communications and high-speed data processing. This network is also an integral component in the optical computers of the future. This papers reports a 1x4 optical switch with three zero-gap directional couplers. The advantage of the zero-gap directional coupler is that the length need not be rigorously controlled. Compared to a 2Δn type X switch, its length can be adjusted arbitrarily.

II. Principle and Design

The 1x4 optical switch designed is shown in Figure 1. The optical field can be simulated by the symmetric and antisymmetric mode method. For instance, only the fundamental mode exists in the input waveguide. In the interaction region (width 2W), both fundamental and first-order modes exist as a result of coupling. The output power $P_{=}$ and P_x (see Figure 1) are related to the input power P_{in} as follows:[1]

$$P_{=}/P_{in} = 2(\alpha_a \cdot \alpha_s)\cos^2(\Delta\beta \cdot L) + (\alpha_s - \alpha_a)^2/2 \quad (1)$$

$$P_x/P_{in} = 2(\alpha_a \cdot \alpha_s)\sin^2(\Delta\beta \cdot L) + (\alpha_s - \alpha_a)^2/2 \quad (2)$$

where α_a and α_s are the amplitude of the antisymmetric mode and that of the symmetric mode, respectively; Δβ is the mean difference between the propagation constant of the symmetric and antisymmetric mode in the interacting region and L is the interacting length. From equations (1) and (2), if α_a is not equal to α_s, the ON/OFF ratio (extinction ratio) of the device would fall. There are several major factors causing the ON/OFF ratio to fall: (1) difference in transmission loss between symmetric

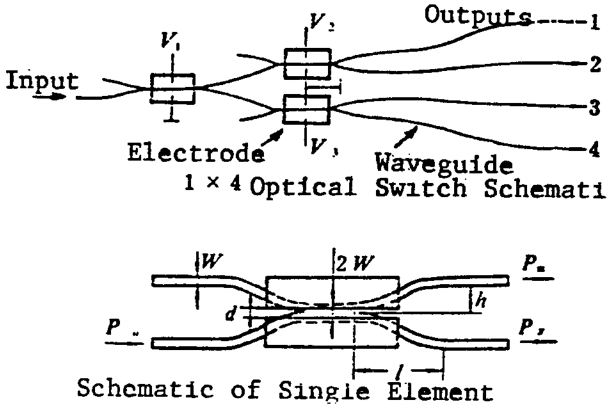

Figure 1. The 1x4 Optical Switch

and antisymmetric mode in the interaction region, (2) asymmetry of device dimensions, (3) convective diffusion, and (4) electrode misalignment, which often occurs in fabrication. We did a calculation using the beam propagation method (BPM)[2] and found that the alignment has to be accurate to within 0.5 μm to produce an ON/OFF ratio over 30 dB. This is very difficult to achieve using the existing contact photolithography technology.

Reduction of size and waveguide curvature loss is very important in the development of an integrated optical switch network. We used the BPM technique to calculate the curvature loss in the waveguide[2] and found that the curvature loss is small for a rising sinusoidal curve, i.e., $x(z) = (h/l)\, z - h/2\pi\, (\sin [2\pi/l(z)])$, when h/l is less than 1/40. When h/l is greater than 1/40, a cosine curve, i.e., $x(z) = (h/2)\, [1-\cos(\pi/l[z])]$, is better. h and l are the total height and length of the curved waveguide connecting two parallel straight waveguides, respectively.

Figure 1 shows the device we designed. The width of the waveguide is 6 μm, the width of the interaction region is 12 μm, the effective length is 3 mm, the total length is 30 mm and the distance between the output waveguides is 130 μm. The transition waveguide profile is a rising sinusoidal curve with h/l = 1/200 to 1/60. The electrode gap is 3 μm and electrode length is 5 mm.

III. Fabrication and Test Results

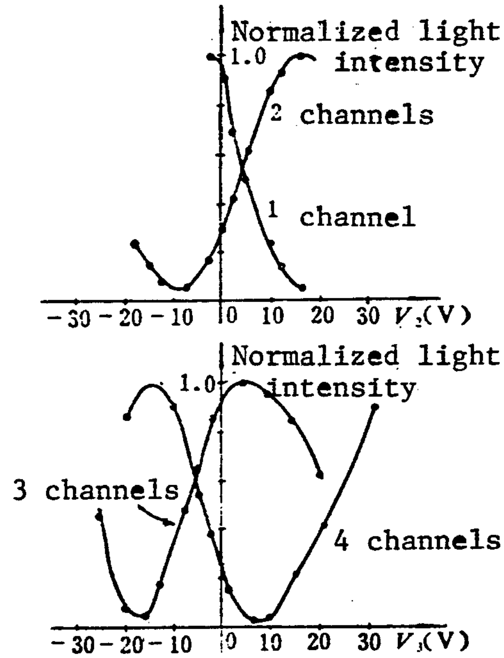

Figure 4. Output Characteristics of Four Channels (upper: V_1 = +7 V, V_3 = 0; lower: V_1 = -11 V, V_2 = 0)

X-cut $LiNbO_3$ was used as the substrate. An electron beam was used to expose the photolithographic mask. The curve was made in steps 0.35 μm apart. An 800-Angstrom-thick titanium film was evaporated on it by electron beam and the waveguide pattern was etched on photolithographically with a lift method. It was allowed to undergo diffusion in $LiNbO_3$ powder for approximately 8 hours at 1050°C. The waveguide is a single-mode waveguide with wavelength λ = 1.3 μm. A 2000-3000-Angstrom-thick aluminum electrode was placed on the end after polishing. Finally, electrodes were attached with conductive epoxy.

The test apparatus is shown in Figure 2. The λ = 1.3 μm square-wave-modulated semiconductor laser was directly coupled to the input waveguide of the precision-polished device. The three electrode pairs were powered by a stable dc power supply. The waveguide output was

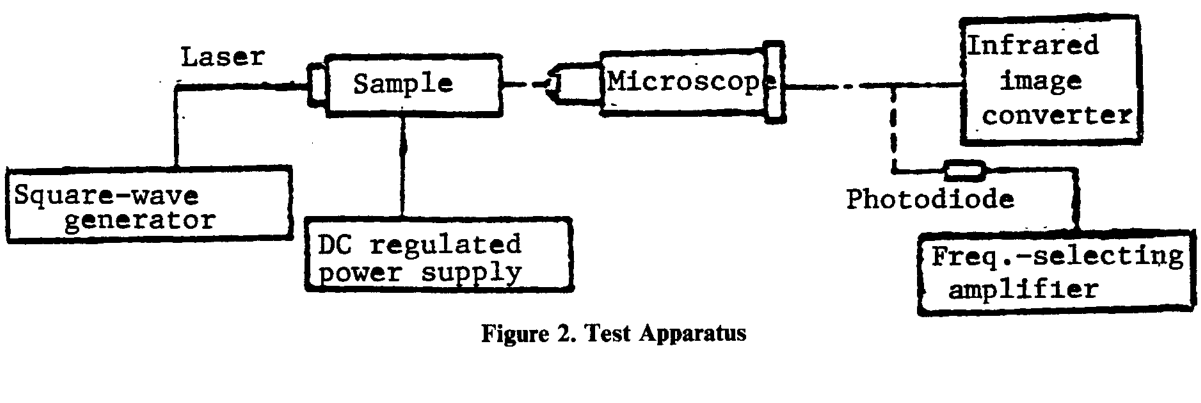

Figure 2. Test Apparatus

observed with an infrared image converter through a 150 x microscope or measured with a photodiode and a frequency amplifier.

Figure 3 [photograph not reproduced] shows a picture from the infrared image converter. Figure 4 shows the light power output as a function of the driving voltage for four devices. The switching voltage was found to range between 18-23 V, the ON/OFF ratio was 12.7-16.7 dB, and the capacitance between a pair of electrodes was 6 pF. If the electrodes are connected to a 50 Ω load to match with that of the signal source, then the bandwidth is $\Delta f = 1$ GHz. In our device, electrodes directly cover the waveguide. Although this is good for the TM mode, there is considerable absorption of the TE mode. The insertion loss was estimated to be 15-20 dB.

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First Inter-Provincial Fiber-Optic Line Operational

90P60033 Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 27, 11 Jul 90 p 1

[Article by Xin Long [2450 7893]]

[Text] China's first inter-provincial optical communications system—the Hangzhou-Jiaxing-Suzhou Digital Optical Communications Project—is now operational. This project, jointly funded and built by the posts and telecommunications authorities of Jiangsu and Zhejiang Provinces, was recently put into full use after 2 years of construction. Throughout the system, 181.2 kilometers in total length, engineers have employed domestically made fiber-optic cable and transmission equipment provided by Wuhan Institute of Posts & Telecommunications Science; this equipment includes a 34 Megabit/second single-mode long-wavelength DS3 [480 voice circuits] system. In the project, engineers used the n + 1 inversion mode and used computers to cross-connect the digital segments for complete [computer] monitoring and control—a pioneering technique for this nation.

KDD To Lay Japan-China Undersea Fiber-Optic Cable

OW1308143890 Tokyo KYODO in English 1319 GMT 13 Aug 90

[Text] Tokyo, Aug. 13 KYODO—KDD, Japan's international telecommunications giant, agreed Monday with China's Post and Telecommunications Ministry and American Telephone and Telegraph Co. (A T & T) to lay a submarine optical-fiber cable between Japan and China, a KDD spokesman said.

A memorandum of agreement signed by them also covers a plan to construct digital satellite communication facilities in China to be linked to the International Telecommunications Satellite (Intelsat) system, he said.

The optical-fiber undersea cable, the first of its kind to cover China, will run some 1,300 kilometers between Miyazaki in southern Kyushu and Shanghai. The operation is expected to start at the end of 1993, the spokesman said.

The 10 billion yen cable will have two communications circuits, each with a capacity of 560 megabits. The cable will be connected with the trans-pacific cable (TPC-4), due to be installed by 1992 between the United States and Japan, enabling China to participate in the global digital communication network, the KDD official said.

Meanwhile, the Intelsat facilities will be completed sometime next year, linking Beijing and Shanghai with Japan and the United States, he said.

The planned projects are private-sector initiatives and will not be affected by the international sanctions imposed against the Chinese Government since the military crackdown on the pro-democracy movement in Tiananmen Square in June last year, the spokesman added.

Developments in Satellite Communications Reported

New Vehicle-Mounted Satcom Ground Station

90P60038a Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 16 Jul 90 p 2

[Unsigned article: "3-Meter Vehicle-Mounted Satellite Communications Ground Station Debuts"]

[Text] (Summarized from JIANGSU KEJI BAO)—A new communications system described as a 3-meter vehicle-mounted satellite communications ground station has been developed by Research Institute 63 of the PLA General Staff, and was technically certified a few days ago. This flexible, secure, high-voice-quality system permits simultaneous multiplexed bidirectional secure digital speech, is easy to operate, has high output power, a high reception quality factor, and can function in the computer automated measurement and control [CAMAC] mode. All the station equipment may be installed on one vehicle. The appearance of this system provides a new dimension for troop mobile communications.

Multi-Channel Satellite TV RF Modulator

90P60038b Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 14 Jul 90 p 2

[Unsigned article: "MSR-1 Multi-Channel Satellite TV RF Modulator"]

[Summary] The MSR-1 multi-channel satellite TV RF [radio frequency] modulator, developed by the Nanjing Naval Medical Professional School's Applied Electronic Technology Equipment Plant at Haining, is designed to permit satellite ground stations to receive and re-transmit satellite TV programs, and can also be used in the community antenna [CATV] closed-circuit TV systems at schools and businesses. One modulator permits reception and re-transmission of the signals from 3 to 5 channels.

The principal technical parameters for the system are as follows: RF output level, about 100dBμV [decibels above 1 microvolt] for 1 to 5 frequency channels, about 103dBμV for 6-12 channels; tuning range, about 10dBμV; intermodulation greater than or equal to 54dB; modulation depth, video, 80 plus or minus 5 percent; audio frequency deviation, greater than or equal to 50kHz. The dimensions of the unit are 360 x 300 x 119 millimeters, and weight is about 6 kilograms.

Domestically Made Digital Microwave Equipment Described

90P60044 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 22 Jul 90 p 1

[Unsigned article: "Chinese Manufacture of Small-to-Mid-Capacity Digital Microwave Communications Equipment Enters Practical Phase"]

[Summary] Xian, 21 Jul (XINHUA)—China's domestic manufacture of small-to-medium-capacity digital microwave (DMW) communications equipment has entered a practical phase with the recent announcement of three new DMW communications transmission systems (2Mb/s, 8Mb/s, and 34Mb/s, respectively) and eight new sets of communications equipment, all independently developed by the Ministry of Posts & Telecommunications' Xian Microwave Equipment Plant. This equipment, which has been technically certified as meeting international standards for the eighties, will be put into batch production so as to replace imports of foreign products. These systems will be incorporated into the backbone microwave communications networks of mid-to-large-sized cities and will improve the backward state of communications in the nation's rural areas.

The Xian plant, China's largest specialized producer of complete sets of microwave communications equipment, has managed to raise co-channel circuit capacity in this new third-generation DMW transmission system to 1800 circuits.

Feature on Wuhan Institute of Posts & Telecommunications Science

90P60029 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 7 Jul 90 p 2

[Article by Yang Yuankui [2799 0337 7608]: "Tracking the World State-of-the-Art in New High-Tech Areas: Wuhan Institute of Posts & Telecommunications Science Becoming Major Base for Fiber-Optic Communications"]

[Summary] The Wuhan Institute of Posts & Telecommunications Science (WIPTS) is rapidly becoming the nation's premier research institute for fiber-optic communications. Over the past few years, the institute has achieved results in 101 projects, many of them key S&T projects of the State's Seventh 5-Year Plan and the corresponding plan of the Ministry of Posts & Telecommunications (MPT). In 1989 alone, the institute received 72 awards from MPT for S&T advancement. In the main technical areas of fiber-optic communications, WIPTS has reached or approached the world state-of-the-art. Examples include the institutes's development of a laser diode assembly with an operating lifetime that has broken through the 100,000-hour barrier; one type of laser chip has an experimental lifetime of 250,000 hours. The institute's yield (or proportion of products passing inspection) for single-mode optical fiber has grown from 40 percent in 1985 to 62 percent in 1989, and yield for free single-mode fiber-optic connectors has exceeded 90 percent.

One of the institute's areas of specialization is renovation and development of overhead fiber-optic cable systems, for which the institute can now supply complete sets of equipment as well as technological services. Using this technique, WIPTS has saved an estimated 2 billion yuan in renovating the nation's 180,000-kilometer system of intra-provincial second-level [DS2, 8Mbps, 120 voice circuits] communications trunklines. Some of the projects utilizing WIPTS products and services include China's first domestically manufactured long-distance fiber-optic line (Wuhan to Jingzhou, 244.8 km), China's first single-mode fiber-optic trunkline (Yangzhou to Gaoyou [Jiangsu Province], 75 km), and China's first domestically made metropolitan telephone repeater fiber-optic communications line (Hanyang to Hannan, 36 km).

WIPTS is currently in the midst of a major expansion. Technology-related revenues have reached 4.5 million yuan. The Wuhan Telecommunications Devices Corporation, a joint venture between the institute and a U.S. firm, now provides the most advanced optoelectronic devices in China—devices of a quality sufficient to replace imports. Together with the Wuhan Municipal government, WIPTS has also formed a joint venture with the Netherlands' Philips: Changfei [7022 7378] Optical Fiber and Fiber-Optic Cable, Ltd.

Value-Added Services To Be Provided for INTELSAT Network Data

90P60024 Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE] in Chinese No 6, Jun 90 p 5

[Unsigned article: "China to Open Up Value-Added Services for Data on International Satellite Communications Network"]

[Summary] Shanghai is the first city on the Chinese mainland to provide electronic mailbox services, to be targeted primarily toward the foreign commercial firms and investment firms set up in Shanghai. This information was disclosed at the International Satellite Communications Network's Shanghai Economic Region press conference held on 18 April in Shanghai. According to a spokesman for the Asian-Pacific Region of the International Satellite Communications Corporation, China's Ministry of Posts & Telecommunications has agreed in principle to provide the Chinese mainland with value-added services from INTELSAT network data, and to establish testing and promotion facilities in Shanghai for the first electronic mailbox users. The spokesman further revealed that many international firms are hoping to set up organizations, investment enterprises, and partnerships in China to enter the market for INTELSAT network-system value-added services such as information transmission, processing, storage, interchange, and

concentration. Especially significant is the service known as the electronic mailbox, which provides a simple and secure means of information transmission to those with a portable computer: information can be received or transmitted to any telex (teletype) or FAX machine anywhere in the world, as well as to all electronic mailbox users.

Noted Specialist Calls For Governmental Establishment of Research Center for Fiber-Optic Communications

90P60027 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 21 Jun 90 p 1

[Article by Jing Zhaoyu [5427 2600 3254]: "Noted Fiber-Optics Specialist Professor Ye Peida Recommends: Government Should Set Up as Quickly as Possible an Advanced Fiber-Optic Communications Research Center"]

[Summary] Beijing, 20 Jun—With China's theoretical basic research in fiber-optic communications lagging behind the world standard by approximately 5 years, and actual production and operational capacity lagging by about 10 years, noted Chinese fiber optics specialist Professor Ye Peida [0673 1014 1129] has called upon the government to establish as soon as possible an advanced fiber-optic communications research center. Professor Ye, who is a member of the Chinese Academy of Sciences' Academic Commission and honorary director of the Beijing Institute of Posts & Telecommunications (BIPT), made these remarks at the recently inaugurated International Communications Technology Conference. The 75-year-old professor specified that, before the year 2000, all efforts should be made in the following three areas. First of all, the experiments now being conducted at a BIPT laboratory in high-capacity coherent fiber-optic communications should be completed, and the schedule for on-site tests should be moved up. Secondly, based on the two main fiber-optic-cable trunkline networks now being constructed in China—the [2200-kilometer-long] Nanjing-Wuhan-Chongqing line running east to west, and the Beijing-Wuhan-Guangzhou line running north to south—a fiber-optic network linking all of China's principal cities should be completed. Simultaneously, research into photonic switching systems for broadband fiber-optic-cable network correspondence should be vigorously promoted. Thirdly, attention should be paid to monitor technological advances in fiber optics, most importantly in the area of optical [circuit] integration and optoelectronic integration. The professor concluded by commenting that, if an advanced research center is set up soon, this three-part plan may be implemented by the year 2000.

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