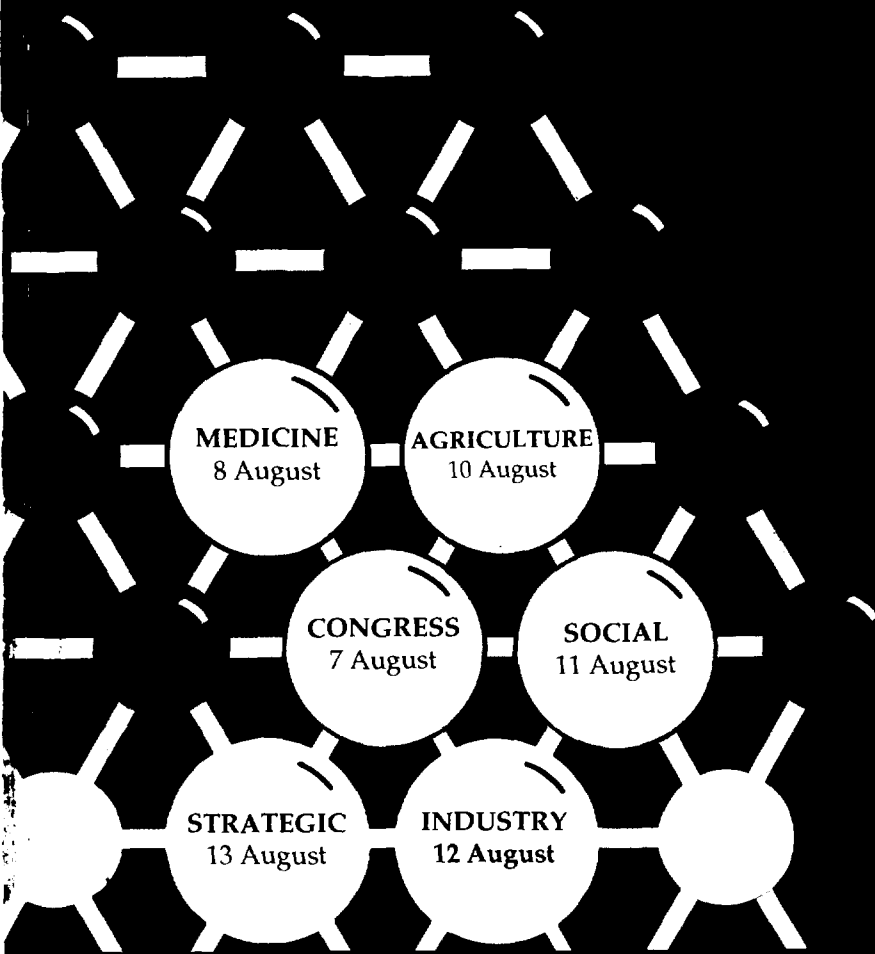




MY9700835



Vision 2020 Through Science and Technology

**PROCEEDINGS
of the
6th SCIENCE AND TECHNOLOGY
CONGRESS AND SEMINAR**

"Vision 2020 Through Science & Technology"

**Kuala Lumpur
August 7-13, 1992**

PERCUMA

VOL 28 No 16

Perpustakaan Utama Unit Tenaga Nuklear
No. Perolehan 1051/Pp
Tarikh Terima 2/7/93

PREFACE

Congresses and seminars on science and technology are now becoming annual events during national science weeks. A congress and five seminars, held from August 7 to 13, 1992 in Kuala Lumpur were organized by the Nuclear Energy Unit, Ministry of Science, Technology and the Environment, in collaboration with the various research institutes, institutions of higher learning and S&T non-governmental organizations.

Five prominent speakers presented excellent papers during the congress (August 7) which was followed by seminars in medicine (August 8), agriculture (August 10), social (August 11), industry (August 12) and strategy (August 13). Selected and invited papers managed to address S&T issues related to the nation's development. Many issues need to be further discussed in our effort to achieve Vision 2020 through Science and Technology.

The S&T Congress and Seminar was organized with the following objectives:

1. to exchange new ideas in solving the problems of science and technology, and
2. to instill awareness to science and technology towards establishing a scientific, progressive, innovative and far-sighted society; not only as a user of technology but able to contribute to future national development of science and technology.

This publication contains all keynote papers presented at the congress and the five seminars, abstracts of all papers both oral and poster presentations, summaries of all panel discussions, overview of sessions and conclusions. It is hoped that some of the points highlighted in the proceeding can be adopted as useful inputs to streamline our national strategy in creating a greater recognition and importance of science and technology in our nation's development.

Secretariat

Congress and Seminar on Science and Technology 1992

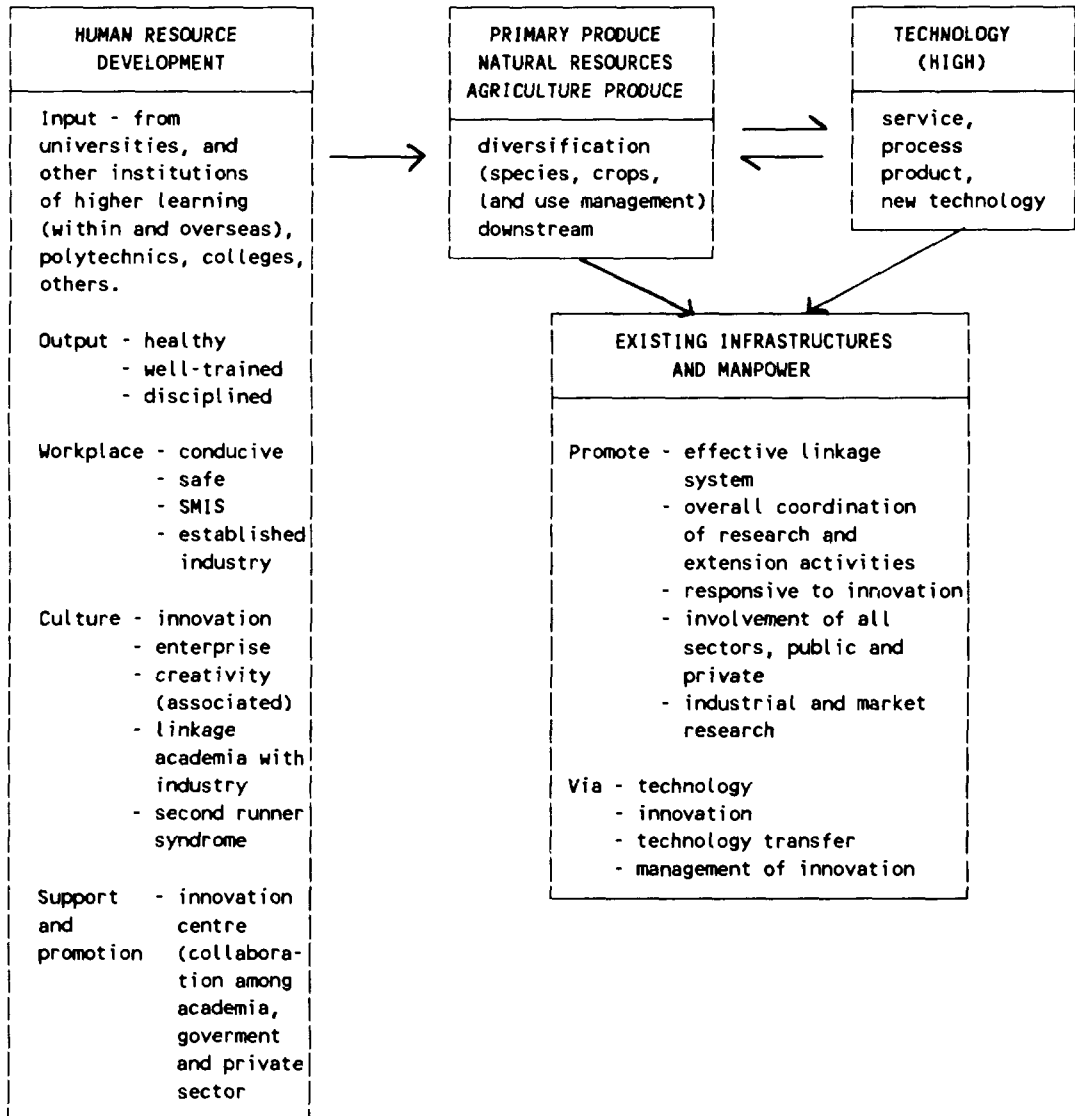
CONCLUSION

Having considered all points and views expressed by speakers during their presentations and panel discussions held at the end of each of the five seminars, the following conclusions can be drawn for attention :

1. Nationhood involves much more than political independence. The realization of a vital economy through the promotion of technical innovation is crucial. We need a strategy for science and technology. Technical advance for increasing the production and also multiplying the products from the available resources is paramount. There is the need for economic security which advances productivity and production. Production is paramount; it is the output of an economic system. There are production pressures.
2. The country must try to effectively combine technology, **existing** and new, with social requirements which themselves will change, at least in the ranking or priorities. The scheme should concentrate on the practical application in industry of advanced technology whether in the form of service, process or product.
3. The country must develop itself on a comprehensive economic development strategy. This must be on an outward-looking development policies whose export growth is based on efficient use of the already existing man-power, potential and infrastructures. The economy must not be defensive or conservative but outward-looking, competing with the international market through a planned economy.
4. The long-range plan for existing and new ventures will be focussed on a fewer critical major fields within which arenas may be expanded, grouped or added.
5. The strategy for S&T should take into account moral, economic, scientific, and political aspects with particular emphasis to strengthen the overall scientific, technical, agriculture and industrial infrastructures of the country that will result in increased efficiency in production and manufacturing operations with concomitant savings in raw materials and energy along with the protection of the environment. This will lead to higher overall productivity and hence to an increase in competitive advantage of the nation that results in higher socio-economic standard of the people.
6. The thoroughly industrialized science will become a major part of the scientific enterprise. A frank recognition of this situation will help in the solution for the problems of decision and control. The criteria for assessment of quality will be heavily biased towards possible technical function of result.
7. Improvements in technology are the result of investment in highly organized scientific and engineering knowledge and

skill. It is easy to overlook the absence of appreciable advance in an industry. It should be regarded that the absence of investment in innovation in an industry as intolerable.

8. A pictorial representation is portrayed below :



EDITORIAL COMMITTEE

- Chairman** : Datuk Dr. Mohd. Ghazali b. Hj. Abdul Rahman
Director General
Nuclear Energy Unit (UTN)
- Secretary** : Dr. Norimah Yusof (UTN)
- Rapporteurs** :
- Medicine Dr. Inder Singh (IMR)
Dr. Mohamad Isa Abdul Majid (USM)
En. Harun Masri (KemSains)
En. Shafii Khamis (UTN)
- Agriculture Dr. Ruslan Abdullah (Guthrie)
En. Chee Kim San (KemSains)
Dr. Mohd. Nazir Basiran (UTN)
- Social En. Loo Koi Sang (PPASM)
En. Andrew Tan (BIM)
En. Md. Shahid Ayub (UTN)
Dr. Azali Muhammad (UTN)
- Industry Dr. Mohamad Deraman (MMST)
En. Md. Shahid Ayub (UTN)
Pn. Kok Kuan Ying (UTN)
- Strategy En. Mohamad Ali (KemSains)
Dr. Abdul Fatah Awang Mat (UTN)
En. Md. Shahid Ayub (UTN)
- Editors** : En. Md. Shahid Ayub (UTN)
En. Khairuddin Abdul Rahim (UTN)

**Ucapan YAB Encik Abdul Ghafar bin Baba
Timbalan Perdana Menteri
Di Upacara Pelancaran
Minggu Sains dan Teknologi Kebangsaan Keenam
Pada 7 Ogos 1992 Jam 9.30 Pagi
Di Hotel Shangri-La Kuala Lumpur**

Tema Minggu Sains dan Teknologi tahun ini ialah "Wawasan 2020 Melalui Sains dan Teknologi". Tema ini adalah amat sesuai kerana untuk mencapai negara maju kita mestilah dapat membangunkan kegiatan perindustrian pada tahap yang tinggi dan untuk mencapai matlamat ini kita mestilah pula dapat mewujudkan proses pembangunan teknologi perindustrian yang dinamik dan sihat. Dua keperluan ini hanya dapat diwujudkan melalui satu masyarakat yang saintifik dan maju, masyarakat yang berinovasi dan tahu bukan sahaja menggunakan teknologi tetapi juga mengubahsuai dan mencipta teknologi.

Walaupun tahun 2020 masih tiga dekad lagi, tetapi adalah penting bagi kita untuk mengatur strategi serta perancangan ke atas langkah-langkah yang perlu kita jalankan. Seperti usaha pembangunan bidang-bidang yang lain, pembangunan sains dan teknologi juga memerlukan keperluan-keperluan asas iaitu meningkat keupayaan merancang dan melaksanakan strategi; menyediakan kemudahan infrastruktur sains dan teknologi seperti institusi-institusi pengajian, penyelidikan serta penyebaran maklumat kepada pengguna oleh Pusat Sains dan Taman Teknologi; dan pembangunan sains dan teknologi juga memerlukan peruntukan sumber, peraturan dan juga galakan.

Saya berharap Minggu Sains dan Teknologi yang kita adakan tiap-tiap tahun ini dapat mewujudkan kesedaran tentang betapa pentingnya kemajuan sains dan teknologi di dalam mengubah masa hadapan kita. Setiap lapisan rakyat adalah perlu memiliki kesedaran ini malah mereka yang sudah terlibat dalam kegiatan sains dan teknologi sendiri pun perlu mempunyai kesedaran tertentu tentang penglibatan mereka dalam memajukan sains dan teknologi.

Mereka yang terlibat ini perlulah mengetahui tentang sejauh manakah peranan mereka sudah dapat memenuhi keperluan kemajuan sains dan teknologi yang mereka cipta itu telah diterima pakai oleh golongan yang ditujui. Saya percaya golongan ini memanglah menyedari tentang kelemahan usaha kita dalam pembangunan sains dan teknologi negara dan biarlah daripada sini kita mencari jalan sepakat untuk mengatasinya bersama-sama.

Kita adalah perlu menggembeng tenaga dari semua pihak yang terlibat dalam pembangunan sains dan teknologi. Semua pihak baik dari institusi pengajian dan penyelidikan, para pengeluar dan usahawan sektor swasta, guru-guru sains serta pegawai-pegawai kerajaan perlulah bersama-sama menyumbangkan tenaga dan buah fikiran agar keupayaan masyarakat kita menyerap dan seterusnya membangunkan sendiri teknologi dalam semua bidang dapat disemai dan ditingkatkan.

Di samping kita perlu memperkukuh keperluan asas dan pelaksanaan strategi pembangunan sains dan teknologi, kita juga perlu mewujudkan kesedaran orang awam mengenai kepentingan sains dan teknologi. Kefahaman yang jelas mengenai peranan sains dan teknologi adalah amat penting bagi mewujudkan keyakinan rakyat serta sebagai bimbingan untuk mereka menuju kejayaan hidup yang lebih baik.

Kita perlu sedarkan bahawa setiap yang kita bayar dan kita guna setiap hari itu adalah teknologi. Kalau kita membeli barang dari luar negeri, kita sebenarnya adalah membayar harga teknologi bagi mengeluarkan barang tersebut yang dimiliki oleh pengeluar di luar negeri. Jadi kita perlu sedarkan rakyat supaya jangan terus membeli hasil teknologi orang lain dan kita harus bertanya apakah barang keluaran yang kita jual hasil dari teknologi yang kita miliki. Sedarkan bahawa bagi mencapai Wawasan 2020 kita mestilah lebih banyak menjual hasil teknologi kita berbanding dengan kita membeli dari orang lain.

Malaysia tidaklah boleh terus bergantung kepada teknologi yang diimport dalam membangunkan ekonomi kerana ia hanya sesuai untuk peringkat awal perindustrian sahaja. Kita perlu menjadi 'self-reliant' dalam sains dan teknologi sama seperti negara-negara yang maju. Dalam hal ini kita perlulah sedar bahawa masih terdapat jurang yang perlu dikejar bagi membolehkan kita memiliki asas keperluan teknologi yang sama seperti negara maju. Dari segi bilangan ahli-ahli sains dan teknologi misalnya mereka mempunyai bilangan sepuluh kali ganda lebih ramai daripada bilangan yang kita miliki bagi setiap satu juta penduduk. Ini bermakna kita perlu melipat gandakan bilangan ahli-ahli sains dan teknologi kita. Begitu juga dari segi perbelanjaan mereka untuk kegiatan R&D mereka berbelanja dalam lingkungan 3-4% dari hasil keluaran negara berbanding dengan kita sebanyak 1/2 % sahaja. Sekarang kita sedang berusaha untuk meningkatkan kepada 3/4 %.

Menyedari hakikat ini kerajaan telah meningkatkan peruntukan untuk penyelidikan dari \$400 juta dalam Rancangan Malaysia Kelima kepada \$600 juta dalam Rancangan Malaysia Keenam. Kerajaan juga telah menaikkan belanjawan pembangunan untuk sains dan teknologi dari \$127 juta kepada \$560 juta dalam RM6. Sumber-sumber kewangan dan sumber manusia yang terhad ini perlulah menentukan senarai keutamaan bidang kajian serta menumpukan kepada aspek penggunaan. Tugas utama kita sekarang ialah untuk menjadikan penemuan-penemuan ini kepada kegunaan praktik supaya ia dapat menyumbangkan kepada ekonomi kita.

Sebagai sebuah negara yang sedang membangun sistem pengajaran dan penyelidikan sains dan teknologi yang ada selalunya hanya tertumpu kepada aspek mengenali bagaimana sesuatu barang itu berfungsi tetapi kita tidak tekankan bagaimana untuk membuat barang tersebut ataupun mengubahsuai supaya ianya lebih sempurna. Aspek inilah yang perlu kita beri perhatian iaitu meningkatkan penyelidikan perindustrian. Dalam hal ini peranan sektor swasta adalah sangat penting. Kerajaan sedang mengambil langkah-langkah yang perlu untuk memastikan bahawa pembangunan sains dan teknologi diberi sokongan dan perhatian yang sewajarnya.

Saya ingin mengambil kesempatan ini untuk mengucapkan tahniah kepada masyarakat sains dan teknologi negara kita kerana walaupun bilangan mereka adalah kecil namun kita dapat mencapai kejayaan yang besar dalam sains dan teknologi terutama dalam sektor pertanian. Dari hasil-hasil penyelidikan pengeluaran, pemprosesan pertanian dan penggunaan keluaran dalam industri ianya telah dapat mengukuhkan pembangunan sektor pertanian terutama bagi sektor moden yang memang bersedia mengguna-pakai penemuan teknologi baru. Kita berharap sektor tradisional juga akan menggunakan teknologi baru kerana dengan cara itu sahajalah mereka dapat memanfaatkan sumber-sumber yang mereka miliki dengan sebaik-baiknya.

Kerajaan baru-baru ini telah menubuhkan "Malaysian Technology Development Corporation" untuk membantu dalam memperdagangkan hasil penyelidikan. Saya ingin menyeru kepada ahli-ahli penyelidik ahli-ahli perniagaan untuk memberi keutamaan kepada memperdagangkan hasil-hasil penyelidikan dan supaya ia dapat memberi sumbangan yang bermakna kepada pembangunan ekonomi kita. Nilai sains dan teknologi hanya dapat diukur daripada sumbangannya terhadap negara dan rakyat dan bukan berasaskan daripada bilangan penerbitan yang dihasilkan oleh institusi-institusi penyelidikan dan universiti-universiti.

Sektor swasta adalah mempunyai peranan yang penting bukan sahaja bagi menggalakkan R&D tetapi juga bagi menentukan bidang-bidang keutamaan serta memperdagangkan penemuan-penemuan penyelidikan. Sumbangan sektor swasta kita kepada aktiviti R&D hanyalah di sekitar 12-20% daripada keseluruhan perbelanjaan R&D. Jumlah ini adalah amat kecil dan tidak mencukupi. Sumbangan itu diharap dapat ditingkatkan sehingga 60% pada tahun 2000 sebagaimana ditetapkan pada pelan tindakan pembangunan teknologi perindustrian kita.

Untuk menuju matlamat ini pihak swasta adalah juga digalakkan supaya bekerjasama dengan institusi-institusi penyelidikan kerajaan dan institusi-institusi pengajian tinggi di dalam menjalankan projek-projek penyelidikan secara bersama. Pihak swasta boleh memainkan peranan yang penting di dalam memperdagangkan penemuan-penemuan penyelidikan kita. Hanya dengan cara-cara tersebut sahajalah maka pembangunan penyelidikan dan teknologi kita dapat berjalan dengan berorientasikan pengguna dan digerakkan oleh keperluan pasaran.

Tuan-tuan dan Puan-puan,

Saya ingin mengucapkan tahniah kepada Kementerian Sains, Teknologi dan Alam Sekitar dan juga Kementerian Pendidikan Malaysia kerana menganjur Minggu Sains dan Teknologi dalam usaha untuk membawa sains kepada masyarakat umum. Saya juga ingin mengambil kesempatan ini untuk mengucapkan terima kasih kepada semua Kerajaan Negeri yang mengadakan aktiviti ini sebagai satu acara kebangsaan. Dengan itu saya dengan sukacitanya merasmikan Minggu Sains dan Teknologi Kebangsaan Keenam.

Terima kasih.

CONTENTS

PART	TOPICS	PAGE
I	Congress	
	Keynote Address by the Hon. Minister of Science, Technology and the Environment	1
	Abstracts of Plenary Papers	7
II	Seminar : Medicine	
	Keynote Address	59
	Abstracts of Papers	70
	Panel Discussion	92
III	Seminar : Agriculture	
	Keynote Address	97
	Abstracts of Papers	108
	Panel Discussion	128
IV	Seminar : Social	
	Keynote Address	133
	Abstracts of Papers	142
	Panel Discussion	153
V	Seminar : Industry	
	Keynote Address	157
	Abstracts of Papers	162
	Panel Discussion	194
VI	Seminar : Strategy	
	Keynote Address	197
	Abstracts of Papers	207
	Panel Discussion	229
VII	Overview	233

PART I

CONGRESS

KONGRES SAINS DAN TEKNOLOGI KE 6, 1992

**Ucaputama oleh Yang Berhormat Encik Law Hieng Ding,
Menteri Sains, Teknologi dan Alam Sekitar
Pada Hari Perasmian, 7 Ogos 1992.**

"Science And Technology In Nation Building Towards 2020"

Yang Mulia Pengerusi Majlis, Yang Berbahagia Tan Sri-Tan Sri,
Datuk-Datuk dan Dif-dif Kehormat;
Ahli-ahli Jawatankuasa Penganjur dan
Tuan-tuan serta Puan-puan hadirin sekalian.

Saya sungguh berbesar hati dan gembira kerana telah diberi penghormatan untuk menyampaikan ucapanutama dalam Kongres Sains dan Teknologi pada kali ini.

Dengan bertemakan **Wawasan 2020** melalui **Sains dan Teknologi**, Kongres dan Seminar ini disusun merangkumi bidang-bidang perubatan, pertanian, industri, sosial dan strategik. Ahli-ahli sains yang terkemuka dalam bidang berkenaan sama ada dari dalam mahupun luar negara dijemput berkumpul bersama-sama di sini untuk bertukar-tukar pandangan di samping mendapatkan idea-idea baru dalam bidang-bidang kepakaran mereka. Adalah diharapkan dengan cara ini para saintis akan menemui dan bertukar idea-idea baru untuk meneruskan tanggungjawab masing-masing dalam usaha menjadikan Malaysia sebagai sebuah negara maju menjelang tahun 2020.

Ladies and Gentlemen,

We are now considering science not in the usual way. Instead we are considering what kind of activity it is, how it works and how it relates to other activities. It has become a major facet of the life of modern communities and have effects so powerful and all pervasive that we are forced to develop our social conscience by being made to discuss such issues.

The social function of science implies much more than the impact of the products of science and technology on society. It encompasses a vision of society where social affairs are permeated by methods, ways and thoughts of science. Science is also an occupation. It should not be interpreted as only to include natural science but scientific production and administration, a major agents for change. However what most people want from science is wealth.

Earlier enthusiasm for the unqualified transfer of technology from the industrialized to the developing countries and the optimism and faith in its beneficial effects has given way to

increasing sceptism and criticism. There is the increasing questioning of the appropriateness of the technology and the critical scrutiny of the various costs associated with the transfer. We must therefore, decide what new technologies to develop, what existing ones to adapt and adopt and what administrative machinery to use. For this, human foresight is needed.

Science is not so autonomous. Economic and social factors external to science, including industrial, commercial, military and political ones, exercise the crucial effects in determining areas of research that attract most effort. The socio-economic factors account for the whole complex of the scientific activity. Science and technology are important factors in the development of the human personality and play an integral part of nation building. Science has grown rapidly and as such there is the large scale of expenditure on science that must be considered. The main emphasis at the moment is on the country's industrialization policy. The role of scientific and technological research should not be devoted only to encompass a variety of functions for research but extend to innovation, production, marketing and forecasting. Basing on this, the country must formulate long-term science and technology development and utilization programme so as to convey a definite vision of its plans. There must be an in-built flexibility to cope with new circumstances. We are at the state of the development of the scientific method.

The thoroughly industrialized science will become a major part of the scientific enterprise. There is now some degree of commercial awareness to government level discussion of science policy. Government and related institutions must carry out research directed along profitable lines with the view to creating both social and economic gains particularly through the expanded use of modern technology. Government departments run research stations to tackle problems connected to public interests and welfare.

It is now clear that turning science more applied is not enough. If science is to create wealth one has to pay due attention to market and commercial factors beyond the realm of science and technology. Emphasis is to the team directed along profitable lines.

The felt need is to encourage effective innovation, not abortive invention, and innovations that can contribute to national wealth. Effective innovation requires clear definition and thorough understanding of user needs acquired by careful study of such factors as market and even direct collaboration with potential users and followed up, when there is a product to market, by adequate publicity, user education and continuing effort to anticipate customers' problems.

Research and development (R&D) personnel must undergo an attitudinal change and be more sensitive to practical and market demands for their expertise and technology. They need to develop a better understanding of industrial processes to be able to

discuss any possibility of incorporating their expertise in the improvement or efficiency of such processes. In this case science helps by improving processes or products that already exist. In other words the goals of the work of the scientists are directed towards achieving aims external to science in the wider society.

Ladies and Gentlemen,

We need a strategy for science and technology. It must include economic, scientific, moral and political aims and be regarded as one of a planned operation. The plan must be based on a comprehensive economic development strategy based on outward-looking development policies. The plan should emphasize on export growth based on efficient use of already existing manpower, potential and infrastructures. Here is the dilemma whether to go for development of labour intensive industries or research-based industries. Our domestic market is too small for efficient production of many items. There is the need to supplement the domestic market with export growth. This will allow industries to reach an efficient scale of production, creating jobs, enhancing technological level as well as the enlarging of horizons.

Technological advance for increasing the production and also multiplying the products from the available resources is paramount. In few large industries such as oil, automobiles and rubber the technological advance is considerable. The research and developmental work is well financed and comprehensive. But in industries such as the clothing manufacturing, home construction, the natural fibre textile industry and the service industries the investment in innovation is negligible. No firm is large enough to afford it on an appreciable scale. The agricultural sector and the primary produce sector fare no better. In fact a large number of industries make little or no such investment. We take production as the measure of our achievement but we do little to increase the rate of capital formation or the rate of technological progress in the backward industries despite the clear indication that these are the dimensions along which large increases in output are to be expected.

We are regarded as an agricultural base society as well as a producer of primary produce and there is the need to give emphasis to the improvement of these sectors and build up our industry on this basis. There need not be a conflict between the priorities of industry and agriculture in a nation's development. They complement each other and remain closely interdependent.

In the process of becoming industrialized, we need to introduce modern technology in production and manufacturing to increase efficiency and economic benefit. The current energy situation, environmental pollution, and increasing concern

about the availability of raw materials have had a serious impact on industrial operations world wide. The introduction of modern technology, together with concomitant savings in raw materials and energy along with the protection of the environment, is essential to continuing growth and productivity and vital for Malaysia. Progressive steps must be taken to convert agricultural economy to agro-industrial economy. Market oriented finished products from these raw materials together with our primary produce must be explored. This effort will yield economic and social gains over the period of 6-10 years and will lay the foundation for long-term economic growth.

The country must also have a dedicated and relatively well-educated labour force, without which the realization of the outward-looking development strategies will be impossible. The continued emphasis on education and the skill and hard work is essential for growth in the nation. Modern economic activity requires a great number of trained and qualified people. Investment in human beings is, prima facie, as important as investment in material capital. They are the sources of technological change. Without them investment in materials capital will still bring growth, but it will be an inefficient growth that is combined with technological stagnation.

While maintaining a relatively high growth rate, our economy will undergo major structural changes. Technological innovations now gaining momentum in many industries will have a decisive effect on future patterns of industrial development. Simple assembly-type industries, which have flourished on low-cost labour, will yield to more skill- or technology-intensive fields i.e. in electronics and maybe other high-technology areas as well as in our fledging automobile industry. Development of the domestic computer and telecommunications capabilities will also greatly improve the productivity of the service industries, where productivity has traditionally lagged behind the manufacturing sector.

High growth should not be accompanied by high inflation; price stability is vital. This price stability can be achieved not through temporary price control but through appropriate aggregate demand control, based on free market competition. Import liberalization will further strengthen price stability in the future, by encouraging price competition and greater efficiency in economy.

Ladies and Gentlemen,

The goals of economic development of the government is clear but for the private entrepreneurs, the government may intervene or guide in order to speed adjustment and promote growth by providing incentives for certain activities or industries. The emphasis on market mechanism is an important basis for economic reforms. This can be done by the transfer of leadership in

economic management from the government to the private sector hopefully based on the creativity and responsibility of the private entrepreneurs.

There must be a mechanism that is responsible for the planning and promotion of the science policy, coordination of agencies and institutes. The mechanism should have the responsibility of setting an overall policy which takes into account of all technical, production, financial and marketing factors, and then ensuring that the various departments of the organization understand the need to co-ordinate their activities within the framework of this policy, at the same time securing the full cooperation of the whole labour force in the ensuring technological changes. There must be the ability to carry out an idea through to the final product without a break in the innovative chain. There must be the readiness of banks and private investors to finance the total technological innovation, and, lastly the scale and impact of government purchasing policy. This philosophy is vital for Malaysia. The exhortation is to feel dedicated to commerce and to generate the sense of technological awareness.

R&D teams should avoid aiming for 'internal' recognition and deliberately try to make themselves more amenable to needpull. More men of the highest ability, including some of those with technical backgrounds, should be deployed in phases of innovation other than R&D such as production and marketing.

In the high-technology world, strategy often revolves around the innovation activities of the scientists on the floor and to business people whose decision will require ratification by top management. Innovation involves welding marketplace opportunities with inventive technology and new technical knowledge. This requires substantial skill and it is by no means a simple decision-making process. Three elements must be brought together by R&D managers and/or new-venture managers in their efforts at strategy formulation. These elements are :

- technical competency
- market need, and
- corporate interest

Supporting long term scientific research cannot be argued on economic ground. A scientific discovery may take many years before it finds practical application. The justification for it is that this constitutes the fount of all new knowledge, without which the opportunities for further technical progress must eventually become exhausted. Laboratories carrying out long-term basic research which stretch techniques to the limit are at the same time a valuable forcing ground for new technical developments.

There is also the concern as to the role of individuals. To an increasing extent, they cannot do scientific work alone and independently. Complex projects can only be undertaken by teams whose work is organized. It looks like man of outstanding genius are not necessary for progress; at least they can, perhaps, speed up what would otherwise have taken a little longer. "The real accomplishment of modern science and technology", according to J.K. Galbraith, "consists in taking ordinary men, informing them narrowly and deeply and then, through appropriate organization, arranging to have their knowledge combined with that of other specialized but equally ordinary men. This dispenses with the need for genius. The resulting performance, thought less inspiring, is far more predictable".

What about the future? In what ways will be activities of science and technology, and the roles they play in society, come to differ from what they have been in the past? Forecasting is difficult. But since it is all too clear that the future is full of questions and problems, and undeniable that science and technology are major agents of change, it is important to look ahead and to face the challenge.

Lastly, ladies and gentlemen, a scientist must become aware and to have a unitary outlook and that he cannot be torn by the contradiction between his science and his duty.

Thank You.



**TOWARDS INDUSTRIALIZED NATION BY 2020:
SOME CHALLENGES FOR CORPORATE LEADERSHIP**

DATO' MOHD ALI BIN HAJI HASHIM

Group Chief Executive

Johor State Economic Development Corporation

ABSTRACT

Malaysia's Vision 2020 has been able to captivate all Malaysians and is now charging the nation with a new-found sense of purpose, direction and urgency.

The timing in the launching of the vision is also never more appropriate. It was unfolded by the Prime Minister at the current juncture when the whole history of human society is virtually being rewritten, when global geo-politics are undergoing a massive shift as rarely witnessed in human history.

Many nations are today facing serious problems of coping with dramatic change at an unparalleled global scale. Within this context of potential confusion and upheaval, Vision 2020 stands therefore as a beacon, a clear light that can guide us through. Vision 2020 is able to mobilize thoughts, inspire fresh conviction and focus perceptions of the young Malaysian nation in charting for itself a definite course in the rough seas of future uncertainties.

In launching Vision 2020, our Prime Minister also made his point regarding the role of science and technology crystal clear. He stressed that we need to establish "a scientific and progressive society, a society that is innovative and forward looking, one that is not only a consumer of technology but also a contributor to the scientific and technological civilization of the future".

I deliberately singled out the above statement regarding Science and Technology in view of the theme of today's Congress. Within the context of the title of this paper, we therefore need to find answers to 2 basic questions:

1. What role does the corporate leaders have to play in the context of such global changes?
 2. Is there not a role for Malaysian corporate leadership in realizing Malaysia's aim to be not only a consumer of technology but also as a contributor to the scientific and technological civilization of the future?
-

Proacting to a global shift

The main contention of this paper is therefore that the corporate sector would provide the main thrust for Malaysia's search for excellence in most fields of national endeavor and this would also hold true in our pursuit for technological excellence. The corporate leader is the prime mover who has to initiate and sustain this difficult task. It therefore implies also that in the particular field of science and technology as in others, the company as the corporate leader's principal organizational vehicle would be the most suited institution to deliver a "rapid, realistic, focussed and market driven development of our technological capabilities.

In fact the company as a corporate organization in modern society would turn out to be the single most important and most powerful institution, not only to meet with the technological aspirations of Malaysia but to also deliver all the tangible and material needs of modern society, plus often the intangible as well!

I can think of 3 compelling reasons for the company's indisputable role in the future:

1. The predominance of the free enterprise or market system as the new global order

With the collapse of the command economic system and the subsequent downfall of centralist communist governments all over the world the free enterprise system or the market system will dominate economic and political lives of all nations for some time to come.

The fallout and spread effect of this ideological collapse is also felt in countries who used to champion socialist, welfare state as well as mixed economic systems. Malaysia had fortunately preempted this global shift consequent upon the collapse by adopting early on an aggressive privatization policy and by boldly dismantling a long inherited interventionist set of policy framework. The pro-enterprise stance of the Malaysian government has therefore been able to establish an enterprise-friendly environment conducive to business growth and enhancement of corporate activities.

The basic and single most important economic institution under the free enterprise or market system is the private company and the corporate leader and entrepreneur is therefore expected to take the lead role in spearheading this transformation.

2. The primacy of economics in national affairs and the diminish in role of ideological, political and military concerns globally

The collapse of the communist system of government also leads to a transition towards a transformation of the

world order. Nations now have to establish new definitions and draw new boundaries for their global interrelationships after the sudden end to the "Cold War" which had dominated world politics for several decades in the past.

It has been said that "although in the net this game-shift will be more economically productive than the deadly game of Cold War, one must expect an increase in economic competition and conflict in the global arena".

This tougher and more demanding global economic scenario which is currently being underlined by tendencies towards regional groupings and trends towards protectionism, will pose greater challenges to corporate leaders particularly of a growing economy such as Malaysia. One of the biggest challenges for Malaysian corporate leaders would be to ensure that the domestic economy is not about to be swamped by more powerful multi-nationals or satellite corporations operating in the region representing the interests of developed countries. For example concern have often been expressed about the passive by stander's role even in areas involving small and medium-scale activities in the context of an open and liberal economic order.

3. **The predominance of the company as the most efficient and effective institution to deliver economy goods to society**
The "primacy of economics" and the global shift from "geo-politics" to "geo-economics" intimated above will elevate companies and corporate organization into greater prominence in term of their institutional roles in society.

The tremendous impact that companies will have not only on economic but also political and cultural life of nations in future is very obvious considering the following facts:-

1. Corporate organizations will enhance their position as economic power-houses in society.

We will witness the multiplication of small and medium-sized companies and the growth of big companies into corporate giants with the ability to mobilize vast resources that will transcend even the capacities and capabilities of governments.

2. The concentration of such economic resources and power in corporate hands will have wide-ranging implications on the economic, political, social and cultural life of nations.

The dark side of this over concentration of power in corporate hands cannot be over emphasized.

Early writers including Professor Galbraith in his "The New Industrial State" had cautioned against the possible dangers of "arbitrary corporate government" and of the need to protect the nation against it.

The danger of the political system being dominated by "private government without the consent of the governed" and hence undermining the functioning of democratic institutions in society has also to be recognized.

On the other hand fears abound, particularly in non-western societies, of the potential subversion of what is regarded as higher-values in society. This is naturally more felt in countries that are still sustaining strong religious outlook and is greatly felt in Malaysia because of the potential value-conflict with many aspects of the principles and practice of Islam as a way of life.

In such societies nations will have to successfully manage one of its greatest paradoxes. On the one hand nations are faced with no alternative other than adopting a market oriented free enterprise system. On the other there is a strongly felt need to preserve equality and social justice which is not easily achieved in a free enterprise system. There is a further need to prevent the worst of materialism and other dark aspects of the corporate culture from dominating social life. The Corporate leader surely has a definite role to successfully reconcile these conflicts and win in managing such paradoxes where they arise.

Some issues and challenges for corporate leadership

For the purpose of this Paper I have identified 3 major issues and challenges that should be among the top agenda of Malaysian corporate leaders. It is not intended to be exhaustive as it particularly excludes many basic responsibilities of corporate leadership in terms of the operative and business aspects of successfully managing and positioning his corporation or company. The list is therefore focussed more towards the broader, more fundamental issues that are of national significance within the context of Malaysia's Vision 2020.

1. Building a positive image of business and its role in Malaysian Society

Given that the trend towards free enterprise and market system is irreversible and that a more prominent role for corporate organizations and business entities is inevitable, there is therefore a critical need for Malaysians to change our attitude towards business. This can however happen only when business leaders themselves adopt fresh attitudes towards business.

Unfortunately our own business track record is dismal, punctuated more by corporate inefficiencies, breaches of trust, executive misdeeds, gross mismanagement, sheer profiteering and other irresponsible acts, than by examples of high public responsibility and a caring for social needs and enhancing the public good.

There are many ways to make profits. Some by cheating, others by exploitation and others again by fancy corporate footwork. But the fact is that successful business organizations cannot stay successful and should not be allowed to stay for long with such negative kinds of attitude and damaging behavior.

There are now in Malaysia and most countries tighter and more stringent laws, rules and regulations to punish corporate misconduct and they are being very strictly enforced. The business sector has, however to finally develop self-regulating and self-disciplining mechanisms to reflect their sense of social responsibility.

Fortunately, there has been a tremendous change sweeping business philosophy throughout the world. Profits per se are no more the ultimate goal of business as popularly assumed. The most successful and excellent companies tend to have pronounced altruistic goals, with public interest and particularly customer satisfaction paramount on the list of their priorities. These, for example are reflected in statements of corporate objectives or principles adopted and adhered to by some very familiar household business names:

DU PONT:

"BETTER THINGS FOR LIVING THROUGH CHEMISTRY"

SEARS, ROEBUCK:

"QUALITY AT A GOOD PRICE"

THE IBM WAY:

3 SIMPLE COMMITMENTS:

- * THE INDIVIDUAL MUST BE RESPECTED. PEOPLE, NOT MONEY OR THINGS, ARE AN ORGANIZATION'S GREATEST ASSET.
- * THE CUSTOMER MUST BE GIVEN THE BEST POSSIBLE SERVICE.
- * EXCELLENCE MUST BE PURSUED, IT BEGINS WITH RECRUITING, CONTINUES WITH TRAINING AND IS SHAPED AND SHARPENED BY COMPETITION AND REWARD. IT TRANSLATED INTO SUPERIOR PERFORMANCE IN BOTH PRODUCT AND SERVICE.

Let us have a look at examples from Japanese companies which have become multi national in operations. Some of these are now not more Japanese than 'global' or world class, having competed and won and having reached there by sheer dedication and single-minded pursuit to win over the customer by providing among the highest quality products or service. Many of them do not at all mention "profits" and as Asians, their corporate ambitions and aspirations are also sometimes intertwined with wider goals and objectives of the society at large.

AKIO MORITA AND SONY:

"TO DEVELOP THE TECHNOLOGIES THAT WOULD HELP REBUILD JAPAN'S (POSTWAR) ECONOMY"

HONDA'S COMPANY:

"MAINTAINING AN INTERNATIONAL VIEWPOINT, WE ARE DEDICATED TO SUPPLYING PRODUCTS OF THE HIGHEST EFFICIENCY YET AT A REASONABLE PRICE FOR WORLDWIDE CUSTOMER SATISFACTION"

MATSUSHITA'S EARLY 7 PRINCIPLES:

1. SPIRIT OF SERVICE THROUGH INDUSTRY
2. SPIRIT OF FAIRNESS
3. SPIRIT OF HARMONY AND COOPERATION
4. SPIRIT OF STRIVING FOR PROGRESS
5. SPIRIT OF COURTESY AND HUMILITY
6. SPIRIT OF ACCORD WITH NATURAL LAWS
7. SPIRIT OF GRATITUDE

There is therefore a very important lesson to learn from, the experience of these companies as well as so many successful others. To my mind the success of these companies and thousands of others like them throughout the non-socialist world has contributed in no insignificant terms towards the breaking down of the Berlin Wall, towards destroying communism as an ideology and towards reducing the concept of the welfare state to redundancy. They all have been able to deliver the goods minus any ill feeling by the customer.

One important perspective to note from the success of these companies, which is also the outcome of adherence to such non-materialistic philosophies and principles is that these are the same companies that have made the world a better place for the average man to live in. They have been adding value and benefit on a sustained basis to society and to mankind generally. They have made it possible for the average man, to have better living standards. As just one example, in the case of Honda, a car or at least a motorcycle within easy access of every one.

Honda's success had turned motorized transport, which would otherwise be a luxury only a few can afford, into a convenience within almost everybody's reach. Companies like these have made it possible for many not only to "dream" for better things in life but to "live them. And I am therefore strongly of the opinion that Corporate leaders do have a social responsibility to ensure that economic power and resources at their disposal be utilized principally to serve public good, to make quality products and services affordable and a better life and higher standards of living accessible, to the average

Malaysian. This would in fact be critical towards changing the image of corporation and enhancing public acceptance of business generally.

2. Enhancing Malaysia's global competitive capabilities

With the economic power and resources vested within their control the onus is therefore on the nation's corporate leaders to enhance Malaysia's competitive position.

As it Malaysia has the geo-strategic advantage of being located in one of the fastest growing economic region of the world. This advantage, however, has still to be exploited fully by Malaysians for Malaysians. Without a successful national effort to capitalize from this advantage we would only be leading ourselves towards foreign domination of our strategic position within the context of the current openness and economic liberalization.

Here therefore lies another major challenge before our corporate leadership. The agenda for them in this area would include sustaining the highest level of productivity of workers under their charge, mobilizing and motivating their corporate teams to ever higher levels of achievement, mastering relevant techniques, skills and technologies for that supreme national effort and finally fighting, carving and winning for advantages at the global level at least for a specific range of products or services.

This supreme national effort would require tough adjustments and for many companies, total departures from past practices and habits. It would require adjustments, for example, particularly among companies which inherited management attitudes, outlook, practices, structure and systems from an outdated colonial past. This is obvious particularly in the plantation sector where industry structure and relationship between management and workers are still very much a colonial legacy structured on an elitist, if not exploitative framework that is opposed to the total effort and participative approach of managing in a highly competitive environment.

Adjustments and shifts in outlook is also required on the part of traditional and conservative family controlled corporate entities. These has to be a shift towards adopting highly professional management skills and techniques. There has to be a departure from adopting blood and family ties as basis for captainship of industry, to be replaced with professionalism, merit and proven managerial and leadership capabilities.

We may want to extend this argument in favor adjustments at managerial and corporate leadership levels by analysing the impact that current ownership structure of enterprises would has on Malaysia's national competitive position. In the event that the existing structure stifles

talent and prevent the most skilled and capable from being given meaningful corporate leadership roles, then a restructure of such ownership arrangement will have to be carefully instituted. No company or corporate entity and consequently no nation can global arena, if the vital command over corporate resources continue to be placed in uncommitted, incompetent or mediocre hands. This fact would be a sure formulae for disaster.

On the other hand a similarly revolutionary approach towards management development would be necessary. There should also be a national, all out effort to develop and grow entrepreneurs. The conventional approach in developing entrepreneurs need to be revised. Malaysia cannot depend anymore on the rags-to-riches approach to entrepreneurship development to gain competitive position, however appealing this may appear to leave it to chances and the normal course of business to throw up quality corporate leaders.

We will never be able to grow enough number of entrepreneurs if we depend purely on chances and the double coincidence of finding a talented manager well placed at full command of sizeable resources. We need a deliberate and elaborate program to develop entrepreneurial skills and in this regard the successful intrapreneurial approach of developing manager-entrepreneurs undertaken by several corporate organizations including the Johor SEDC merit close study and consideration by the corporate sector.

In fact a definite program will have to be effectively instituted to ensure that valuable national and corporate resources are progressively and increasingly being made available to support outstanding entrepreneurs in their pursuit for excellence and corporate achievements. This program cannot however be ad hoc and arbitrarily administered. It can perhaps be best managed in conjunction with a programmed development of entrepreneurial talent riding on the business success and achievements of selected corporate entities.

3. Shaping corporate value and instituting a dynamic and healthy corporate culture

The company and corporate organization as the dominant institution in society shall also inevitably be responsible, among others for providing the bulk of employment and career opportunities and hence for the development of the full human potential to realize fully Malaysia's ambition to be a developed nation.

All companies and corporate organizations will have no choice but to undertake this task though not necessarily for pure nationalistic reasons. Corporate entities pursuing excellence will have no other choice than to demand for and get excellent from their own people. Companies in the final analysis are not merely an aggregation of assets and wealth in

an organization but are fundamentally human institutions. It is in the quality of their people that we will find the distinction between a successful and excellent company from one that is mediocre and the average. (Those below average will not survive for long need therefore not be a focus attention).

Foremost on the agenda under this category of corporate responsibility would perhaps be the adoption of statements of corporate missions espousing clearly the vision and outlook, the aspirations and motives of particular organizations.

Such statements should also address a corporation's attitudes towards its human resources as well as its mission and role in society, especially in relation to the interest of all its stockholders and customers alike. The final challenge for corporate leaders would be to utilize the power, resources and organizational support available at their disposal to realize fully the aims of these mission statements and to mobilize their respective organizations to actually live by them.

Other than mission statements corporate leaders will have to institute and develop a dynamic corporate culture consonant with the pursuit for excellence. No organization operate in a cultural vacuum and in the absence of such a deliberate program a cultural form will still take shape.

Left on its own, however, the behavior, norms, attitudes and beliefs of the people in the organization may not be consonant with the demands of a dynamic and competitive corporate entity. Corporate leaders have therefore to play the role of cultural builders and the corporate equivalent of tribal chiefs.

This role would therefore take greater prominence and vitality within the Malaysian context as a country recently emerging from an agricultural society. Obviously major adjustments, transformation and sometimes painful shifts are required. It is indeed a challenge to change people with the ingrained habits of a largely easy-going character moulded by generations of purely agricultural pursuits and to turn them into highly productive industrial workers at ease with the harsh demands and often rigid disciplines of an industrial society. But this challenge must nonetheless be taken and taken successfully!

It is also the contention of this paper, in view of the permeating and all-pervasive role and influence that private enterprise and corporate organizations will play in Malaysian society, that the social transformation sought for by our national leaders can only be effectively achieved with the full identification, involvement and commitment of corporate leaders and their organizations in this total national effort. It is therefore imminent that corporate leaders equip themselves with the necessary skills, aptitude and correct perceptions of the

character and quality of the corporate culture that is to be adopted. In principle, the corporate culture suitable for Malaysian adoption must be structured on the internalization of all the values, norms and practices which are universally regarded as essential for corporate success and excellence. These have, however, to be successfully integrated with the fundamental values and beliefs in Malaysian society that are also universally regarded as supportive and conducive to the national mission of becoming a developed nation by 2020.

Conclusion

Allow me to conclude by relating all issues discussed so far back to be theme and context of this Congress. In so doing, I must therefore try to answer the second question posed in the beginning of this paper i.e. "is there not a role for Malaysian corporate leadership in realizing Malaysia's aim to be not only a consumer of technology but also a contributor to the scientific and technological civilization of the future?"

This link was actually pointed out by the Prime Minister himself in the launching of Vision 2020 when he said:

"In a world of high technology, Malaysia cannot afford to lag behind. We cannot be on the front line of modern technology but we must always try catch up at least in those fields where we may have certain advantages.

The Government will certainly provide the necessary commitment and leadership to this national endeavor. The institutional and support infrastructure will be put in place to ensure rapid, realistic and focussed and market-driven development of our technological capabilities. **But let us never forget that technology is not for the laboratory but the factory floor and the market.** The private sector and our people must respond."

If technology is not the laboratory but the factory floor and the market, then it is obvious that the major thrusts and initiative will also have to be industry-led. This is fully in line with the contention of the first part of this paper which underlines the role that the corporate sector will take in Malaysia's future. To facilitate the development of a successful corporate thrust in technological development however would require the fulfillment of at least 3 preconditions as follows:

1. There has to be a mutual understanding of the respective roles that scientists and technologists play on one hand and that of corporate leaders and business in general on the other. It is critical that corporate leaders become "S & T literate" as much as scientists and generally and corporate leaders in particular, play in society.

It is my hope that in the first part of this paper I have been able to a certain extent enhance your understanding and perception of business in general and the role of the corporate organization in particular.

It is also obvious that more need bridges need to be built between these two vital components in our society and a continuous dialogue and interaction in that direction will certainly help.

2. Mention has been made of the need to quickly identify specific industries in which Malaysia has a definite competitive advantage, to be developed as critical strategic industries to position Malaysia for a niche or leadership role in the global scheme of things.

It is therefore critical for corporate leaders and scientists and technologists to establish a common agenda and to zoom into the chosen strategic industries of critical national interest and structure and mobilize common efforts to ensure the materialization of that objective. We have to quickly agree on a list of "critical technologies" that Malaysia must have to win in this global game.

The concept of Malaysia Incorporated, which had successfully led to the hand-in-glove, mutually supportive cooperation and coordination of efforts between industry and the public administrative sector will have to be extended to incorporate and involve the scientific and technological community and institutions.

3. Corporate organizations must themselves develop their own critical technologies and take necessary initiatives to build their respective technological capabilities.

In this regard, corporate restructuring and adjustments as indicated in the first part of this paper would be an important prerequisite. The internal corporate environment will first of all have to be conducive and attractive to professional managers and corporate leaders themselves before they can be similarly friendly to researchers, scientists and technologists. A healthy corporate atmosphere which is not bureaucratic and which does not stifle initiative, which does not reduce people to pure statistics or worse still regard them as machines; and one that allows room for experimentation and tolerates risk-taking, would be one that is conducive to the development of technological talent. Finally the environment must also be one that is conducive towards recognizing such talents and quick to reward technological success and achievements.



MY9700837

FOSTERING INNOVATION IN TECHNICAL ORGANIZATIONS: A NORTH AMERICAN PERSPECTIVE

Fred M. Amram
General College
University of Minnesota
Minneapolis, Minnesota, U.S.A

ABSTRACT

Many nations are now spending a great deal of money and time to train and encourage employees to demonstrate creativity in the workplace. Special efforts are made to help engineers and other scientists innovate new products and processes. Managers are told to "find a better way".

Much of the investment will be wasted, however, if the work environment in which employees find themselves is not conducive to new ideas, risk taking, and other components of innovation. No amount of employee skill and attitude development will enhance creativity unless the environment supports that effort.

Three key factors in work environment have special influence on creativity: people, space, and time. While all three are interrelated, each will be discussed independently.

The Challenge

I was asked to discuss "Fostering Technology Leadership In Your Organization With Particular Reference To Proven Business Skills". I very much respect the phrase "YOUR ORGANIZATION".

In the USA there is a joke that refers to an expert as someone who is away from home. One's expertise is increased in proportion to the distance from home. I am very, very far from home and therein lies a problem. I come from North America and YOUR organization is in Southeast Asia. What you do in YOUR organization depends, in part, on YOUR culture.

I speak and think in an American form of English. I wish I could speak to you in Bahasa Malaysia and brings you wisdom which reflects the complex and interesting value systems of your culture. Truly, language is culture and culture is language. Put another way: We think as we speak and we speak as we think.

YOUR organization reflects YOUR value systems and YOUR norms of relating to one another. I can bring your wisdom as seen through my eyes. You must translate what I say to meet YOUR special circumstances.

Furthermore, I speak from the perspective of the US Corporation and my examples are from that setting. What I can say, and should, be translated to meet the needs of YOUR ORGANIZATION be that a university, science center, library, government office or shopping mall.

The invitation asks me to discuss "Fostering Technology Leadership With Particular Reference to PROVEN BUSINESS SKILLS". I will not meet those expectations. PROVEN BUSINESS SKILLS were proven at another time and were appropriate to difference sorts of problems. Instead I will ask you to restructure in new ways. I will propose organizational skills and organizational structures for today and for tomorrow. When my new wisdom has been PROVEN it will be time for new skills and new structures to meet the needs of yet another time.

Overview

Many nations are now spending a great deal of money and time to train and encourage employees to demonstrate creativity in the workplace. Special efforts are made to help engineers and other scientists innovate new products and processes. Managers are told to "find a better way".

Much of the investment will be wasted, however if the work environment in which employees find themselves is not conducive to new ideas, risk taking, and other components of innovation. No amount of employee skill and attitude development will enhance creativity unless the environment supports that effort.

Three key factors in work environment have special influence on creativity the self, and time. While all three are interrelated, each will be discussed independently.

People Impact On Creativity

There are three categories of people in the work setting who may enhance or inhibit creativity the self, peers and supervisors. The self is certainly the most severe critic. Who knows better which "put down" will be most effective? Who remembers best, consciously and subconsciously, one's entire life history of failures?

Training works best when it teaches the individual to try, to risk, to dare. Training works best when it demonstrates to the individual that he or she blocks creativity with unnecessary habits, fears, conformity, fixations and all other self-inhibitors.

Innovation requires self-confidence the "I think I can" attitude which comes largely from remembered success experiences. Ultimately the motivation to risk (to want to try) requires feeling good about oneself and good management help people feel successful and discover personal strengths.

A reward system which endorses effort as well as winners will help insure success experiences. It is noteworthy that not every new idea is a good idea, but without new ideas there is no innovation. Not every oyster contains a pearls.

Reward systems should allow for individual difference and preferences. Just as we each know our failures we also know best what makes us feel successful. The encouragement of rewards may not be enough for some. A limited amount of pressure may bring out the best. "I expect you to be creative" says that I believe in you. I think (I know!) that you can do it. Nothing enhances self-confidence more than the confidence of others.

Other people in the work environment impact on the individuals creativity as well as the individuals feelings about self. Peers surely have more influence on ones sense of creativity than "bosses". While our coworkers give us a sense of ourselves and self-worth, they also give us a real opportunity to collaborate. Two heads frequently are better than one.

American culture is often not conducive to collaboration. American corporate culture is rarely conducive to collaboration. We are a competitive people. In the corporate setting we are afraid that the other person may get the patent, the reward, the step up the elusive ladder to success. Again and again engineers report that they dare not share an idea until its in "final form". Scientists report that they dare not even ask advice technical or procedural for fear that an idea will slip away. Yet none of us is expert in all things. We need our colleagues to develop our ideas, to enhance our ideas, and to test our ideas. Consequently, American industry is trying to develop a collaboration system which encourages and teaches individuals to use one another's information, insights, and skills.

For openers, industry must develop group reward structures, if two or three individuals participated in an innovation, each should share in the reward either equally or in proportion to their contribution. In some cases whole departments might be rewarder even though not all individuals contributed to the idea. Such group reward recognize the importance of peers as emotional support for innovators and emphasize an organization commitment to its creativity program. Furthermore, group reward encourage group spirit and help to discourage the individual competitiveness which damages efforts to collaborate.

Organizations can develop flexible reward systems which concurrently encourage groups as well as key individuals. Systems can be designed to meet individual ego need as well as to foster group loyalty and member interdependence. In some cases peers are the best judges of who would receive rewards and what forms they should take.

Having established a sense of trust even emotional support the new "Collaborative Culture" wont succeed without some "how to" training. Intrapersonal and interpersonal communication skill development is crucial and some insights into the workings of task oriented groups will optimize time spent in collaboration effort. "How can I get others to hear what I'm saying? Misunderstanding is pervasive and too often taken for granted. Greater self-awareness and additional communication skills can help to minimize misunderstanding.

While technical support is one of the most useful outcomes of collaboration, especially for scientists, testing ideas and improving ideas is a more interesting and, often, more productive outcome. Everyone should have a sparring partner with whom ideas can be tested without the risk of personal (emotional) injury. This intellectual sparring partner should first understand ideas and then help test them with thought, insightful, yet supportive questions. "What if....." questions encourage the exploration of modifications and alternatives without the devastation of "I have a better idea".

School has taught us to well to set straw men so that we can knock them down. "I like that idea BUT...." usually leaves both the idea and the ego badly damaged. George Prince, in **The Practice of Creativity**, suggests beginning the testing of an idea with "What I like about that idea is...." followed with some genuine comments about the strengths of the idea. Prince proposes that a good way to enhance an idea (point up and overcome its weakness) is with "What I like about that idea is.... AND I wish....". The "and" replaces the traditional "but" thus pointing to potential strength rather than weakness. The "I wish" identifies a fantasy of an even better idea which the sparring partners (collaborators) can jointly bring to reality.

Collaboration, communication and sparring skills require training and practice. The investment is worthwhile if it permits peers too enhance each other's creativity.

"Bosses" may not have as important an impact on creativity as peers do, but supervisors, managers, directors and vice-presidents are an important part of the work environment and do have major opportunity to enhance and inhibit innovation. "Bosses" have "referent power". That means they act as models of how to behave. "Bosses" can be models of creativity, risk taking and intellectual daring or they can be models of stagnation, self-protection and intellectual boredom.

This is not to say that "bosses" must be exceptionally creative. It means that they must model an openness to new idea and an enjoyment of challenges. Paul Torrance, who has developed much of the important research related to creative behavior (especially in children), has demonstrated well that leaders, including teachers and Peace Corps Volunteers, need not necessarily display exceptional creativity. Whether or not these leaders demonstrate great creativity is less important than their "tolerance for ambiguity". Are they open to a diversity of options, different styles for problem solving and some apparent "messy" thinking? Do they welcome disagreement? Bosses who enhance the creativity of others do not insist that their own solutions are best.

To enhance employee creativity bosses must provide difficult problems, "I am not challenged by problems assigned to me" is a common statement from highly paid scientists in industrial settings. In tennis one sharpens one's skills by competing, under

some pressure, with a partner who is a better player. So one sharpens one's creative problem-solving skills with difficult problems, presented with some expectation to innovate. Most employees respond quite well to a little pressure.

Too many bosses inhibit creativity by presenting problems and the procedure for solving them. "Management by objectives (MBO)" requires clearly stated objectives. Creativity requires the freedoms to design innovative ways to meet those objectives.

In summary, employees will generally innovate if permitted. Bosses give permission by providing challenges and then providing appropriate rewards for effort.

Space Impacts On Creativity

Three key factors in the work environment have special influence on creativity people, place and time. The people factor, we have said, includes self, peers and bosses. Place (space, location) also merits exploration.

The laboratory is normally (not always) a place for testing ideas not for having them. Perhaps a "think space" needs to be provided. A survey in a USA "top 50" corporation asked technical and scientific employees to identify what, in their work environment, inhibits creativity. The number one response was noise (including visual and aural). A private office is not a requirement for all employees. Employees do need private think spaces available to them. They need quiet places to formulate hypotheses and to "incubate" ideas spaces relatively free of unrelated stimuli.

Quiet spaces are, however, not enough. The library is still critical for information gathering and the laboratory/shop is still necessary for testing ideas and for creating the drawing and/or model.

And public space is necessary for collaboration and for the sometimes noisy intellectual sparring recommended earlier. Public space can be used for team building for learning to trust.

The creative problem solving process is more than silent thinking and it is more than the manipulation of lab equipment. It is a complex process requiring space to think alone, space to collaborate with others, as well as space to test and to implement. People are, indeed, most important, but people work best in appropriate space.

Time Impacts On Creativity

Peers and bosses, influence worker creativity. The physical work environment is a second factor which enhances or inhibits innovation. Time is a third critical factor. Creative problem solving takes time!. Surely going to a file cabinet to pull out last month's solution seems time effective. But last month's

solution doesn't solve this month's problem. (It may not have solved last month's problem). And file cabinet solutions rarely provide an innovative product, process, manufacturing system or sales program.

"Time is money" we are told. "We can't afford the time". If time is really money it can be perceived as an investment. Investing \$50,000 worth of time on developing a million dollar product or process is a good investment. Of course there is risk. No risk no profit.

Creativity requires think time just as it requires think space. One of the problems one can spend time solving creatively is how to do existing tasks in less time, thus making available even more time for innovating.

Time management programs are often helpful and may bear repeating periodically. Such programs generally require participants to document in detail exactly how time is spent. Unnecessary activities, unwanted interruptions and inefficiencies are brought to light. One time problems are identified, changes can be implemented. Creativity applied to personal work habits as well as to work distribution can save substantial time which, in turn, may be reinvested in more creative efforts.

Employees report greater benefits from large blocks of time (an afternoon, a day, a retreat) than from occasional random snatches of time. Concentrated, on purpose problem solving time leads to concentrated, on purpose productive creativity.

Epilogue

Corporate creativity requires the development of an appropriate people environment to enhance self confidence, group collaboration and supportive supervision. Corporate creativity requires an appropriate space environment which permits research and testing, thinking and sparring. Corporate creativity requires the investment of think time.

Corporate creativity does not come easily, nor is it inexpensive. It is, however, a good investment. The "ah ha" experience without effort is a myth. Frederick Douglass, The Black American who struggled for the end of slavery in the United States during the nineteenth century, mocked those who "want the rain without the thunder and lightning". The rewards of great effort are twofold. First is increased worker satisfaction. The psychologist Maslow was surely correct when he pointed out that individuals need self actualization and they achieve it continuing ability to compete in a world of radical change and incredible technological development.



MY9700838

SCIENCE AND TECHNOLOGY FROM ASIAN PERSPECTIVE

Prof. Yang Chen Ning
Director
Institute of Theoretical Physics
University of New York at Stony Brook
USA

ABSTRACT

Different types of R&D work will be analyzed and contemporary examples given. Approaches to science and technology policies in different regions and nations in Asia will be presented. Also, Asian involvement in scientific research will be discussed from the long range historical viewpoint.

COMMERCIALIZATION OF TECHNOLOGY

Ian Fraser
Deputy Chairman
Australian Scientific Industries Association



MY9700839

ABSTRACT

I wish to talk about the process of commercializing technology. How the results of scientific research are turned into commercial products.

At this end of the process it is about diffusion of the "product" into the market-straight forward stuff. Hectares of University space is given over to teaching the management of production, marketing, people, finance and all their sub-sets.

I will leave the "science" end for today. I wish to try to pass on my experience and that of others about this middle area; where research findings grow into technology, invention and innovation, ultimately to be handed over to the managers of the business process. It is this area where most opportunity seems to be lost and where we can have the most influence in the short term.

The whole process is constantly carried out within large companies; as well it is conducted between quite separate organizations who may have different roles in the process (e.g. a University and a private company).

I will focus on this latter situation because most of my experience relates to trying to link private companies to interesting researchers in public sector research organizations.

In Australia the practical reality is that most of this process takes place between public sector research organizations and private companies in industry. Of course, in GT nations much more of this process is carried out within departments of large companies.

Wherever it is done - the challenge is to more successfully integrate two parts of that community, science and business. To better align and connect two parts which have quite different value systems and motivations in such a way as not to inhibit the output of either.

Though we still know little of the process of generating innovation we have progressed our knowledge somewhat. Up until fairly recently Australia's research organizations, were internally self-sufficient communities of interest with few outside connections not only with the so called 'real' world of business but also with other Public Sector Research Organizations (PSRO) laboratories.

Simplistically it was believed that if you mixed the best scientists with generous funding and maximum freedom to do their thing; this would produce great science which could be translated into technology and applied to new products and services. Business would exploit the new products and services recycling increasing amounts of cash into the laboratories completing this magic and ever expanding loop.

Under such conditions of research - public or private - four major mistakes were typically made:

- * the process of technological innovation was barely understood or allowed to proceed.
- * the different motivations of scientists, inventors, entrepreneurs and business managers were largely overlooked.
- * the national managers abdicated their rights and duties to manage our public sector research and development activities in the nations economic interests.
- * too much reliance had been placed on luck.

INTRODUCTION

While Australia has produced disproportionately large amounts of internationally recognized science we have produced relatively small amounts of innovation in scientific instruments and an even smaller amount of successfully commercially exploited innovation.

Certainly we do produce innovations within private and public sector research and our successes are internationally noteworthy. We simply haven't done it often enough. Most of our research effort to date has been in pursuit of scientific discovery, and therefore at the cutting edge so to speak. When our science driven research lead directly to a new innovation it was generally outstanding and commercially significant.

The most quoted example is still a superb example - the fundamental research work of Sir Allan Walsh in the CSIRO Division of Chemical Physics lead to the development of the Atomic Absorption Spectrophotometer and its worldwide use in chemical analysis. This was a major innovation by any standard. It is being very successfully exploited, even 30 years after the original innovation, by many companies around the world, including the Varian Techtron Company manufacturing and exporting from Australia. The ICI Co. laboratories in Melbourne developed an innovation in the gas chromatography field. The Flame Ionization Detector they invented, would have enable a company to dominate a market as large as that of the A.A. Spectrophotometer. The innovation ranked internationally as a major development but the commercial benefit was lost completely because of inaction on the part of the company.

The company stuck to its knitting!

A comparison of the product development history of Hewlett Packard's Scientific Instrument Division, headquartered in California and Australia's achievements in developing scientific instruments shows that Australia was scientifically more than capable of innovating even better product designs and were often doing so before them.

But we simply failed to capture and commercially exploit all of our innovations. Most research and development project failed because they did not sell, not because they did not work.

There should be no doubt that successful innovation is good business; even small innovations produce useful returns for the company and the country, while major successes can produce great economic benefit.

The Atomic Absorption Spectrophotometer referred to earlier cost the Australian taxpayer probably less than a million dollars to invent it and has generated in excess of \$400 millions dollars in export earnings for the national economy.

Australia is currently trying to convert to a research structure where 'industrial relevance' and/innovation generation is an accepted and important goal. At the same time our manufacturing industries and commercial infrastructure are undergoing the most dramatic changes in our history.

In order to link our public sector research organizations (PSRO) to our industry we will have to change the attitude of both far beyond its present state. A major part of the 'good science' capability of our Public Sector Research laboratories still is only linked to our industry and the market place by centralized industry liaison intermediaries. Under such conditions Australia manages largely to get only the bill for the research effort and misses out on much of the rewards of exploitation.

To correct the situation we have had to understand the early part of the innovation process in detail.

GROSS DOMESTIC EXPENDITURE ON R&D (\$US) M

		1987
1.	United States	121,284.0
2.	Japan	46,118.1
3.	Germany	22,907.1
4.	France	16,343.2
5.	U.K.	16,202.9
6.	Italy	8,319.6
7.	Canada	5,993.8
8.	Netherlands	4,165.5
9.	Sweden	3,362.1
10.	Switzerland	2,868.0('86)
11.	Australia	2,616.0('86)
12.	Spain	2,009.1
13.	Belgium	1,972.3
14.	Norway	1,180.8
15.	Turkey	1,178.4
16.	Austria	1,154.0
17.	Yugoslavia	1,146.3
18.	Finland	1,146.3
19.	Denmark	974.6
20.	New Zealand	346.5
21.	Ireland	253.2

SCIENCE, TECHNOLOGY AND INNOVATION

Innovation

"In order to develop and grow new technical business which provide jobs, satisfy people and restore the economy, invention is not enough. To provide wealth for the inventor, the firm and the nation, science and technology must be embodied into new products, processes or services which are introduced to the market with commercial success. Therefore, technological innovation is defined as new application of science and technology to a specific market or industry."

'Capturing innovation' has a sense to it of "plucking moonbeams from the scientific ether".

While serendipity occasionally happens, many believe that, though the link between science and technological innovation is not well understood, it is much more a process of managed 'innovation generation' than one of happen - chance and capture.

On the other hand.....

Sir Alan Walsh of the AA spectrophotometer development, believes passionately that free ranging research and unexpected advances resulting from uncommitted research lead to the birth of new scientific instruments. (Walsh 1989, P.16)

I think the two ideas are separated parts of the one process - one closer to pure science one closer to innovation.

This is a key policy decision area for research organizations. With so many interesting research areas possible and relatively few scientists countries like ours have to make difficult choices.

Science is about knowledge and discovery regardless of its application. It is an international commodity which can be transferred easily through literature and meetings.

In contrast technology is a resource, and as all resources, only provides value if it is properly managed or applied. Technology is usually transferred through people by training and experience in a slow and difficult process which must be managed for success.

A scientist finds his rewards in discovery and invention which leads to peer recognition. A technologist finds his rewards in innovation which leads to change, value or power.

Understanding these basic differences in human motivation and behavior is of enormous importance if we are to establish appropriate roles, interactions and interfaces for efficient transition from science to commercial exploitation in the market place.

Scientific research only becomes a technological innovation when it has impact in the market place. Technological innovation

is far more likely to take place if research and the market place are explicitly linked. This is appreciated by very large corporations in the US, Europe and Japan with research facilities where scientists, technologists, business managers and marketers interact freely, each informed of the common mission and objectives of the corporation. The corporations have invested millions and continue to do so because the process yields technological innovations and innovative solutions to market place problems. They don't do it on the off-chance that investing substantial amounts of shareholders' funds in bringing the best scientists together with the best facilities might "pop" out highly exploitable innovations.

The following diagram is instructive (refer OHP):

Key factors to be noted when considering the innovation process include:

- * There is no direct connection between science and technology-technology results from the creative interaction of many things into a new system. The implication is that in the absence of other creative input 'good science' will remain just that and no innovation will occur.
- * The time period between the 'science' and the first practical application of it can be very long, 10 to 50 years. It seems incredible but track the development of any major innovations. Increased activity in research and development and better understanding of the process is reducing this period.
- * The first critical decision in the commercialization process is when to involve the "commercial" world with the science being researched.
- * Not all inventions become innovations; for an innovation to succeed there must be an entrepreneur or a product champion whose main goal in life is to bring that new product, process or service to market and generate value. In some cases the inventor and the entrepreneur may be found in the same person but this is more the exception than the rule.

Some important demarcations -

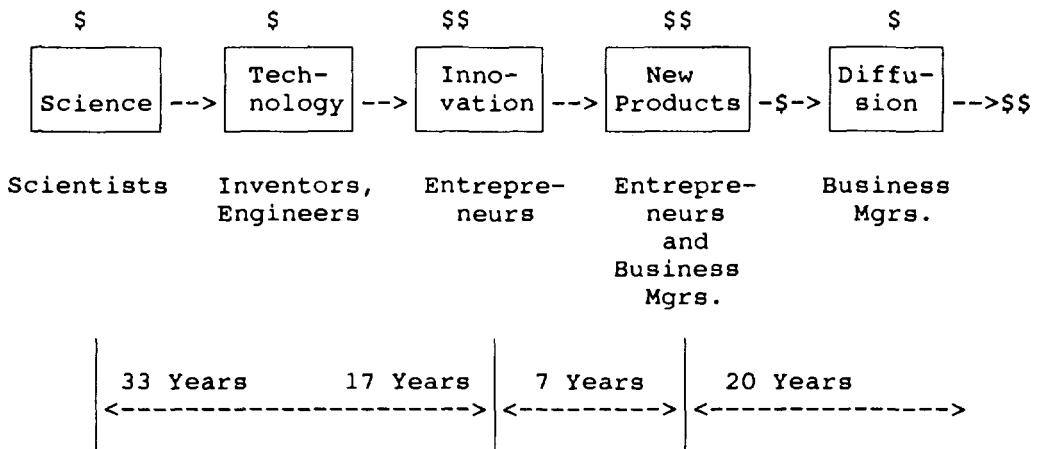
- * 'Science' is the preserve of the scientist, 'technology' is a function of engineers and inventors, while 'innovation' is a matter for the entrepreneur. The entrepreneur sees a new product in the raw innovation, reduces the invention to practice and shepherds the new product through the difficult phases of engineering development, manufacturing, market development and market introduction. This time period can be longer but for large innovations averages 7 years; in the

scientific industries 5 years is more likely; in Australia many companies try to rush the process to meet the cashflow needs of the undercapitalized start-up business.

In terms of financial investment it is generally accepted that 1 unit of 'good science' needs 10 units of development and possibly 100 units of diffusion.

When National Managers tried to manage this process rather than facilitate it the over-direction of researchers and their activities resulted in:

- * Minor product and process improvements hardly worthy of being defined as innovations.
- * Pedestrian rather than creative solutions.
- * The researchers began telling the managers what they thought they wanted to hear rather than the truth.
- * Underground research and development activities indicating dissatisfaction with the system.
- * Disenchantment, low morale, low productivity and especially resignations of many of the best people.



Challenges in research management

The successful innovations are being turned out with teams of people from marketing manufacturing and finance participating in research work from the very beginning

Drucker on Management

Current management strategies for research and development activities, aimed at producing commercially exploitable technological innovations, try to integrate the creative and innovative capabilities of the research and development personnel with the commercial objectives - not by direction but by process and practice.

A key element of these strategies is to provide leadership, which, because of its experience and qualification has the respect of the participants. A leader who will assist the process to happen. You cannot reform institutions from the outside. It requires vision and leadership on the inside.

If you are to improve the conduct of the process of innovation generation, capture, and commercialization within an organization then that organization will perform much better if it exists within established, clear national objectives; stated roles, responsibilities and policies which integrates industry, government and research.

I wish to talk more specifically about the scientific instrument industry but first I should say something about the sector.

- The scientific instrument industry exercises a leverage on innovation and scientific advance out of all proportion to its relatively modest size in economics and manpower. (de Solla Price, 1984, pp.19-20)
- Scientific instruments stands out as the one R&D - intensive manufacturing sector in which, despite a rising balance of trade deficit, Australian companies have continued to increase their level of exports.
- Growth in major overseas markets has been fastest in high technology sectors like scientific instruments.
- There is a broader strategic consideration in that strong basic competence in generic instrumentation technologies will be a key National asset.

The importance of instrumentation is clearly apparent in the list of twelve emerging technologies identified by a recent US Department of Commerce study of future opportunity for R&D. Several are core technologies in the scientific instruments sector (eg. digital imaging technology, sensor technology and medical devices and diagnostics) while instrumentation is specified as a 'major technology element' in many others (eg X-ray lithography for advanced semiconductor device production).

EMERGING TECHNOLOGIES IDENTIFIED BY THE US DEPARTMENT OF COMMERCE

EMERGING TECHNOLOGY

MAJOR TECHNOLOGY ELEMENTS

Emerging Materials

Advanced Materials	Structural and Functional Ceramics, and Metal Matrix Composites, Inter-metallic and Lightweight Alloys, Advanced Polymers, Surface Modified Materials, Diamond Thin Films, Membranes, Biomaterials
Superconductors	High-Temperature Ceramic Conductors, Advanced Low-Temperature Conductors.

Emerging Electronics and Information Systems

Advanced Semiconductor Devices	Silicon, Compound Semiconductors (GaAs), ULSI, Memory Chips, X-Ray Lithography
Digital Imaging Technology	High Definition Systems, HDTV, Large Displays, Data Compression, Image Processing
High-Density Data Storage	High-Density Magnetic Storage, Magneto-Optical Storage
High-Performance Computing	Modular/Transportable Software, Numerical Simulation, Neural Networks
Optoelectronics	Integrated Optical Circuitry, Optical Fibres, Optical Computing, Solid-State Lasers, Optical Sensors

Emerging Manufacturing Systems

Artificial Intelligence	Intelligent Machines, Intelligent Processing of Materials and Chemicals, Expert Systems
-------------------------	---

**EMERGING TECHNOLOGIES IDENTIFIED BY THE US DEPARTMENT OF COMMERCE
(continue 2)**

EMERGING TECHNOLOGY	MAJOR TECHNOLOGY ELEMENTS
Flexible Computer-Integrated Manufacturing	CAD, CAE, CALS, CAM, CIM, FMS, PDES, Integrated Control Architectures, Adaptive-Process Control
Sensor Technology	Active/Passive Sensors, Feedback and Process Control, Nondestructive Evaluation, Industrial and Atmospheric Environmental Monitoring and control
Emerging Life Sciences Applications	
Biotechnology	Bioprocessing, Drug Design, Genetic Engineering, Bioelectronics
Medical Devices and Diagnostics	Cellular-Level Sensors, Medical Imaging, <i>In Vitro</i> and <i>In Vivo</i> Analysis, Targeted Pharmaceuticals, Fibre Optic Probes

CHARACTERISTICS OF THE INNOVATION PROCESS IN SCIENTIFIC INSTRUMENTS

Until now I have been describing the innovation process in general but the process varies according to the type of technology.

The basic technological trajectories of scientific instruments companies usually differ in certain important respects from those in other sectors. Pavitt et al. (1989) have developed a useful topology distinguishing firms into four categories of 'science-based', 'scale-intensive', 'information intensive' and 'specialized supplier' on the basis of their analysis of 4,000 UK innovations (see Table 2). Scientific instruments companies are classified as 'specialized suppliers' in this scheme (along with producers of Machinery, specialty chemicals and software), and obtain their technology primarily from 'large-scale users' and 'small-firm design'. In contrast, 'science-based' electronics or chemicals firms rely on in-house R&D laboratories.

Three features of the innovation process in scientific instruments.

First, there is considerable evidence that 'users' (often researchers) play a far more dominant role than 'producers' (ie scientific instruments companies) in comparison with almost all other technology sectors. Van Hippel (1988) found in a detailed study of innovation in four major families of scientific instrumentation that 'users' accounted for: 100 per cent of 'first-of-type' innovations, 82 per cent of 'major improvement' innovations and 70 per cent of 'minor improvement' innovations. Overall 77 per cent of the innovations were 'user developed', while manufacturers in contrast were responsible for only 23 per cent.

Second, an unusually high proportion of innovative 'users' are located within academic and government laboratories. In von Hippel's study, 72 per cent of user-developed 'major improvement innovations' were found to have been made by universities or research institutes, while private manufacturing firms were responsible for only 11 per cent.

Third, the technological trajectory of scientific instrument companies ('specialized suppliers') is primarily to improve the reliability and performance of their products and the strategic problems facing their R & D management are:

- i) matching technological opportunities with user needs
- ii) absorbing user experience and
- iii) finding stable or new product niches. In turn, innovations made by specialized suppliers represent a significant source of new technology for scale-intensive and information-intensive companies.

Recognizing the commercial prospects for novel scientific instrumentation

The 'development gap' between the invention of a working laboratory instrument by researchers and the production of a first-generation commercial prototype is perhaps the key barrier to innovation.

It is far from easy to transform a working laboratory prototype into a standard first-generation commercial instrument which can be manufactured and marketed successfully. In particular, the high costs of initial product development and testing are widely acknowledged to be a significant barrier to innovation, especially for smaller firms which account for a high proportion of scientific instruments companies (NS, 1987).

However, before this barrier is encountered it is first necessary for the innovating organization to recognize at a sufficiently early stage the prospects for commercial development of the instrument. Information about such opportunities may diffuse in many ways. It may occur, for example, when equipment suppliers become involved in building the experimental laboratory

prototype through being called upon to provide external technical assistance or specialized components. More usually, it will be diffused by the inventor-researchers through a wide variety of other mechanisms like informal scientific networks, publication, presentation of papers at symposia and visits.

Taken together, the signals from the inventor-research will often be such that an existing instrument supplier begins exploring the prospects for commercial production. This process could be greatly improved!

If the inventor-researchers are entrepreneurially-minded they may attempt to establish a spin-off company or other joint venture to develop and manufacture their instrument. The increasing economic importance of many areas of basic science, coupled with considerable cultural change among researchers, has led to a growth in such activities during the 1980s. The result has been the emergence of the 'science business', with academic institutions and government laboratories becoming more pro-active in identifying potential commercial markets for their novel ideas, techniques and instrumentation. Israel has, for example, achieved significant success with its policy of sharing technological royalties with research staff. In a study of 200 cases of commercialization of medical diagnostic imaging equipment, Mitchell (1990) has shown that the likelihood of technology transfer and licensing of proprietary know-how is much greater when academic institutions have established formal in-house patent and license offices.

DIFFERENT NEEDS: DIFFERENT OPPORTUNITIES

If you are going to form linkages researchers and industry it especially important to recognize the different types of companies which comprise the industry; they have different needs and offer different opportunities for commercialization.

Large Companies

The Australian scientific industry manufacturing and exporting scene is comprised of only few large companies with turnovers exceeding \$50-100 million per annum with world market ranking. The characteristics of these companies include:

- * profitable and viable in the long term with professional management
- * usually entered the market at the pioneering stage
- * have substantial distribution channels built-up over many years
- * are driven by developed management systems with a heavy emphasis on financial objectives.

- * are customer, and service driven rather than technology driven. Tend to stick to their focused market area.
- * Have access to substantial capital and in-house R&D
- * have few linkages with Public Sector Research Organizations but use government assistance schemes to the maximum.

They are 'A' grade corporate citizens providing substantial export earnings, diversity of employment and high standard training and experience eg. Varian Techtron, Telectronics, Scientific Glass Engineering, Ajax Chemicals.

These companies prefer to have their own research facilities. Even those that have been established originally on the results of public sector research invariably establish in-house research for product development. As companies grow they move from being technology driven to market driven and their major strength becomes their distribution and service network. They are then likely to lose their links with public sector research organizations except for specific contracted research into known problems having defined benefits if solved. They pursue better products - classic 'specialized supplier' technology path.

Large companies usually only seek innovation in their focused market area. (Note ICI FID GC) If an opportunity to take up a technological innovation arises if it is taken up it is only in a separate new company.

Growing companies: A number of companies in the industry could be described as being in transition to becoming large companies.

Scientific Glass Engineering (SGE), a manufacturer of specialist chromatography accessories, ICI Scientific Instrument Division (ICI), a manufacturer of high performance liquid chromatography systems, and GBC a manufacturer of spectrophotometers are typical. SGE AND ICI SID are growing steadily while GBC is growing at 40 per cent annually. ICI and GBC have yet to achieve international market ranking and are particularly vulnerable at this stage of their growth. The research resources to substantially assist these companies through generated product innovation exists in many laboratories in Australia. The companies acknowledge that major benefits would derive from a strategic alliance with a leading research laboratory provided that the PSRO research team was:

- dedicated to meeting the commercial objectives, and
- managed as if the research were in the industry sector.

However, there is almost no mechanism for aligning the research activities of public sector research organizations with a company's market needs in the national economic interest except via financial arrangements which the companies have obviously

found unacceptable to date. The opportunity for the nation to grow exports through product innovation requires only appropriate policy changes and management at a national level.

Small companies

The industry has a large number of companies plateaued at turnovers of around \$1-3 million with staff of 10-30. Generally they manufacture a narrow range of products which fit into niche international markets. Often innovations made by these specialized suppliers represent a significant source of new technology for 'scale intensive' and 'information intensive' companies.

Characteristics of these companies include:

- long term viability is anything but certain
- usually built around one person
- management is technically qualified with limited business training or experience
- plateaued because they are at the limit of the central person's financial reach, management reach - (he is the centralized decision maker), entrepreneurial reach-(he has no clear exit or growth strategy).
- technology or product driven
- management is generally highly technically qualified but with little business experience
- innovations sought but often cannot do anything with them when they are found due to lack of capital and general management overload.
- knowledge of government support schemes is inadequate and inclined to be under used.
- generally do not have time to attend to the wider considerations of the industry; badly need organized communication, a "voice", with government.

They represent a major opportunity to expand the industry by solving some relatively straightforward problems. Their problems relate mostly to management though the ailment is often portrayed as lack of capital. They need a new culture through new directors and better trained management. Many of them started with world class innovations, inadequate business skills and inadequate capital.

While the Management Investment Corporation assistance scheme (MIC) has invested many tens of millions in this type of company and continues to do so, it has barely impacted on their management problems. In many cases they have actually worsened the problem by encouraging the technologist whilst providing a financial safety

net, inappropriate directors and no real management input. The economic benefits from world class innovations have been lost or lessened in some companies.

Start-up companies and innovation

While the larger companies are showpieces of the industry and most important economically it has been start-up companies that take on the significant innovations. It is important to remember the origins of the large companies and their condition when they captured their original innovations.

- Varian Techtron (one of Australia's largest scientific instrument companies) can trace its origins to the one-man Techtron Company taking up a CSIRO innovation.
- Telectronics (heart pacemakers) ranked 3rd in the world in its field, started with the owner working from the back of a house in Sydney.
- An important part of ICI SID product range started out being custom built and sold from the inventor's house.
- Scientific Glass Engineering (an internationally significant scientific component company) commenced operations from the owner's house.

Whilst every possibility of working with large companies should be developed by the PSROs it should not ignore these lessons. Choosing a commercialization partner is one of the other critical decisions in the commercialization process.

Despite the extensive range of assistance available to new business we still have major problems finding capital and management. We need to become much better at starting and growing companies. We lose too much through delay and poor performance.

There is evidence of an interest in establishing linkages between the large established companies and start-up companies, especially where the technology is strategically interesting to the plans of these companies. Large companies can provide objectives and strategies for the pioneering investor. While many pioneers don't wish to be involved in a large operation, large companies readily admit they are not managers of start-up operations but become interested once the company moves into the \$3 to \$8 million turnover and is seeking a 3rd and serious level of re-financing.

Much has been learned in recent years about the role of government in promoting the commercial exploitation of advances in instrumentation made by universities and government laboratories. The Australian Government has developed numerous schemes to assist the generation and commercialization of innovation.

'Specialized suppliers' such as scientific instrument companies need different R&D/commercialization support mechanisms compared to 'science-based', 'scale-intensive' and 'information-intensive' related activities.

The 150 percent tax concession for R&D now in place in Australia does not, for example generally benefit start-up companies, while few highly specialized scientific instruments firms are likely to regard participation in collaborative generic technology programs as the best way to secure their longer-term future. Furthermore, although direct subsidies for certain types of R&D (like the 50 percent discretionary project support available to Australian companies under the Grants for Industrial Research and Development Program) may be of some value, they are generally insufficient focused on the key task of 'pulling through' instrumentation technology from the public to the private sector. The British NSF Small Business Innovation Research and British Link programs provide two different models of how government can support the crucial early phase in the transition from the working academic prototype stage to the development and manufacture of first-generation commercial instrument.

DEPARTMENT OF INDUSTRY AND COMMERCE

- * Tax concession for research and development
- * Management and Investment Companies
- * Venture Capital Offsets Scheme
- * Grants for Industrial Research and Development (GIRD)
- * Discretionary Grants for R&D projects
- * Generic Technology Grants
- * National Procurement Development Program
- * Teaching Company Scheme

OFFSETS

- * Australian Civil Offsets Program
 - Research and Development
 - Venture Capital Investment
 - Exports
 - Overseas Marketing
 - Joint or Collaborative Ventures
 - Purchases of Australian Made Products
- * Information Industry Strategy
- * The National Procurement Development Program
- * The Australian Electronic Development Centre
- * The Vendor Qualification Program
- * International and Regional Cooperation Initiatives

- * The Partnership for Development Program
- * Export Strategy for the Computer Software Industry
- * Scientific and Medical Equipment Industry Strategy
- * International Science and Technology Collaboration Program
- * Export Market Development Grants (EMDG) Scheme
- * International Business Development Scheme

DEPARTMENT OF DEFENSE

- * Defense Offsets Program

DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

- * Research and Development Corporations

SUGGESTIONS FOR IMPROVING COMMERCIALIZATION OF TECHNOLOGY

Government

The principal challenge for the future will be to establish a long-term structural policy for the scientific instruments sector which emphasizes both supply and demand factors.

- To establish clear National objectives, sales and responsibilities for industry government and research in this process. With matching long term structural policy for technological sectors of industry.

Introduce new mechanisms for financing R & D which bridge existing support programs for basic science and industrial technology. These can help set in place the mutually reinforcing structures of invention, innovation and exploitation.

Integration of research and industry

Open our public sector research organizations up to greater direct involvement with industry. Management must integrate the research activity with commercial objectives. There must be no confusion between contracted research and commercializing innovation when the researcher is pursuing short term funding goals.

Line scientists and line business managers must interact-commercially relevant research will result and is more likely to lead to technological innovation. The mix of skills involved in the innovation process needs to be broadened to include

technologists, engineers, inventors as well as production and marketing professionals, among others. Facilitate networking and diverse interaction - avoid isolation, concentration and formal liaison roles.

If we are presently producing too much science and insufficient innovation correct the skill mix and address the interaction requirement by transferring some of the current research funding to these purposes.

In Australia for each scientist we produced only 0.4 engineers; in the USA it is 1 to 1; Germany 2.5 to 1 and Japan 6 to 1.

The commercialization of technology process will need considerable direct and indirect encouragement by Government. We could easily hold a separate seminar on the pro's and con's of the many assistance schemes in use.

My own experience suggests three separate schemes:

- I aimed at assisting the research activity.
- I aimed at pre-competitive commercialization development including marketing considerations.
- I aimed at start-up and growth capital for small to medium sized companies.

In each scheme I would only contribute to a maximum of 50 per cent funding. In all cases I would be careful in choosing the recipients and demanding of performance.

Governments's main role is as facilitator; provide policy and leadership, information, networking and training.

CLOSING

I hope what I have had to say is helpful to you. I would like to acknowledge Dr Pier Abetti formerly of GEC and Dr John Irvine Science Policy Research Unit University of Sussex who's experience I have called upon.

Thank you for the invitation to speak to you today I enjoy personally and professionally networking with you. Thank you for the time you have given me.



MY9700840

RECENT DEVELOPMENT OF BIOTECHNOLOGY IN JAPAN

Prof. Hiroki Murakami

Graduate School of Genetic Resources Technology,
Kyushu University,
Fukuoka 812, JAPAN

ABSTRACT

In view of the situation where Japan has been increasingly expected to make a greater contribution to the international community through the supply of not only manufactured product but also of new technologies developed by herself, Ministries of International Trade and Industry; Agriculture, Forestry and Fishery; Health and Welfare; and Education have been coordinating varieties of biotechnology-related projects in co-operation with industries and academia.

Through the Japanese biotechnology projects, many Japanese companies have achieved functioning systems in biotechnology. These systems combine many relevant component technologies and human connections in order to efficiently convert a scientific findings into a business. For this reason, it is to say that large part of the biotechnological activities of Japan derive from company institutions. Since this has been sometimes criticized for crippling biotechnological advances in the country, both Government and industries start to support to enhance biotechnological research activities in universities.

INTRODUCTION

In view of the situation where Japan has been increasingly expected to make a greater contribution to the international community through the supply of not only manufactured product but also of new technologies developed by herself, Ministries of International Trade and Industry; Agriculture, Forestry, Fishery; Health and Welfare; and Education have been coordinating varieties of biotechnology-related projects in co-operation with industries and academia.

The Japanese government policy for science and technology aims at; promotion of economic progresses improvement of qualities of line and development of human potentials.

The policies are defined in the General Guide Line for Science and Technology, approved by the Cabinet in March 1986. The General Guide Line focuses on;

- * Promoting basic science and creative technology.
- * Promoting international scientific and technological cooperation.

- * Coordinating scientific and technological efforts in accordance with the needs of society.

The Japanese government recognizes that promoting basic research is the key to advances in science and technology. Towards this end, the ministries and agencies of the government promote basic research that meets their own requirements.

Table 1 describes the major programs to promote basic research. These include such biotechnology programs as the Exploratory Research for Advanced Technology (ERATO), the Human Frontier Science Program (HFSP), and "Jsedai", the Japanese alias for the research and development project on basic technologies for future industries.

The Council of Science and Technology (CST), chaired by the prime minister coordinates science and technology R&D policy for Japan through subcommittees drawn from major industries, universities, research organizations the media and government organizations.

The prime minister initiates Council activities by presenting the CST an inquiry on a specific topic, The topic is then studied by appropriate subcommittee. Finally, the CST submits recommendations of the subcommittee to the prime minister.

There are three Inquires corresponding Recommendations regarding life sciences;

- * The recommendation concerning Inquiry No. 5 (1971), explores the importance of promoting research in the life sciences.
- * The recommendation concerning Inquiry No. 10 (1984), lays out basic plans for guiding basic research and development in the life sciences.
- * The recommendation concerning Inquiry No. 16 (1989), seeks to promote research in the life sciences with special emphasis on the development, maintenance and supply of research animal and materials and preserving genetic resources.

Each Japanese government ministry or agency responsible for promoting its own science and technology program. Some programs are conducted at independent research facilities under the direct control of the ministry or agency. Other programs are carried out at national universities and international institutes.

The Ministry of Education, for example, administers academic research programs. The Ministry of International Trade and Industry conducts research to improve social welfare. And the Ministry of Agriculture, Forestry and Fisheries does research on the nation's agriculture, forestry and fishery resources.

The ministries and agencies formulate appropriate policy and research programs and provide funding corresponding with the recommendation of the CST.

The Science and Technology Agency is responsible for ensuring that all government-sponsored science and technology promotions are conducted efficiently. The Agency also endeavors to ensure that the goals in research program are in basic accord with the national development.

In FY 1989, national science and technology expenditures total 1.8 trillion yen (about US\$13.5 billion) up to 5.8% from the preceding year and exceeding the 3.2% increase posted in FY 1988. Eighty percent of financing for research and development in Japan comes from the private sector compared with 52.6% in the USA, 61.8% in Germany, 52.2% in UK and 41.8% in France. While government funding is modest, is very effective in stimulating private sector research funding. In effect, national government projects serve as a trigger to promote research in specific private fields. For example, when the Research Association was established for the "Jisedai" project ten years ago, a number of companies launched biotechnology research in their laboratory and now over 800 companies in Japan have biotechnology research projects.

1. National Project

In 1971, the Council for Science and Technology (CST) submitted its recommendation to promote life science research in response to Inquiry No. 5.

In 1980, The Council issued a report entitled "Opinions on Life Science Promotion" which identified important research objectives.

In 1984, responding to Inquiry No. 10, the Council Identified important areas and objectives for directing basic research and development in the life sciences.

In 1989, responding to Inquiry No.16, the council made recommendations on development, storage and supply procedures for animals and materials required in research. It also made recommendations for preserving genetic resources.

Council recommendations initiate life sciences research and development promotion activities. All national research project rely on these recommendations. Private companies in turn, base their research programs on the national projects. This has been especially true in the case of practical applications of biotechnology.

A brief description of a few of many life sciences projects of government organizations is printed in Table 2 which also identifies their administrative organizations.

2. Practical Management and Funding of National Projects in MITI and the Ministry of Agriculture, Forestry and Fisheries

Each ministry has its own specialized administrative and funding organizations. The organizations in MITI and the Ministry of Agriculture, Forestry and Fisheries are described below:

MITI

The Agency of Industrial Science and Technology oversees research in all 16 MITI institutes. MITI also has two non-profit research organizations; the Japan Key Technology Center and the New Energy and Industrial Technology Development Organization. The Key Technology Center is a funding organization and supports several research institutes such as the Protein Engineering Research Institute, and the Plant Cell Culture Technology Institute.

The New Energy and Industrial Technology Development Organization undertakes or promotes national research projects through research organizations. The research association for biotechnology for example, has been conducting three biotechnology programs for ten years. This association is similar to The Korean Genetic Engineering Research Association. The Japan Bioindustry Association is an independent industrial organization that promotes bioindustries.

The Ministry of Agriculture, Forestry and Fisheries

The Ministry's Agriculture, Forestry and Fisheries Research Council manages all ministry research projects. The bio-Oriented Technology Research Advancement Institute funds such research institutions as the Research Institute for Functional Peptides which examines functional peptide production in cell cultures or animal secretions.

The Ministry also promotes research associations. Ten associations have been established by the ministry including the Research and Development Association for Membrane Technology in the Food Industry (1982-1988) and the Japanese Research and development Association for Bioreactor System in the Food Industry (1984-1991).

3. Organizations Undertaking National Research Projects

There are many organizations that have been established to undertake research for national projects (Table 2). However, the following cases should suffice as an illustration;

The Research Association for Biotechnology

In 1981, MITI initiated a research program called the Research and Development project of Basic Technologies for Future Industries, known by its Japanese alias "Jisedai". Biotechnology was one field identified by MITI as a basic technology of the future. Within the Jisedai project, fourteen major chemical, food processing and pharmaceutical companies organized the Research Association for Biotechnology to do contract research with three national institutes.

In 1961, MITI promulgated the Association Law and the Industrial Research Association for Polymer was the first association established under the new law. Since then, MITI has established 42 research association projects and initiated 52 more projects involving several hundred companies mainly from the manufacturing or processing industries. Objective range from material research and automotive manufacturing to microelectronics and biotechnology.

Over the past 30 years, this promotion system has been a major factor in the commercialization of modern technologies in Japan. There were 114 associations established during the period.

Under the Jisedai Project, the Research Association for Biotechnology established three longterm research project. The bioreactor project was an eight-year undertaking while the animal cell culture and recombinant DNA projects lasted for nine and ten years, respectively.

The Research Association for Biotechnology and Jisedai Project had an enormous impact on the promotion of biotechnology in Japan and after 1981 many companies from various files such as chemical, food processing, pharmaceutical, construction, iron and steel and others began biotechnology research. Currently there are over 800 companies involved in biotechnology. These initiatives also stimulate other ministries to start biotechnology research, for example, the Research Association for Membrane Technology in Food Industries was established in 1982, one year after the Research Association for Biotechnology started. This was the first Research Association established in biotechnology as a project of Ministry of Agriculture, Forestry and Fisheries.

Generally, when a Research Association completes contract research, it is decommissioned. However the Research Association for Biotechnology continues to undertake new research tasks such as Molecular Assemblies for a Functional Protein System and Production and Utilization of Complex Carbohydrates. One more topic is expected to be taken up shortly.

Marine Biotechnology Institute

The Marine Biotechnology institute was established in 1988 by 24 companies including an amino acid producer Kyowa Hakko Kogyo, Nippon Steel Corp., Shizu Corp. and Kirin Breweries. MITI's large-scale Industrial Technology Research and development program awards contracts to the Marine biotechnology Institute to perform research. The institute is managed as a private company with 30% of its budget provided by the 24 sponsoring companies and 70% by the New Energy and Industrial Technology Development Organization.

The institute's contract with the new Energy and Industrial Technology development Organization began in 1989. The institute concentrates on basic and applied research on the utilization of marine organisms. A part of its basic research studies is to sample, culture and preserve a large number of heretofore unknown species of marine organisms, microalgae and other organisms. Basic research also studies applications of biotechnology to marine organisms such as cell fusion and gene manipulation. The institute also develops data processing systems and research equipment. Some examples of applied research are searching for efficient carbon dioxide-fixing microalgae and photosynthetic bacteria that can serve as an antidote to the green house effect. Applied researchers then develop ways to use such materials. The institute is particularly concerned with the effect of oil spills on ocean ecology. Under natural conditions, microorganisms degrade oil very slowly if at all. Another subject of concern are the marine organisms that attach to ships and oceanic structures. Such fouling reduces the speed of ships and shortens the life of structures.

The Marine Biotechnology Institute operates one laboratory in Kamaishi and another in Shimizu. It also operates one research vessel. The ship is full equipped with research instrumentation and exploration facilities such as observation decks and underwater exploration facilities. The final goal of the Marine Biotechnology Institute is to make more use of marine organisms in industry.

Protein Engineering Research Institute

The Institute was founded by 14 companies in 1986 as a private organization to undertake decade-long research projects. This institute has a staff of 70 including 60 researchers and ten secretaries. The Japan Key Technology centre provides 70% of the institute budget of 17 billion yen (about US\$130 million) with the rest provided by the founding companies. The Institute has two Research projects, one on Structural stability and another on Artificial Proteins.

Plant Cell Culture Technology Institute

The Institute was established by Kyowa Iyakko, Mitsui Petroleum, Mitsui Toatsu, Hitachi, Suntory, Tonen, and Kirin to undertake plant biotechnology research. Research period is six years and two months. The total funding for the institute amounts to 2.8 billion yen (about US\$22 million). The Japan Key Technology Center provides 70% of the budget and the participating companies provide 30%. Practical research is carried out in the companies' own laboratories.

The primary focus of research is to develop production technologies for useful substances using plant cells. Secondary efforts seek to establish viable new plant cell lines. In addition, the institute develops mass production techniques for plant cell cultures as well as extraction, separation and refining methods for target substances.

Research Institute for Functional Peptides

The Institute was established in 1990 for the purpose of contract research with the Ministry of Agriculture, Forestry and Fisheries. Also managed as a private corporation, the institute is funded by the Bio-Oriented Technology Research Advancement Institute and Livestock Improvement Organization as well as by ten regional companies including Tohoku Electric, the Yamagata Bank and Yamagata Shimbun, a newspaper company.

The focus of research is to establish a complete embryo transfer system, such as in vitro maturation for domestic animals, including fertilization and subsequent development in a serum-free medium. This medium contains biologically active substances some of which are synthesized and some secreted from reproductive organs (ovary and oviduct).

4. Private Sector Biotechnology Research Institutions

The number of private Japanese research devoted to biotechnology is too large to cover in the space allotted. Generally biotechnology companies have their own institutes of which facilities and researchers are highly qualified. Their budgets for biotechnological research amount to around 5% of their total incomes. The followings are some examples:

Mitsubishi Kasei Institute of Life Sciences

At the time of the establishment of the institute by Mitsubishi Kasei Corporation in 1971, the term "life science" was not commonly used in Japan. Two years later, Dr Cohen of Stanford

University reported the first successful genetic recombinant studies. This institute played a major pioneering role in ushering in the biotechnology boom that seized the Japanese business world.

The institute has about 70 permanent researchers and 30 postdoctoral fellows. Although postdoctoral fellowships are unusual in Japan, the first president, Dr Egami, had the foresight to introduce them when the institute was founded. Now, the institute has a total staff of 190, including research assistants and administrative staff.

In its 20-year history, the institute has had many successes one of which is placing scholars and researchers in many universities and institutes. Dr Egami collected a wide range of information on life phenomena. The institute continues to view life science as an integrated science of man that explain life and make its results available for the well-being of mankind. The institute has undertaken various research programs such as biomolecular science, developmental biology, neuroscience and natural environmental research. Now, under the direction of the third president, Dr Imabori, research programs focus on immunology, neuro-science and understanding the problem of aging.

Although Mitsubishi Kasei provides research funds to the Institute, it does not advise on how the research is to be done. Another interesting feature of the institute is that outside researchers, businessmen and the public have access to it. In fact, more than one thousand domestic and international visitors tour the institute every year.

Mitsui Plant Biotechnology Research Institute

The institute was established in 1989 by 21 companies. In the Mitsui group including Mitsui Toatsu Chemical, Mitsui Petrochemical Industries, Oji Seishi, Dai-Ichi Engei Plantech and the Mitsui Taiyo Kobe Bank. The laboratory is situated in Tsukuba and has a staff of 16 researchers and four secretaries.

Research focuses on screening and identifying useful plant genes and regulator genes. Examples of targeted genes are pyricularia-resistant genes, storage-protein related genes, lignin biosynthesis genes and rice starch synthetic genes.

Osaka Bioscience Institute

The institute was established in 1987 by the City of Osaka on the occasion of its centennial. It is supported by the City of Osaka and local industrial and academic organizations and seeks to become a major international participant in bioscience research. It has 38 staffs including a president, 4 directors, 11 senior researchers and researcher, 10 assistants and 12 special researchers.

The primary objectives of the institute are basic research in molecular biology, enzymes and metabolism, neuroscience, cell biology and other fields in the general domain of the biosciences, and to make a positive contribution to the advancement of science by training and developing researchers of merits and promise.

The achieve these objectives, specific activities cover the following four general areas:

1. Advancing basic research more efficiently by combining efforts in related research areas.
2. Introducing a postdoctoral research system to help develop young researchers and accepting graduate research students from industry and academia.
3. Inviting researchers from overseas and promoting research and exchange activities with major foreign research institutes.
4. Sponsoring lectures and symposia to improve the exchange of research personnel and information on an international scale. Through interdisciplinary and innovative research, the institute seeks to develop the seeds of a new technological revolution in the 21st century.

5. Industrial Biotechnology Organizations in the World

There are over ten such organizations in the world. The names of these organizations are listed in Table 3, Cooperation among these organizations should be promoted in order to rationalized international regulations, intellectual property rights and environmental issues. In Japan, Japan Bioindustry Association (JBA) is already making such cooperative efforts. The JBA stresses the importance of international activities. The reason for this special concern is that when companies commercialize this new; technology, they face such issues as safety, intellectual property rights and technology exchange. These are transnational issues that have significant impact on many other countries, resolving bioindustrial issues requires close international cooperation and coordination, a task that is best performed by industry associations rather than through bilateral or multi-lateral government negotiations. Industry associations around the world are equipped with the expertise and under standing of issues to resolve them fairly efficiently.

Through the Japanese biotechnology projects, many Japanese companies have achieved functioning systems in biotechnology. These systems combine many relevant component technologies and human connections in order to efficiently convert a scientific findings into a business. For this reason, it is to say that large parts of the biotechnological activities of Japan derive from company institutions. Since this has been sometimes criticized for

crippling biotechnological advances in the country, both Government and industries start to support to enhance biotechnological research activities in universities.

Table 1. Major Basic Research Promotional and Their Budgets

Ministry or agency	Program and measures	Year established (FY)	Budget (unit Y100 million)	
			1984	1989
Science and Technology Agency	○ Special Coordination Funds for Promoting Science and Technology . Encouragement of Basic Research . Basic Research Core System . Science and Technology Special Research Program	1981	63	101
		1985	-	14
		1988	-	8
	○ Exploratory Research for Advanced Technology (ERATO) ○ Frontier Research Science Program ○ Human Frontier Science Program (HFSP) ○ Basic Science Special Research Program	1990	-	2
		1981	23	46
		1986	-	17
		1989	-	15
		1989	-	1
Ministry of Education	○ Grant-in-aid for Science Research ○ Special Researchers Program	1965	405	526
		1985	-	19
Ministry of Health and Welfare	○ Grant-in-aid for Welfare Science Research	1979	22	55
Ministry of International Trade and Industry	○ Next-generation Fundamental Industrial Technology Research and Development Program ○ Human Frontier Science Program (HFSP)	1981	60	68
		1989	-	9

Ministry or agency	Program and measures	Year established (FY)	Budget (unit Y100 million)	
			1984	1989
Ministry of Agriculture, Forestry and Fisheries	o Advanced Biotechnology Research and Development Program	1984	5	8
Ministry of Posts and Telecommunication	o Research on the Frontier of Telecommunications Program	1988	-	2
Various ministries and agencies	o Working Expenditures of National Research Institutions		339	345

Table 2. Life Science-Related Research Tasks Being Promoted by Research Institutes under Ministries and Agencies Undertaken in FY 1989.

Ministry or agency	Research institute or program	Project
	<ul style="list-style-type: none"> . Special Coordination Funds for Promoting Science and Technology 	<ul style="list-style-type: none"> . Research on the development of basic technology to elucidate the immune system . Research on the development of common basic technology to support oncological studies . Research on the development of embryological engineering technology . Research on the development of high-sensitivity and high-resolution non-destructive techniques to elucidate the biological functions of living systems at the molecular level

Continue.....

Ministry or agency	Research institute or program	Project
Science and Technology Agency		<ul style="list-style-type: none"> . Fundamental research on safety in operation of recombinant DNA technology in field test
	<ul style="list-style-type: none"> . Institute of Physical and Chemical Research 	<ul style="list-style-type: none"> . Special research on biological functions of living organisms, including a study on their genetic composition . Research into biological homeostasis as part of the international frontier study system and research into the mechanism of thinking . Promotion of recombinant DNA experimentation . Gene bank projects
	<ul style="list-style-type: none"> . Research Development Corporation of Japan 	<ul style="list-style-type: none"> . Biophotons, Morphogenes, Plant Ecochemicals, and genome sphere . Commissioned project to develop techniques for the production of specific antibodies using the immune system of fowl
	<ul style="list-style-type: none"> . National Institute of Radiological Sciences 	<ul style="list-style-type: none"> . Research into the treatment of cancers using heavy particle beams
	<ul style="list-style-type: none"> . Japan Atomic Energy Research Institute 	<ul style="list-style-type: none"> . Research into the utilization of radioactivity for biotechnology
Environment Agency	<ul style="list-style-type: none"> . National Institute for Environmental Studies 	<ul style="list-style-type: none"> . Research into the atmospheric environment using the biotechnological development of plants used as Indicators

Continue....

Ministry or agency	Research institute or program	Project
Ministry of Finance	<ul style="list-style-type: none"> . Research Institute of Brewing 	<ul style="list-style-type: none"> . Research into biotechnology and mechatronics for the advancement of brewing technology, and for the development of new products
Ministry of Agriculture, Forestry and Fisheries	<ul style="list-style-type: none"> . National Institute of Agrobiological Resources . National Institute of Agro-Environmental Sciences . National Institute of Animal Industry . National Grassland Research Institute . Fruit Tree Research Station . National Research Institute of Vegetables, Ornamental Plants and Tea . National Institute of Sericultural and Entomological Science . National Institute of Animal Health . National Foods Research Institute . Forestry and Forest Products Research Institute . Regional Fisheries Research Laboratories 	<ul style="list-style-type: none"> . General research in biotechnological plant breeding . Research to elucidate the dynamics of the rhizosphere environment and develop control techniques . General research to develop technologies to efficiently utilize biotechnological sources (the Biomass Transformation Project) . Preparation of a generalized system for the control and utilization of agricultural, forestry and fishery gene sources and genetic breeding information . General research to develop new agricultural, forestry and fishery techniques through the clarification and control biological information . General research to elucidate the ecological order in the agricultural, Forestry and fishery systems and development optimal control . Research to elucidate the arrangement of plant DNA base
	<ul style="list-style-type: none"> . Mechanical Engineering Laboratory 	<ul style="list-style-type: none"> . Research to elucidate the three-dimensional structure of the body and its clinical applications

Continue....

Ministry or agency	Research institute or program	Project
Ministry of International Trade and Industry	. National Chemical Laboratory for industry	. Research into the production, isolation and concentration of lipid hybrids
	. Government Industrial Research Institute, Osaka	. Research into the bioelement detection system
	. Government Industrial Research Institute, Nagoya	. Research into the composite bioceramics with high bioaffinity
	. Fermentation Research Institute	. Research to develop and utilize biological function through genetic recombination . Research into synthesized location-selective bio-reactors
	. Research Institute for Polymers and Textiles	. Research into the synthesis of polymers for application specific pharmacopeia
	. Electro Technical Laboratory	. Research into bioformation architectures
	. Industrial Products Research Institute	. Research into the ergonomic engineering of visual display devices
Ministry of Construction	. Public Works Research Institute . Building Research Institute	. Development of a new biotechnological sewerage system
Ministry of Post and Telecommunications	. Communications Research Laboratory	. R&D of highly efficient coding techniques by the use of brain function model

Continue.....

Ministry or agency	Research institute or program	Project
Ministry of Education	. National universities (through provision of grant-in-aid for scientific research and other funding)	. Overview of special studies on cancers . Complete feature of the <i>E. coli</i> genome . General basic research on AIDS . Molecular cytobiological research into the mechanism of aging in the brain . Molecular cytobiological research into the mechanism of reproduction in higher plants
	. Institute of Population Problems	. Research into the development and application of family type models
	. National Institute of Health	. Research to determine the pathogenesis during perinatal and growth periods using primates and small experimental animals . Research into the body's local defense mechanisms against microorganism and toxins produced by microorganisms
Ministry of Health and Welfare	. Institute of Public Health	. Public health study on allergy-caused respiratory diseases
	. National Institute of Health Nutrition	. Research into the constitutional factors for non-cardiovascular system nutritional metabolic disorders
	. National Institute of Leprosy Research	. Research into the pathogenesis and treatment of leprosy using experimental animals
	. National Institute of Hygienic Sciences	. Research to evaluate significance of indicators for biological reactions

Table 3. Industrial Organizations for Biotechnology in the World

Australia (New Zealand)

ABA (Australian Biotechnology Association)

Belgium

B.B.A. (The Belgian Bioindustries Association)

Brazil

ABRABI (Associacao Brasileira das Empresas de Biotechnologia)

Canada

IBAC (Industrial Biotechnology Association of Canada)

France

ADEBIO (Association pour le Developpement de la Bio-Industrie)
ORGANIBIO (Organisation Nationale Interprofessionnelle des Bioindustries)

Germany

DECHEMA (Deutsche Gesellschaft für Chemisches Apparatuswesen
Biotechnologie Dept)

Japan

JBA (Japan Bioindustry Association)

Korea

BAK (Bioindustry Association of Korea)

Netherlands

NIABA (Netherlands Industrial and Agricultural Association)

Republic of China

BIDEA (Bioindustry Association)

United Kingdom

BIA (Bioindustry Association)

USA

ABC (Association of Biotechnology Companies)
ASB (American Society for Biotechnology)
IBA (Industrial Biotechnology Association)
IFBC (International Food Biotechnology Council)

PART II

SEMINAR: MEDICINE



HEALTH RISKS IN THE TWENTY-FIRST CENTURY

Dato' Dr Abu Bakar Sulaiman
Director General of Health
Malaysia

ABSTRACT

As in all technical disciplines, medicine is continuously subject to change since the variables within which health and disease exist are continuously changing. Through time, medicine has evolved into a science within the social system, and therefore has social goals. These goals are encompassed in the global pledge of "Health For All", which was made in the recognition that there is a need to narrow and ultimately close the gap between communities and countries in their access and opportunity for health care.

From health and health-related indicators, it is evident that Malaysia has reached a standard of health that is one of the best among countries in the region, and this is the result of excellent health infrastructure, social commitment and political will towards health matters, which have contributed to equity of access to health and medical care.

As a result of socio-economic improvement, disease trends in Malaysia have clearly shown a changing pattern. Socio-economic improvement have resulted in two inevitable consequences, namely demographic change which leads to population aging, and changing lifestyle of the population, both of which have led to the emergence of the chronic degenerative diseases and lifestyle-related diseases. Therefore, a major risk in the twenty-first century will be the increasing trend of these diseases.

This however, does not mean that the more acute infectious diseases will cease to be a risk. Of particular concern of the coming years is the threat from AIDS which is a global epidemic of considerable proportions. In fact, the threat of viral diseases in general have been shown to be on the rise for the past few years, and it is likely that they will continue to pose a major health problem in the future, unless science can achieve a major breakthrough in the vaccine development and anti-viral therapy.

With the obligations and commitments of various sectors to meet the objectives and challenges of WAWASAN 2020, there will inevitably be major changes in all sectors in the future. With greater focus and emphasis on industrialization and development of more high-technology industry, there will be health and health-related issues particularly in respect of environmental pollution, health and safety of workers. Besides the potential hazards from a newer range of chemicals that will be introduced to the workplace, the worker of the future will also be exposed to greater physical, ergonomic, biological and psychosocial occupational hazard.

Potential implications on the environment and health risks of workers will also ensue from development in the agriculture sector, which has to further grow in order to support the bigger population. In the food industry, the bigger population and changing lifestyle will also necessitate the development of newer technologies in the food production and food processing, with obvious implications on health risks.

Increase travel and greater ease of communication will expose the nation to the introduction of newer and exotic disease-causing agents and lifestyle.

In recognizing the role of other sectors in the health status of the population, it became imperative that health be viewed as an open system, one "without walls" in which inter-sectoral collaboration has to be a main feature. This open system concept can also be extended to be the fact that health is a continuum, in which there is no clear separation between health promotion, disease prevention, treatment and rehabilitation. This implies that individuals and communities have a responsibility for the maintenance of their own health.

Health risks to a large extent depends on several variables within the health care system itself. The concepts of teamwork, responsibility of the health care provider towards the service contract with the patient, and the maintenance of professional standards determine the level of health risks that a patient is exposed to.

In predicting the health risks in the next century, it is also relevant to consider the implications of the current trends in health care costs, and the related issues of health financing, cost effectiveness, cost containment and cost-sharing. Together with this trend will be the need to look critically into the increasing demand for high-technology and high-cost medical-care, and the growth of private health-care, which is growing at an unprecedented rate. Risks arising from these issues relate to the danger of the creation of an uncontrolled, unaudited and unsupervised private health-care, which in turn will introduce the threat of inequity of access to quality care. If these risks are not controlled, there is the danger of health care evolving into an "industry" and health being viewed as a commodity that can be purchased and commercialized, rather than a caring profession which provides health for all.

Finally, to support the health needs of the 21st century, two other important aspects need to be looked into; science and technology in the medical and health sector, and medical education. Technological advancement has left its impact in disease detection and diagnosis, disease prevention, therapeutics and rehabilitative medicine; and the future will see more of these advancements. In this regard, it is extremely important that these advancements should not be subservient to the human elements such as clinical acumen, empathy with the patients and the power of the healing hands - all of these have diagnostic, prognostic and therapeutic values. Medical and para-medical

education to support the increased manpower demands, both qualitatively and quantitatively, need to be planned right from now. In addition, with medicine and health being dependent on several variables which are in the state of continuous change, the need for continuing medical education cannot be overemphasized.

INTRODUCTION

One of the truest of statements often quoted is "CHANGE IS INEVITABLE". However, just as this is an easy point to make, it is also one that is hard to come to terms to. Despite this, the changes made in the field of medicine and health care, whether inevitable or designed, have made the health of individuals and of communities what it is today.

The story of the evolution of medicine can never be adequately told; it is a long story encompassing man through different ages, various cultures and phases of civilization. Medicine began mainly as an art with little science, but has gradually evolved over the centuries, and is now mainly a science which has, fortunately, retained some of its art. This art and science of medicine today exists within the social system having social goals. This social concept culminated not too long ago, in 1978, in the global pledge of "HEALTH FOR ALL BY THE YEAR 2000", which was made in the recognition of the need to narrow and ultimately close the gap in health status between the rich and the poor within countries, as well as among different countries.

CURRENT HEALTH STATUS OF MALAYSIANS

Malaysia is proud to have the recognition of other countries that its health care system is one of the best among developing nations in terms of equity of access to any form of health care, and the quality of care provided. This success is reflected in the various indicators of health. Our infant mortality rate of only 13 per 1000 births and maternal mortality of less than 0.5 per 1000 are evidences of this success. Service coverages range from satisfactory to excellent; for example, coverage rates for immunization against specific diseases of childhood are at levels above programme targets which are generally higher than the international targets set by WHO or UNICEF. Indicators on impact of services also show satisfactory trends, as seen in the dramatic decline of several diseases such as poliomyelitis, yaws and malaria, and the more gradual decline of diseases such as cholera and typhoid.

The number of service facilities, be they hospitals, clinics or health centres, and the range and quality of services provided by these facilities reflect the government's commitment to ensure equity of access to medical and health services. Since the time of independence, the Ministry of Health has been concerned with the

need to provide equitable distribution of health services to both urban and rural populations. To this effect, the Ministry has developed the Rural Health Services which now covers a vast majority of areas in the country. The doctor:population ratio has been steadily improving, but in certain areas, this ratio is behind the national target of one doctor to 2000 population. However, the Ministry of Health is continuously trying to improve this situation by posting more doctors to hospitals and health centres in the less served areas.

In terms of specialist care, patients in this country can avail of any of the medical speciality and subspeciality to treat their illness. Of course, concurrent with this quality of services is the cost implications, and it is now becoming common knowledge that the rising health care costs in this country will one day necessitate the government to study and consider alternative health care systems and health care financing models.

In essence, therefore, to reach the aspiration of the "Health For All" strategy, Malaysia has the right combination of health infrastructure, social commitment and political will.

Once the current objectives of Health For All is attained in the year 2000, there will inevitably be newer health challenges and risks, because, as I have said earlier, change is inevitable, and changes in any sector will introduce newer or additional health risks and health care needs.

CHANGING PATTERNS OF DISEASE

We are already seeing a transition of disease pattern, which is gradually moving away from the infectious diseases, such as cholera and typhoid that once were the main focus of the field of public health to modern diseases such as cancer, hypertension and heart diseases. These diseases of affluence and lifestyle are today the main focus of public health whose scope goes beyond matters of sanitation to encompass various other aspects of preventive and community medicine. As we know, these diseases are on the rise as a result of two major changes; firstly as a direct consequence of increase in life expectancy with the resulting aging of the population, and secondly as a result of lifestyle that is leaning more and more towards an unhealthy "rich" diet, smoking, sedentarism and stress.

It therefore becomes immediately obvious that a major risk in the twenty-first century will be the increased occurrence of these types of chronic degenerative diseases and those related to lifestyle. The challenge therefore will be the management of these diseases from the promotive, preventive, curative and rehabilitative aspects.

While on the subject of disease pattern, it is also very pertinent for us to critically and seriously view a special lifestyle disease, and prepare ourselves to face the ever increasing challenge they pose us today, i.e. AIDS for which death

is a certainty. Tracing the course of the global epidemic of AIDS from its beginning to the present time, there is every reason to believe that the risks of AIDS transmission in the coming decades is going to be higher, unless it is abated with effective strategies involving all Ministries, agencies, communities, families and individuals. Given the current limitation in which there is no vaccine to prevent AIDS and no drug to treat it, the only effective strategy is to create awareness and to motivate the public to change their lifestyles that put them at higher risk to AIDS. The prevention and control of AIDS is not purely a medical problem because it has social, legal, cultural, religious and economic implications. Unless there is commitment and participation of the whole community, the battle against AIDS is going to be an uphill one which could lead to a national disaster that would affect not only the current generation, but also generations to come.

As a matter of fact, among the infectious diseases, the major threat in the next century will be diseases caused by the viruses, especially those for which vaccines cannot be developed. While bacterial and parasitic diseases are generally being controlled, diseases caused by known viruses and the emergence of new viruses have been a continuing medical problem. Although medical science is rightfully proud of the victory won against smallpox and the promising outlook for the eradication of poliomyelitis, there are newer challenges from other viruses. Several phenomena make the risks of viral diseases especially significant; these include easier spread through travel, ability of viruses to mutate and constantly change, the role of viruses in carcinogenesis, and the dismal prospect of obtaining an antiviral drug that is truly effective, safe and economically viable.

CHANGES IN OTHER SECTORS

Demographic changes especially population aging not only result in the increasing trend of degenerative diseases such as cancer and heart disease. The elderly will require special medical and health care, including the management of these types of disease, their nutritional needs, dental care, eye care and prevention of accidents that are prone to occur among this group of people. Besides, not only will we need to cater for the special medical, health and dental services for the elderly, there is also a need to look into other related areas, such as design of homes, hospitals and commercial and recreational facilities, to allow their day to day activities with as little health risks as possible.

With increasing industrialization and urbanization, there is a gradual erosion of the tradition of the extended family, and today it is not uncommon to see old people living apart from, and independent of, the younger family members. This has a negative effect on family health and development; the elderly who, with or

without their choice, are staying on their own will be deprived of the traditional family support to allay their suffering and loneliness in old age, while the younger couples in the modern nuclear family have to cope with full-time jobs and the responsibility of the upbringing of their children. The extended family provides the solution to both these dilemma, in that the elderly can be cared for, while the young children, who would otherwise be left to the care of child-minders who have no emotional attachment with them and have different values, will now have grandparents who not only care for them, but also facilitate their socialization process and inculcate positive traditional values into them.

With the breakdown of the extended family and easy access of the young to a wide variety of foreign media and foreign values, adolescents are exposed to a host of social, mental and psychological risks. There is already evidence that the use of tobacco, alcohol and drugs, and the problems of sexually transmitted diseases among youngsters and teenage pregnancies, are occurring and posing as problems to the community.

To avoid the two scenarios above the government's response of launching the "Caring Society" is most appropriate and should be fully explored and incorporated into the philosophy of various professions, corporate cultures of organizations and value systems of the community.

Besides risks related to the expected demographic changes, health risks in the twenty first century are to a certain extent also predictable based on the expected changes that will occur in the other sectors. This is especially so with the obligation of all sectors to formulate policies, strategies and programmes to meet the objectives of VISION 2020.

Implications on health will arise from more industrialization, in particular in terms of potential for pollution of the environment and health and safety of workers. In the next century, a new range of chemicals and technologies will be introduced to the workplace. Besides the chemical hazards, the worker of the future will also be exposed to greater physical, ergonomic, biological and psychosocial occupational hazards. Industrialization also has the potential of giving rise to negative effects in terms stress and mental health.

The larger population will necessitate more food production, and the consequent growth of the agricultural sector will be accompanied by the need for newer technologies to improve crop production, such as use of pesticides, with health implications on both agricultural workers as well as consumers.

In the food industry, changing lifestyle that encourages the consumption of convenience foods has already seen the development of newer technologies of food processing, preservation and packaging. The potential health hazards of these are well-known; they may be immediate or they may occur after several years of chronic exposure. In the coming years, it is highly likely that these developments in the food industry will be even more

intensified, and the health sector must continuously keep abreast of the developments to protect the population from potential health hazards.

Travel and communications will shorten distances among communities and nations. As a direct consequence, disease causing agents will find it easier to enter other countries, and to minimize this threat, the current surveillance on the importation of foreign pathogens will need to be maintained or strengthened.

Due to ease of international travel and the exposure of the local population to foreign mass media distributed either locally or via satellite direct to the homes, the local people will find it easier to adopt the values and mores of other cultures, and this too can have impact on disease occurrence, or at least on the risk factors leading to or associated with certain diseases.

HEALTH IS A "SYSTEM WITHOUT WALLS"

At this point, with the recognition of the roles of the other sectors, it is imperative that we acknowledge a simple and apparent truth, that health is not a closed system. Health of the individual, community and indeed the nation, is not dependent on the health care system alone, but also equally, if not more, on the sectors that operate outside the health system. In other words, it is important for us to view health as a "system without walls" in the quest for the attainment of health which is "the state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity". The roles and functions of all sectors have been identified, and there is a need for these sectors to develop policies, strategies and programmes which are "pro-health" so that diseases can be prevented and a state of positive health maintained.

Besides inter-sectoral collaboration, this concept of health care as an open system can be extended to two other aspects as well. Firstly, it is applicable to the view of health and disease being a continuum, that is there is no separation between promotion, prevention, treatment and rehabilitation. Secondly, and against this background, it becomes imperative that individuals, families, organizations and communities realize and accept their roles and responsibilities in the maintenance of positive health, and not to entirely depend on the health care system.

THE HEALTH CARE SYSTEM

Within the health care system itself, the concept of linkage and collaboration takes the form of teamwork. Effective teamwork among health care providers within this system is an important factor in reducing risks in the patient, whether this "patient" is an individual, a family or a community. Besides the better-known medical personnel who are often called upon to directly manage a

patient, usually in the clinical setting, there are other team members who are in the background of the scene, and these include engineers, dieticians, social health workers, technologists and technicians in various fields, and a host of other health-related staff. Even less direct and further in the background, but of no less importance is the involvement of other professions, including educationists, economists, personnel and financial managers and other related professions.

One group of health workers in the team that has made a major contribution in reducing health risks of individuals and communities especially in prevention and control of infectious diseases are the doctors specialized in the field of public health. Public health has succeeded in the control of many life-threatening epidemics such as cholera, plague, malaria, food borne diseases and immunisable diseases. With the changing environment, whether physical, occupational, mental, social, or economic, the role of public health and community medicine in the future to reduce the health risks of the community is certainly going to expand in scope and significance.

One of the challenges in the future will be providing appropriate leadership in the health care team. Given the historical successes in the field public health, this leader must continue to be one with a broad-based professional training coupled with appropriate managerial skills.

ECONOMIC CHANGES AND RISING COSTS OF HEALTH CARE

It is now common knowledge that the cost of health care in several developed countries in the world is rising at a tremendous and disturbing rate. In some countries, the cost per capita for medical services is continuously rising, and the percentage of the nation's gross domestic product allocated for health has reached very high levels. For example, in Canada, 8.6% of the GDP is for health; the percentage for USA is even higher at 11.2%, while in Malaysia, less than 2% of our GDP goes for health expenditure and this percentage has remained fairly constant over the past several years. Efforts therefore need to be made to contain these costs without sacrificing the quality of services provided.

In view of the higher expectations of the public, there is a need to provide a wider range of services throughout the country. In doing so, we have to be cautious and conscious of the cost implications of health care services. What is becoming increasingly apparent is the fact that the government is unlikely to be able to continue to provide health care services in its current form, which is heavily subsidized. Hence, it may be necessary for the government to consider alternative health care financing systems in the future that are more economically viable. This will involve a thorough study of the issues related to health care financing such as cost-effectiveness, cost-containment and

cost-sharing. The identification and selection of a suitable and viable alternative will require the study of several tested models implemented elsewhere in the world. In doing so, it is the government's moral responsibility to ensure that equity of services in terms of both access and quality of care are not compromised or jeopardized.

Earlier on, mention was made of the effect of economic improvement on the occurrence of the diseases of affluence. Economic improvement also means better capability of individuals and families to purchase commodities and services including health. One or both of two things will result; firstly, there will be demand for more wide ranging and expensive (though not necessarily better) services, and secondly, there will be an increasing demand for private medical services. As caretakers of the health of the population, the government especially the Ministry of Health, whilst recognizing the advantages of an optimal mix between public and private delivery of medical care, must also view this trend in terms of certain potential risks. A system allowing uncontrolled, unaudited and unsupervised private medical care is susceptible to improprieties such as over-zealous and unnecessary investigations and treatment. This has been known to occur in several countries.

This brings us to the danger of viewing the concept of health as an "industry" instead of a "caring profession" that calls for empathy, charity and compassion for the patient especially those who are poor. The commercialization of medicine is counter to the original concept of the "nobility" of the medical profession. If health is to be purchased for a price and therefore allowed to be commercialized just like any other commodity, then it is likely that greater emphasis will be placed on the more profitable promotive and preventive services, which will be to our detriment in the long term.

Health care is not a commodity to be marketed like any other. Market forces have obviously failed to work where health care is concerned, and one only has to look at the USA as an example of this, where nearly 30 million of the population is under or uninsured and yet about 12% of the GDP is spent on health. We cannot follow that route and this is an issue that we have to address for the future. Health financing is a major issue that is being faced not only in Malaysia, but also in many countries. The system that we will develop will emphasize the important issues of equity and access, taking into consideration cost-benefits, and our philosophy of a caring society.

SCIENCE AND TECHNOLOGY IN HEALTH AND MEDICINE

Thus far, besides looking at health risks in the twenty-first century, we have also looked at the various issues related to these risks. In assessing health risks in the next century, it is equally important to view these risks from two other aspects;

technological advancement in health care especially in its application to research, and medical education.

One of the objectives of Vision 2020 is the creation of a scientifically and technologically advanced Malaysian society. The implications of this will be felt in almost all sectors, but especially so in sectors that are scientifically based, such as the field of medicine. Technological advancement has left its mark in all virtually areas of medicine and health. In the area of disease detection and diagnosis, advancements in laboratory and radiological techniques in the past few years have been nothing less than remarkable. In the field of disease prevention, the discovery of several vaccines against specific diseases have been historical, while great strides have been made in the field of therapeutics especially with the ever continuing discovery of drugs and other modes of therapy.

In our quest for the acquisition of these technologies for the purpose of improving health services and thereby reducing health risks, it must be borne in mind that there may be less expensive technologies that are equally effective. In this regard, one must weigh the cost-effectiveness of using expensive versus the less expensive technologies.

It is also to be borne in mind that technological advancements should not be subservient to the supremacy of the human elements, which include basic clinical acumen, empathy and care, charity, and the powers of the healing hand, which have diagnostic, prognostic and therapeutic values. In other words, it is important to practice the "art" together with the "science" of medicine.

EDUCATION

Finally, but of no lesser importance, with the expected health risks that we are going to face in the twenty first century, especially with the larger population and other implications from the various sectors, there is undeniably a need to plan for adequate and appropriate manpower to deliver health care services. We are currently short of certain health care professionals and workers, and to reduce health risks in the coming years, this problem has to be solved.

While on the subject of manpower needs and linking it to what I earlier said about health and disease being a continuum, and the importance of effective teamwork, let me mention one area that is of growing interest and relevance in the health care arena. This is the concept of Family Medicine and Practice, which enables primary medical care to be given promptly to the patient, and ensures a system that refers the patient to the appropriate specialist at the appropriate time. This will not only save costs, but will provide a more holistic medical care to the patient and his family. In the next century, the concept and practice of Family Medicine will become even more relevant.

Another very important aspect of education is the concept of continuing education, and this is especially relevant in the field of medicine and health, where all variables are in a constant state of change, whether it is the potential patient, his lifestyle and behaviour, the environment he lives and works in or the medical technology that assists him to attain and maintain positive health. Just as the twentieth century, the twenty first century will certainly bring about newer risks. The medical practice and health care that we have today have resulted from an evolution throughout the ages, and history tells us that lessons were constantly being learnt from past experiences. In short, medicine is built from the best of the past.

CONCLUSION

In conclusion, I would like to reemphasize what I have mentioned earlier regarding the role of the individual and the community in maintaining the state of positive health. In the declaration made by 134 countries and several non-government agencies in 1978 in Alma Ater in what used to be the USSR, Primary Health Care was proclaimed as the means of achieving Health For All. Two main pillars of Primary Health Care are intersectoral cooperation and community participation. As such, the role and cooperation of individuals and the community is vital in the achievement of Health For All. In facing the health risks of the coming century, while the government, and especially the Ministry of Health and other health-related agencies play an important role in looking after the health of the people, any amount of efforts by the government will be futile if there is no cooperation and taking of certain responsibilities by individuals and communities.



MY9700842

BIOTECHNOLOGY : A CLINICAL PERSPECTIVE

Y.H Tan

Institute of Molecular and Cell Biology
National University of Singapore

ABSTRACT

Biotechnology generally describes a spectrum of basic and applied activity ranging from basic plant biology to agriculture, from basic biology reactions to clinical medicine and to various industrial processes in the chemical and electronic industry. Perhaps because of its broad usage, one cannot be certain that biotechnology by itself really exists. Hence the topic of biotechnology in its clinical perspective circumscribes the limit of this technology to the health care industry which encompasses diagnostics and therapeutics. Traditionally, clinical diagnosis was limited by the number of enzyme assays and antibodies associated with the disease state. But with the discovery of new disease, new antigens and advent of hybridoma technology, the science and business of the diagnostic industry have proliferated immensely since the birth of modern biotechnology in 1980. It is known that the B-cells of the immune system are capable of producing antibodies from more than 10^{12} different genetic combinations, extending the limits of its application from understanding biological mechanisms to various diagnostic and therapeutic usages. Monoclonals can now be "humanized" by constructing chimerae consisting of antibodies with mouse variable and human constant domains, eliminating the anti-mouse-immunoglobulin response and hence realizing the potential of new vaccines for various diseases.

**HUMAN MONOCLONAL ANTIBODIES AGAINST CANCER TISSUES:
ACQUISITION, CHARACTERIZATION PRODUCTION IN
LARGE QUANTITIES AND FUTURE ASPECTS**

Hiroki Murakami

Graduate School of Genetic Resources Technology
Kyushu University
Fukuoka 812, JAPAN

ABSTRACT

Human monoclonal antibodies (hMabs) are preferred for therapeutic use. hMabs will minimize the problems encountered when administering a foreign animal Mab (e.g., anaphylaxis, clinical manifestations of immune complex formation, and reduced efficacy secondary to anti-antibodies). In well over half of the patients treated to date with murine Mabs, the human antimouse antibody response has limited their usefulness. Only a fraction of the antimouse immune response is directed to the variable region (idiotype) of the rodent immunoglobins. This suggests that Mabs will be more effective therapeutic molecules than their rodent counterparts. Preliminary pharmacokinetic studies with hMabs demonstrate the superiority of these molecules over foreign mouse Mabs.

hMabs are more likely to have species-specific carbohydrates, which may be important in a number of effector functions, such as Fc receptor-mediated antibody-dependent cellular cytotoxicity (ADCC), complement activation, and phagocytosis. Serum half-life and effector functions of immunoglobulin subclasses are very important for designing the optimal anti-infectious disease hMab therapy.

**RESEARCH DEVELOPMENT IN CLINICAL DIAGNOSTIC
BIOTECHNOLOGY: THE ULTIMATE GOAL**

843

S.L. Ch'ng
Clinical Diagnostic Laboratory
University Hospital
59100 KUALA LUMPUR



MY9700843

ABSTRACT

At the present point in time, the field of clinical diagnostic biotechnology is still in its infancy and its growth potential in this region is enormous. The estimated world-wide market in 1985

for the non-isotopic immunodiagnostic reagents alone is over US\$700 millions (Robert & First Inc. USA) and would have double in 1990. The estimated annual turnover of the simple immunodiagnostic pregnancy test reagents in Malaysia for the year 1990 is about 2.2 million ringgits. The inclusion of other immunodiagnostic tests could amount to a sizeable turnover. Despite of this, few clinical diagnostic biotechnology manufacturers which could produce competitive quality diagnostic biotechnology products exist in our country since the introduction of strategy of liberal funding of research and development (R&D) in 1986.

- 1) The direction of research
- 2) the interrelationship between R&D patent, and manufacturing industry
- 3) the importance of related supporting research institution and industry
- 4) the technical skill and know-how required for the development of a competitive diagnostic biotechnology product will be discussed.

THE APPLICATION OF LASERS IN MEDICINE

Terence A. King
University of Manchester
Physics Department, Schuster Laboratory,
Manchester M13 9PL U.K.

ABSTRACT



MY9700844

Lasers are today being used or considered for used in many areas of medicine. Laser radiation can produce with great precision effects in bodily tissue which are highly localized and specific. The intense radiation from lasers can be focused to very small spot sizes, a few times the wavelength of the radiation, to produce extremely high power levels at well-defined tissue sites. For medical applications the particular ability to transmit radiation along flexible optical glass fibres of small diameter means that the radiation can be delivered to sites in a controlled and convenient manner. Most importantly, with the use of endoscopes and catheters access to internal sites in the body is achieved.

Early medical applications of lasers were in ophthalmology, dermatology and surgery, but the adoption of laser-based procedures has undergone continual development. The lasers have been refined to be more suitable for medical application and new lasers and techniques have evolved. Over the last few years a significant increase in the use of laser in medicine has occurred;

there are procedures where its use is preferred or complementary to conventional treatment and new procedures using laser techniques have emerged. At the same time a greater understanding has been built up of the mechanisms of the interaction of lasers radiation with bodily tissue and laser techniques are valuable aids in diagnosis and medical research.

With more highly developed lasers, particularly solid state and semiconductor lasers, and fibre optic, endoscope and catheter systems to deliver laser radiation into the body the scale of application in medicine and surgery is rapidly growing. The extensive range of current research and clinical activity of lasers in medicine includes further developments in ophthalmology and surgery and significant new applications in dermatology, cancer therapy, urology, cardiology and dentistry. New laser systems and techniques are being developed to meet the special needs of the medical applications and their use in diagnosis and medical research. Continuing growth of laser applications in medicine can be anticipated.

ROLE OF PHARMACEUTICAL INDUSTRY IN THE ECONOMIC DEVELOPMENT OF MALAYSIA

Professor Gan Ee Kiang
School of Pharmaceutical Sciences
Universiti Sains Malaysia
11800 USM PULAU PINANG



MY9700845

ABSTRACT

The pharmaceutical industry is a major industry with a growth rate averaging more than 10 percent annually. The current world market size for pharmaceuticals is estimated to be in the region of US\$200 billion. In Malaysia, approximately 80 percent of the pharmaceuticals are imported. As such, there is a tremendous potential for locally manufactured products. The pharmaceutical industry in Malaysia, though still at a very early stage of development can be nurtured into a major industry given the good infrastructure and skilled-manpower the nation possesses. It is suggested that proper incentives be given by the government to the local pharmaceutical industry so that it can contribute towards the economic development of the nation in line with the objective of Malaysia achieving the aim of becoming an industrialized nation by year 2020.

TOWARDS A TOTAL QUALITY ASSURED PHARMACEUTICAL PRODUCT

Dr. Hadida Hashim
Licensing & GMP Division
National Pharmaceutical Control Bureau
Ministry of Health, Malaysia



MY9700846

ABSTRACT

To ensure that only safe, efficacious and good quality drugs and cosmetics are marketed in Malaysia, the Control of Drugs and Cosmetics Regulation 1984 was promulgated under the Sale of Drugs Act 1952. These Regulations empowers the Drug Control Authority (DCA) to control the manufacture, sale, supply and import of the drugs and cosmetics through product registration and licensing of the manufacturers, importers and wholesalers of these registered products.

The National Pharmaceutical Control Bureau (NPCB) which functions as the Secretariat to the DCA executes the policies, directives and decisions of the DCA. Since 1 January 1992, the DCA has implemented a new procedure for the processing of applications for product registration certificates, which is aimed at controlling the number of similar products to be marketed, assessing product quality prior to evaluation and minimizing the lead time required for evaluation. Inspection of licensed premises to assess compliance to **Good Manufacturing and Good Storage Practices** have been intensified and compliance enforced.

Aside from its primary registration and licensing activities, NPCL conducts an active **post-registration market surveillance programme**, supported by a Product Defect Recall System. A **National Adverse Drug Reaction Committee (ADRAC)** was established in January 1990, by the DCA, to monitor and advise on the matters pertaining to ADR. A product Recall ADR Alert is activated when a significant adverse drug reaction is reported. Malaysia also issues Certificates of Free Sale for locally manufactured and market products which are exported, in compliance to **WHO Certification Scheme on the Quality of Pharmaceutical Products moving in International Commerce**.



MY9700847

INCENTIVES AND INITIATIVES FOR AN EXPORT ORIENTATED PHARMACEUTICAL INDUSTRY

Alex Tan

Persatuan Farmasi Malaysia

ABSTRACT

The modern pharmaceutical industry as we know it today had been established in Malaysia since 1959. Since then, the industry had grown somewhat, especially in the last five years with the injection of more capital, not so much in numbers but in facilities and capability and, of course, in output. However with no tariff protection since 1982, with keen competition from imports both in term of prices and numbers, with much higher capital investments and increased production costs, the industry must by necessity seek to remain competitive by economy of scale. Malaysia, with a domestic market of 18 million population necessitates a vibrant and active export market to achieve the economy of scale for competitiveness both domestically and internationally. At present, the industry is engaged in exports, albeit small, and mainly to developing countries, there is much potential in the export market as Malaysian pharmaceuticals had been well received in the export markets.

The Government, through the Ministry of International Trade and Industries, Mexpo, and its Trade Commissioners overseas, had been active in promoting Malaysian products and in identifying overseas markets. These activities had been very helpful to the Malaysian industry in their export efforts, and are by themselves incentives for exports as most members of the industry are, at these present stage, unable to afford aggressive export promotion. There is no special incentives for exports for the pharmaceutical industry. The incentives available to the industry are the same as those prevailing for any industry. With the globalization of trade, one had to cautious with incentives least they may be construed as subsidies and thereby provoke protectionism. Nevertheless, one should look more closely at the present position of the pharmaceutical industry with a view to remove the disincentives and constrains that is hampering export efforts. However that is another topic altogether.



MY9700848

THE STATUS OF DIAGNOSIS AND TREATMENT OF CANCER IN MALAYSIA

Prof. Madya Dr Md. Tahir Md. Azhar
Universiti Kebangsaan Malaysia

ABSTRACT

The status of cancer diagnosis and treatment in this country is a reflection of the good health care delivery systems of the country. In some areas it needs consolidation and in others expansion. Some sophisticated techniques which are not available yet need to be developed, albeit at a substantial cost.

The impact of the cancer problem on a developing society would be best solved in anticipation rather than wait for the problem. The WHO estimated a more than 80% increase in cancer death from 1985 to 2015 globally. What is worse is that, in the developing world the projection is 130% compared to only 20% in developed nations.

Cancer would be the main problem alongside cardiovascular disease for a developing country such as ours. By the time we attain an industrialized status, the pattern of disease would be no different from any advanced western country or Japan. In the western world, cancer and cardiovascular diseases together with the psychogeriatric problem are the main diseases that would occupy top position in terms of health care, while in Japan, cancer is the number one problem followed by psychogeriatric and degenerative diseases.

It would be prudent for Malaysia to take note of this, so that we would not be caught unprepared. In terms of financial requirements, it is always a costly affair, but would not be something that is unsurmountable with proper planning and proper preparation. Comprehensive cancer health care would not be possible without attention to the training of manpower and this would include radiotherapy clinical oncologist, surgical oncologist, paediatric oncologist, and also the training of support staff such as physicists, radiographers and oncology nurses.

Physical facilities would have to be expanded and the coverage of cancer care should be across the country rather than concentrated in one or two cities.

Public education, anticancer campaign programme, screening programme, provision of adequate basic health care facilities, rehabilitative care and care of those with advance disease are the various aspects that would have to be looked into in the fight against cancer.

On the top of this, research and training are mandatory to sustain such efforts.



MY9700849

**RADIATION TREATMENT OF CANCER :
FROM PURE SCIENCE TO APPLIED SCIENCE**

Dr Albert Lim Kok Hoi
Hospital Besar Kuala Lumpur

No manuscript provided.

PRELIMINARY ANALYSIS OF THE NATIONAL CANCER REGISTRY

Dr Narimah Awin
Ministry of Health Malaysia



MY9700850

ABSTRACT

Since no population-based data system existed for cancer, the epidemiology of this group of diseases remain largely unknown, and information was obtainable only from indirect sources such as admissions and death due to different causes in hospitals, and medically certified deaths. For formulation of a preventive programme, reliable data is an important requisite. Therefore in 1987, the Ministry of Health started the National Cancer Registry.

This paper outlines the salient findings on cases reported to the registry in the first year of full implementation, 1989.

Besides the description of the 1,310 cancer cases, the paper also gives some background information on the other sources of cancer data (hospital data, medically certified deaths and a pilot study conducted by the Ministry of Health in 1982). It also gives a brief account of the current prevention activities being carried out and some of the problems in cancer prevention.

The 1,410 cases reported to the National Cancer Registry in 1989 are analyzed by pertinent epidemiological variables including age, sex, ethnic groups, anatomical sites of the cancer and the stage of the disease at diagnosis. Due to incomplete reporting and great variation in terms of centres reporting to the Registry, analysis by region was not carried out. Since the analysis, this shortcoming has been corrected, and the reporting rate is steadily improving.

In essence, the data supports other observations made from other sources of data, i.e. hospital data and the pilot study of 1982.

The leading cancers in Malaysia are those of the trachea/bronchus/lungs, cervix, breast and nasopharynx which together account for about 50% of all cases. There is a slight

predominance of female cases over male cases, accounted by the significantly commoner cervical and breast cancer compared to cancers specific to males. The highest number of cases were in the 50 to 60 year age group, and there is as expected, increasing age specific incidence as age advances.

The highest incidence among the major ethnic groups was found in the Chinese, while the Indians have higher incidence than Malays. A majority of cancer cases detected were at the stage when the tumour was still restricted to the primary site, and very few cases were at advanced stages with metastases. On the other hand, the number of cases detected at precancerous stage was also small.

The main use of the registry is in eliciting epidemiological features of cancer in the country, and in doing so, in assisting in the formulation of appropriate intervention strategies. There is however, room for improvement and expansion of the scope of cancer registration in this country to make it even more useful and effective.

AN IMMUNOASSAY TECHNIQUE FOR THE ESTROGEN RECEPTOR DETECTION IN BREAST CANCER

Azimahtol Hawariah Lope Pihie
Jabatan Biokimia, Fakulti Sains Hayat
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

An immunocytochemical technique has been developed to detect the estrogen receptor (ER) in samples obtained by fine-needle aspiration of breast carcinoma tissue. Out of 50 samples, 21 had detectable receptor, 26 had no receptor and 3 had detectable receptor in the cytoplasm but not in the nucleus. The results of this study indicate that immunocytochemical analysis of estrogen receptor status offers an alternative to the standard biochemical procedure.



MY9700851

THE USE OF RADIOACTIVE TRACERS IN THE DIAGNOSIS OF HEART DISEASE

Dr John Morris

Department of Nuclear Medicine, Royal Prince Alfred Hospital
Sydney, 2050 AUSTRALIA

ABSTRACT

The study of the heart and circulation with radioactive tracers has always been a great challenge to nuclear medicine. Cardiologists are concerned with measurement and they have a number of diagnostic tools to measure blood pressure, electrical rhythm, (electrocardiogram) cardiac structure (x-rays, ultrasound, magnetic) resonance and biochemical estimates of cardiac muscle enzymes are powerful indicators of heart muscle damage. All of these diagnostic processes however are indirect - the use of radioactive tracers is the only direct diagnostic measure of cardiac muscle metabolism and this combined with non-invasive external measurement of cardiac blood flow (muscular and ventricular) has been responsible for nuclear cardiology becoming the most important single application of nuclear medicine in 1992. Coronary artery disease is now the commonest cause of premature death and in 1990 over two million thallium-201 studies were performed in the USA.

The main uses of radioactive tracers in cardiology are focused on:

1. MYOCARDIAL BLOOD FLOW - this is reduced in coronary artery disease.
2. MYOCARDIAL VIABILITY - It is crucial to determine whether the heart muscle stays alive (viable) after a coronary artery blockage.

PRINCIPAL NUCLEAR CARDIOLOGY TEST 1992

1. THALLIUM- 201 (Cyclotron produced) (SPECT)
EXCELLENT PHYSIOLOGICAL CHARACTERISTICS
Measures Myocardial perfusion (Blood Flow) and
Myocardial viability.
Less optimal physical characteristics of low energy (68-
80 Kev) and long half life (73 hours).
2. TECHNETIUM 99m ISONITRILES (SPECT)
ACCEPTABLE PHYSIOLOGICAL CHARACTERISTICS
Myocardial uptake proportional to blood flow.
OPTIMAL physical characteristics-
ideal energy (140 Kev) short half life (6 hours)

3. **POSITRON EMISSION TOMOGRAPHY (PET)**
Major cardiac application is the determination of MYOCARDIAL VIABILITY using FLOW tracers (mostly nitrogen-13 labelled ammonia) and METABOLIC agents (mostly fluorine-18 labelled deoxyglucose)

STATUS OF CARDIOVASCULAR DISEASE IN MALAYSIA

Dr Zainal Abidin Hamid
Institut Jantung Negara

No manuscript provided.

ADVANCES IN CARDIOLOGY: PROSPECTS FOR MALAYSIA

Associate Professor (Dr) Khalid Yusoff
Department of Medicine
Universiti Kebangsaan Malaysia

ABSTRACT

Cardiovascular diseases, especially ischaemic heart disease, have been the leading cause of morbidity and mortality in developed countries for many decades now. This has spurred a major interest in research in this field leading to important breakthroughs in the understanding of these diseases and major advances in diagnostic techniques and therapeutics. The public has at the same time shown its interest and participated in preventive measures. A combination of these factors contribute to the significant decrease in the prevalence, mortality and morbidity of these diseases in the past three decades.

An opposite epidemiological picture seems to prevail in this region, including Malaysia. As they rapidly urbanize and industrialize, many countries record increasing incidence of cardiovascular diseases, especially ischaemic heart disease. Morbidity and mortality from these diseases have significantly increased in the past few decades.

We have at our disposal advanced diagnostic and therapeutic techniques to manage this ever-increasing problem. These are inevitably expensive in terms of financial and manpower resources. Whilst it is vital to bring in these new technologies and to

commit the necessary financial resources, public health education and preventive measures must be emphasized. Lack of local data seriously impedes overall management of this potential epidemic. Research at institutions of higher learning and learned societies, in epidemiology as well as basic science and clinical research, needs revitalization and fresh moral and financial commitments.

**CURRENT STATUS OF MALARIA AND DENGUE CONTROL
PROGRAMME IN MALAYSIA**

Dr Marzukhi Md. Isa
Vector-Borne Diseases Control Programme
Ministry of Health, Malaysia



MY9700852

ABSTRACT

Malaria and dengue are still among the major public health problems in Malaysia. Malaria mainly affects the rural population in the remote areas of the country especially those in Sabah, the Orang Asli in Peninsular Malaysia and workers in newly developed land scheme areas. Dengue Fever and Dengue Haemorrhagic Fever (DF/DHF) mainly affects the urban population.

For the last five years the average number of Malaria cases reported in Malaysia was 49,461. In 1991, there were 39,189 Malaria cases reported, 69.4% (27,178) was from Sabah, 25.2% (9,879) Peninsular Malaysia and 5.4% (2,132) from Sarawak. The most prominent parasite species in 1991 was *Plasmodium falciparum* 63.9% (25,024), followed by *Plasmodium vivax* 34.0% (13,325) and *Plasmodium malariae* 0.7% (285). Sabah contributed the highest *Plasmodium falciparum* infection that is, 68.92% (18,731) of the total cases. In Sarawak, Malaria infection due to *Plasmodium vivax* contributed 62.48% 1,332 of the total cases.

In 1991, there were 47 deaths cause by *Plasmodium falciparum*. The majority of the Malaria deaths were due to Cerebral Malaria. The case fatality rate for Malaria for the whole of Malaysia in 1991 was 0.12%.

DF/DHF recorded the highest number of cases in 1991 since the first outbreak in 1972. The number of DF/DHF notified was 6,628. There were 740 Dengue Haemorrhagic Fever cases and 5,888 Dengue Fever cases. Wilayah Persekutuan recorded the highest number of DF/DHF cases that is 25.09% (1,663); Johor 18.44% (1,222); Sarawak 16.46% (1,091); Selangor 8.46% (561) and Perak 8.27% (548).

The case fatality rate for Dengue was 0.59% with 39 deaths in 1991. Out of these, 19 cases presented with Dengue Shock Syndrome.

**DEVELOPMENT OF DIAGNOSTIC KITS FOR ETIOLOGICAL
DIAGNOSIS OF DENGUE & JAPANESE ENCEPHALITIS
INFECTIONS**

Mary Jane Cardoso,¹ Suchitra Nimmannitya² and Ananda Nisalak³

¹School of Pharmaceutical Sciences, Universiti Sains Malaysia

²Children's Hospital, Bangkok, THAILAND

³AFRIMS, Bangkok, THAILAND

ABSTRACT

This paper describes the need for decentralization of etiological diagnostic services for dengue and Japanese encephalitis infections in order to control the spread of these mosquito borne diseases. One of the means by which decentralization can take place is to make available kits which will be cheap and effective for indicating when and where virus activity is high and therefore to focus control measures on hot spots.

Two formats for the detection of IgM specific for dengue and Japanese encephalitis virus have been developed - a microplate ELISA and EIA based on nitrocellulose filters. These tests have been designed for the research/central or well equipped laboratories and for use in field situations where capital equipment is in short supply. Data will be shown on the sensitivities and specificities of these tests as compared to the laboratory and clinical results of patients from Bangkok Children's Hospital.

A diagnostic kit designed as an alternative to the haemagglutination inhibition test will also be described and discussed in the context of the IgM tests.



MY9700853

OVERVIEW OF TROPICAL DISEASES IN SOUTHEAST ASIA

Dato' (Dr) M. Jegathesan
Institute of Medical Research
50588 KUALA LUMPUR

ABSTRACT

Tropical diseases like malaria, filariasis, dengue and others affect millions of people worldwide and Southeast Asia is no exception. In 1991, W.H.O estimated that malaria affects 270 million people while 200 million are infected with schistosomiasis. The countries most affected by tropical diseases

are the developing ones. As development is dependent on human resources, these diseases are a major setback to productivity and progress.

Over the last 25 years, much effort has been put into malaria eradication and control. But, the number of cases has not decreased substantially. The same is seen in other diseases like dengue, Japanese encephalitis, plague and scrub thypus. Control of filariasis, helminthiasis, schistosomiasis, plague and melioidosis remains a problem.

Progress, however, has been made in the diagnosis, treatment and prevention of diseases. New diagnostic tools have been developed for malaria, Japanese encephalitis, schistosomiasis and scrub thypus. Clinical trials using newer drugs like artemisinin for malaria and ivermectin for filariasis are showing promising results. Vector control techniques using biocontrol agents, newer insecticides and impregnated bednets are being looked into.

Nevertheless, much more effort has to be put into research, intra and inter-institutional strengthening and development of strategies based on priority and feasibility studies. This should be done in a concerted manner so that the countries in the SE Asian region can be self-reliant and address these issues in the manner that is most appropriate for their local setting.

RECENT DEVELOPMENT AND CONTROL IN DRUG RESISTANCE OF MALARIA

Khunying Tranakchit Harinasuta
Faculty of Tropical Medicine
Mahidol University
Bangkok 10400, THAILAND

ABSTRACT

Plasmodium falciparum developed resistance to chloquine in late 1950's in Thailand, Southeast Asia and in Colombia, South America. The resistance from Thailand has spreaded in all directions to Southeast Asia, Western Pacific, to South Asia and Africa, while from Colombia it spreaded to whole Central and South America with the exception of Argentina, Paraguay and Peru which practically have no faliparim malaria. At present *P. falciparum* is resistant to varying degrees to all antimalarial drugs except artemesine, the Chinese herbal medicine.

Drug resistant malaria is a major health problem, it poses threat to the lives of millions of people and renders it less possible for the worldwide eradication programme to attain its goal in the foreseeable future.

The mechanism of drug resistance in malaria parasites is believed to be due to gene mutation selected under drug pressure. It may be one-step as in pyrimethamine or multi-step as in chloroquine. Resistant mutation occurs both in schizogony and sporogony. The parasites lose their S strains through hybridization or overgrowth, shifting in character progressively towards high grade resistance.

Policies that may help to minimize further development of resistance to existing compounds and to safeguard any new drugs that may be developed in the future include:

- 1) limit the distribution of antimalarials
- 2) select priority groups for prophylaxis
- 3) use the gametocytodal drug primaquine to restrict transmission of resistant strain
- 4) establish an effective drug monitoring system
- 5) only deploy drugs for control as part of an integrated campaign
- 6) control use of new antimalarial
- 7) encourage the use of tested effective drug regimens for treatment
- 8) encourage research on antimalarial

RECENT ADVANCES IN MALARIA

J.W. Mak

Institute of Medical Research
50588 KUALA LUMPUR

ABSTRACT

Malaria, considered the most important parasitic disease, is believed to cause a million deaths annually. Control of malaria is extremely difficult, due not only to the development of parasite resistance to antimalarial, but also to changes in mosquito vector behaviour and resistance to insecticides. Although the need for vaccines to complement control measures is now generally accepted, the development of effective vaccines is difficult due to a number of factors.

An essential ingredient for the preparation of effective vaccines will be the characterization of the immunodominant epitopes eliciting appropriate host protective immunity. It is now known that extremely large polymorphism exists in some of the important epitopes of the various stages, and such antigenic while advantageous to the parasite, result in the slow development of effective host immunity to the heterogeneous pool of parasites normally present in endemic areas. The antigenic polymorphism in

the sporozoite, merozoite and sexual stages will be the a major problem in the development of effective synthetic malaria vaccines. Other major problems are the MHC restriction and the apparently limited number of immunodominant T-cell epitopes in malaria antigens.

While three types of vaccines are being developed, namely, against sporozoites, a sexual stages and gametes, the final form would probably be multivalent subunit vaccines produces by recombinant DNA or synthetic peptide technologies. Problems envisaged will be the selection of a sequence with adequate immunogenicity, appropriate B-cell activating epitopes, as well as T-cell epitopes of defined function for optimal induction of antibody production and representing all major variant parasite forms.

Advances have been made in our understanding of the pathology in malaria. Cerebral and some other forms of severe malaria are believed to be immunologically based with tumour necrosis factor playing a central role, probably mediated through their induction of the release of nitric oxide.

The recent development of more sensitive and specific diagnostic tools like the quantitative buffy coat technique and various types of nucleic acid probes for malaria parasites and their vectors, has not resulted in better field epidemiological assessments, mainly because of required high technology or expenses for which most health services in endemic areas cannot afford.

RECENT DEVELOPMENT AND CONTROL OF VIRAL HEPATITIS

Dr Violet How
University of Malaya
Kuala Lumpur

No manuscript provided.

RECENT DEVELOPMENT AND CONTROL OF AIDS

Datin Prof. Madya Dr Ilina Isahak
Universiti Kebangsaan Malaysia

No manuscript provided.



MY9700854

OCCUPATIONAL HEALTH PROBLEMS OF DEVELOPING COUNTRIES

Prof. J. Jeyaratnam

Division of Occupational Medicine
Department of Community, Occupational and Family Medicine
National University of Singapore
SINGAPORE 0511

ABSTRACT

The term developing countries often implies a group of countries with an identical set of problems and solutions, this is indeed a misconception. In reality, the developing world comprises countries of great diversity in terms of economic and industrial development, political ideologies and systems; administrative and work ethics; besides cultural and geographical differences. In this context, it would be evident that there exists no common solution to the occupational health problems of the developing countries. But, what may be identified are some of the common policy issues in occupational health which are relevant to these countries. However the style and pace of implementation of these policies would be according to the characteristics of the individual nations.

The title of this paper implies that occupational health problems in the developing countries are different from those of the industrialized nations. This not necessary always the case. The health concerns of man in his working environment are to a large extent universal, with much in common to both the industrialized nations and the developing countries. However, there are differences and this paper addresses the following three issues in occupational health which require the attention of the nations and the developing world.

- (i) Identification of priority needs in occupational health.
- (ii) Legislation for the delivery of occupational health care services.
- (iii) Transfer of industrial process and hazardous waste to developing countries.

These needs are largely related to the organization of occupational health services in the countries of the developing world. As, the main problem for occupational health in the developing world is not the need for new technology and skills but rather policy decisions which could make available existing knowledge and skills to those in need - the working population.



MY9700855

THE RELEVANCE OF OCCUPATIONAL HEALTH IN THE TWENTY-FIRST CENTURY

Dr. Mohd Yusof Adon
Ministry of Health, Malaysia

ABSTRACT

Occupational health is a specialized field concerned with the two-way relationship between work and health. The practice of occupational health requires a multidisciplinary and multisectoral approach.

It is a field of growing importance particularly with respect to Malaysia. The goal of attaining a fully developed nation status by the year 2020 has important implications for occupational health. It is envisaged that a range of new chemicals and technologies would be introduced to local workplaces. Together with the expansion of the existing industries, a significant increase in the variety and magnitude of occupational health hazards can be expected.

However, it is not possible to speculate on the nature of occupational hazards and health problems in the next century due to a scarcity of local occupational health information. Generally, occupational hazards may be categorized into physical, ergonomic, chemical, biological and psychosocial.

As many occupational health problems are preventable but not amenable to cure, preventive and control measures are of utmost importance. The principles of prevention and control in occupational health include engineering measures, administrative measures, environmental monitoring, medical surveillance, training and health education, personal protective devices and legislation.

The absence of effective preventive and control programmes for occupational health problems could result in workers succumbing to occupational injuries and diseases. As a result, the realization of Vision 2020 could be jeopardized. Occupational health should be a concern of all; be they the employees, employers and the authorities.

NOISE AND VIBRATION RISKS IN SOME MALAYSIAN INDUSTRIES

Mohd. Imran Ghazali and Prof. Dr Mohd. Salman Leong
Institute of Noise & Vibration
Universiti Teknologi Malaysia
Kuala Lumpur

ABSTRACT

It is generally known that noise and vibration pose a latent and potentially serious occupational health risk to workers. Excessive noise and vibration potentially result in hearing loss and white fingers syndrome respectively. While there are current Malaysian legislation for control of industrial noise exposure, there are no such control for vibration exposure. A brief discussion on current Malaysian legislation, and internationally recommended limits are presented. Statistics from the Factories and Machinery Department showed definite hearing impairment risk in Malaysian industries. A more detail examination of noise levels, noise dosage for several selected industry types are presented. The examples illustrated the need for greater awareness, and urgency for engineering noise control.

Vibration is an even more latent risk. Users of power tools, and heavy machinery had tended to be unaware of such occupational health risk. The paper present typical vibration measurements of some power tools, and assessed against recommended safe limits. Current research at UTM confirmed hand arm vibration reduction with the use of gloves and anti-vibration lining. Some typical results are presented.

OCCUPATIONAL RADIATION EXPOSURE IN MALAYSIA

Mchd. Yusof Ali dan Wan Shafiey Wan Abdullah
Unit Tenaga Nuklear
Kementerian Sains, Teknologi dan Alam Sekitar
Kompleks PUSPATI, Bangi, 43000 KAJANG

ABSTRACT



MY9700856

Radiation techniques have certain advantages over conventional techniques which make it a popular choice in various applications in industry, medicine and research. Its uses in Malaysia increases by about 13% per year in the industrial sector and 20% per year in the medical sector. Since radiation can also cause side effects to exposed persons the safety of workers, thus, becomes very important and needs to be given proper attention.

Persons working in radiation-controlled areas are required by law to be monitored individually. They are monitored by film dosimeter and TLD provided by UTN for whole body and hand exposures. Based on monitoring results over the last 5 years, it was found that the average annual individual whole body dose and the average annual collective (accumulated) dose received by the workers are between 0.53 - 1.6 mSv and 1.37 - 3.42 mSv respectively. These figures are comparable to those experienced by radiation workers in other developed and developing countries. For hand exposure, however, the dose received is generally higher than the whole body dose but overall it shows a significant improvement in terms of safety as indicated by a reduction in the amount of dose received from 10.28 mSv in 1987 to 2.16 mSv in 1991. The overall trend of declining occupational dose received by the workers for both whole body and hand exposures indicates a favourable working condition provided for workers in radiation related activities.

Fatal cancer risk associated with occupational exposure is small compared with the existing mortality rate. There is, however, a considerable spread of doses received by workers within occupational groups and there could, therefore, be room for further reduction of radiation exposure in a number of instances.

**OCCUPATIONAL HEALTH SERVICES IN MALAYSIA:
THE WAY AHEAD**

857

Dr. Lim Heng Huat
Mediviron Consultant Sdn. Bhd
257-2 Jalan Tun Sambathan
50470 KUALA LUMPUR



MY9700857

ABSTRACT

As Malaysia stands on the threshold of joining the industrialized nations, the country has to face the challenge of controlling the concomitant problems of environmental pollution, industrial accident and diseases. National socio-economic development also brings in its wake a higher expectation among the population on their quality of life. There is also growing concern about the increasing number of industrial accidents, disasters and diseases which result in loss of lives and disabilities among affected workers. While this has caused great economic loss to the nation, the human suffering and anguish of those affected and their families can never be quantified. Consequently, there is now an urgent need to gear up our occupational health services to prepare

for the task ahead in both prevention as well as treatment of occupational diseases and injuries. The present paper examines some of the ways in which this can be achieved.

359

TRAINING AND EDUCATION IN OCCUPATIONAL SAFETY AND HEALTH IN MALAYSIA

Ir Abu Bakar Che Man
Jabatan Kilang dan Jentera



MY9700858

ABSTRACT

As Malaysian moves towards being a fully developed nation by the year 2020, economic activities in all the industrial problems related to occupational safety and health such as occurrence of accidents and diseases will inevitably be increased. One of the ways to check the potential problems is to step-up training and education activity in occupational safety and health. The goal is to develop the relevant skills which will contribute to the reduction of risks in the working environments among all those affected. The current status of the training and education in Malaysia which regards to the availability of training courses for specialists, management and supervisors, and workers are either non-existent or grossly inadequate. The scarcely available specialists in industrial hygiene, industrial safety and industrial medicine received their training overseas as local universities do not offer such courses. Management and supervisors training are carried out in an uncoordinated manner by several government agencies, voluntary bodies, professional institution and trade unions, while workers education only exist among the large multi-nationals. The trend in training and education in future is expected to be greatly influenced by the proposed enactment of the Occupational Safety and Health Act as well as the establishment of the National Institute of Occupational Safety and Health (NIOSH). The general duty clauses of employers, employees, designers, suppliers stipulated under the proposed Act will induce greater activity in this area. NIOSH will be responsible to promulgate and conduct courses for those directly or indirectly involved in OSH. To enhance training and education in Malaysia, several actions are recommended.

859

LOW POWER LASER EFFECTS ON BLOOD AND TISSUE

Dr. Proom Promwichit
Jabatan Sains Nuklear
Universiti Kebangsaan Malaysia
43600 UKM BANGI



MY9700859

ABSTRACT

Investigation on low power laser effect on testicular tissue was done on albino rat whilst laser effect on blood and blood plasma were carried out using cow blood and blood plasma. Laser effect on testicular tissue based on active mitotic prophase spermatocytes stained with hematoxyline and scored under ordinary light microscope, whilst the effects on the blood and blood plasma were based on their respective relative viscosity changed. The results show marked decrease of spermatocytes with increasing laser energy. In case of blood and blood plasma, the viscosity change of similar pattern was observed. However, the rise in viscosity in both samples at low laser energy was attributed to coagulation, while the decrease of viscosity thereafter was due to precipitation.

PANEL DISCUSSION: MEDICINE

Panelists: **Tan Sri Datuk Dr Abdul Khalid Sahan (Chairman)**
Dato' Dr M. Jegathesan
Prof. Dr Mohd Roslani Abdul Majid
Dr John Morris
Dato' Dr Megat Burhainuddin Megat Abdul Rahman

The following points were raised during the discussion.

Tan Sri Datuk Dr Abdul Khalid Sahan

1. The panelists felt that there should be an exchange of new ideas to relate problems for Science and Technology.
2. Discussions should be based on the **Pengenalan** as given in the Programme.
3. To discuss some of the common issues that have prevented us from improving the health status.
4. To identify issues that will have an impact on science and technology.

The following issues were brought up by the panel:

1. Gap between knowledge and its application in the solution of human problems.
2. Causes of the problem: inadequate resources, lack of manpower, lack of application of knowledge, not enough research.
3. New knowledge - no skills to apply new knowledge.
4. Identify issues in the medical sector that will be useful to the Research Council to formulate the necessary policies and strategy for Research and Development, which would be both Qualitative and Quantitative.
5. Identify certain key issues:
 - (i) Plan our services better.
 - (ii) Research should have new orientation.
 - (iii) If there are enough scientists they are not doing scientific work.

Dato' Dr M. Jegathesan

1. Tropical diseases cause significant mortality and thus cannot be ignored.
2. The country has expertise and can play a global role.
3. Development can be contributory factor in lessening some of the diseases or on the contrary it can cause problems. So Environment Impact Assessment studies should be conducted.

4. (i) Parasites have become resistant; thus better methods of control and more effective research on new drugs should be carried out.
- (ii) Innovative methods of control e.g. biological control agents for vectors should be studied.
5. Health planners, managers and researchers should continue to look into the above issues.

Prof. Dr Mohd Roslani Abdul Majid

1. Look towards 2020 when the population will be 24 million.
2. Appropriate manpower required.
3. Professional and semi-professional workers will be needed.
4. There will be an increase in life expectancy coupled with high technology.
5. Disease patterns will change with more urbanized development and industrialization.
6. Number of aged (old population) will increase.

Dr John Morris

1. Increase in diseases of the heart.
2. Identify technologies in medicine.
3. Identify key principles and identify resources, people.
4. Medical discoveries in 2020 will be in genetic probes, biotechnology.
5. There is gap between knowledge and application, policies and application of technology in medicine.
6. Skill in immunology to be developed.
7. Lack of technology.
8. Quantitative identification and application.
9. Planners should represent the universities, the public sector and the private sector.
10. The planning group should look at technologies, application of technologies, direction of technologies, collaboration and manpower service.

Dato' Dr Megat Burhainuddin Megat Abdul Rahman

1. The group felt that cost of Health Care is going to increase and we should prepare ourselves for change.
2. There is new knowledge and new application and have extended application of knowledge.
3. At present, there is a gap between new application and application of knowledge.
4. Bureaucratic constraints on policy issues whereby implementation of policies is being delayed.

5. Change of concept in planning to more of a "Scenario Planning". (Have a vision and have a scenario).
6. There should be a drastic change to use new methods, techniques.
7. Are we importing a lot of scientific development and are we utilizing and gaining this knowledge for the benefit of society.
8. Inculcate a technological society.
9. What is the social economic impact when introducing these techniques.
10. Implication on the various system of science and technological development.

The Panel concluded:

1. Do we have enough scientists?
2. Are the scientists productive in the relevant areas?
3. Do the publications reach the right people i.e. the managers?
4. If the scientists are not productive why is it so?
5. Is research being carried out as "Researcher Given" or "Need Given"?
6. Has IRPA produced a listing document to address the above issues?
7. Has the trend of research changed since the IRPA document?
8. Is there shortage of scientific personnel?
9. Is there a lack of proper "scientific culture" in research institutes?
10. Are scientists drawn into the private sector?
11. Is the private sector not involved in Research and Development, whereby scientists are offered managerial posts?
12. What type of collaboration should be between Private Sector and Universities?
13. Create avenues in academic institutions for research.
14. Utilization of some of the findings by the academic researchers.
15. There are enough scientists in the universities.
16. Look at science and delivery system together.

Some participants stated that:

1. More should be done to prevent accidents.
2. Improve knowledge and occupational safety.
3. Cost of health care is going to increase.
4. Everyone should pay for health treatment.
5. Provide good pre-hospital care.

Other issues discussed:

1. How do we get across new ideas?
2. Import lecturers from overseas.
3. Do people in authority look at journals, etc. ?
4. Give "royalty" when the technology is marketable.
5. In Malaysia, training of Primary Care should take precedence over training of specialist.
6. Decisions made at administrative level not passed down.
7. Are we getting the right scientists with the right attitude towards research?
8. Think of alternative sources of funding for high technology that is required.
9. Think of Economic Health Policy, Health Care.
10. How much investment has been allocated for health care?
11. Health Policy - effective implementation of health policy.
12. Is there weak management?
13. Research should be more multidisciplinary, more conscious (to seek the ideas).
14. There should be change in operational policies.
15. Research should lead to problem identification and problem solving and should relate to other disciplines as well.

Role of Private Sector:

1. Study the distribution of scientists in the U.S.A., Germany, Australia.
2. How much of the results goes to the community?
3. Look at good science and delivery together.

PART III

**SEMINAR:
AGRICULTURE**

COMMERCIALIZATION STRATEGY OF AGRICULTURE

**Dato' Dr Mohd Aminuddin M.R.¹, Wan Mohamed W.E.² and
Foong S.K.³**

¹Divisional Director, Manufacturing and Agribusiness

²Senior General Manager, Agribusiness (Food)

³Senior General Manager, Agribusiness (Non Food)

Kumpulan Guthrie Berhad

It is an honour and a privilege to be invited to give a keynote address at this Science and Technology Seminar for agriculture. The importance of this meeting is clearly shown by the enthusiasm of the organizer and the number of participants attending this conference. We hope the deliberation and interaction among the leading scientists, development personnel and policy makers will help stimulate new ideas in resolving various problems and issues, particularly in maintaining and improving the efficiency of the agricultural industry.

Before I proceed to discuss and share our thoughts with you, I would first, state our concept of the words "commercialize" and "agriculture". According to the Oxford Dictionary "commercialize" is defined as "to seek to make profitable". And, "agriculture", is a process of cultivating land and rearing of livestock. In our context, the word "agriculture" has a broader meaning which also include processing, manufacturing, marketing and services. It also include products that are directly or indirectly related to production of crops and livestock.

As you are aware, agriculture particularly the production of commodity products, rubber, palm oil and cocoa was the most important economic activity of our country in the early and mid-twentieth century. However, this economic paradigm is shifting. Therefore, the challenges in maintaining and expanding the frontiers of agriculture contribution to our country's economy is most pressing now than ever before.

CONCEPT OF AGRICULTURE COMMERCIALIZATION

Commercialization is made up of series of actions in transforming ideas, concepts, ideals and others into profitable ventures (Figure 1). The actions are highly complex which are usually inextricable interwoven in a tangle of technical, logistical, organizational and competitive parameters. Therefore, I must emphasize here that, never, never, ever! think of commercialization with narrow views, as most specialists do!

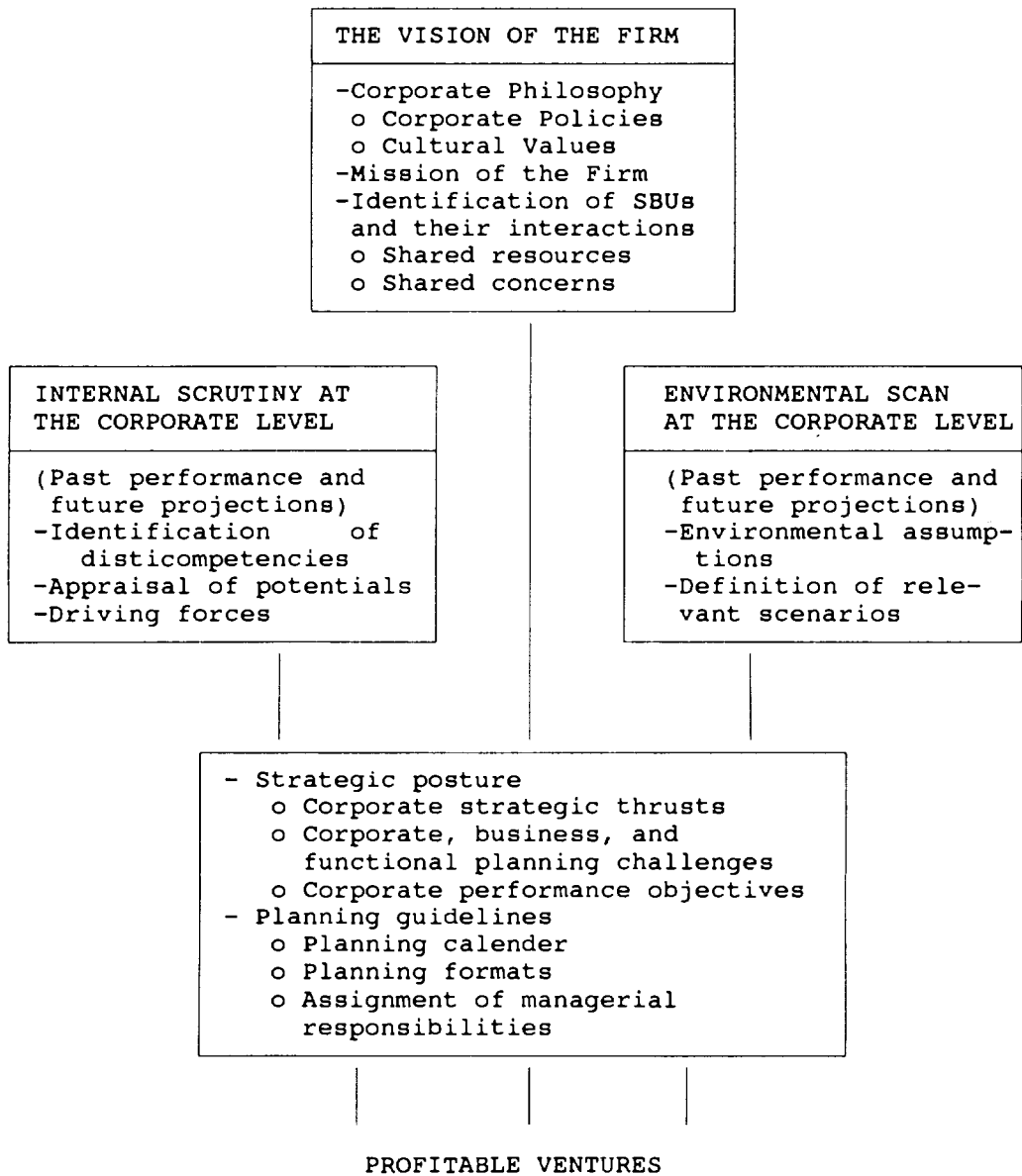


FIGURE 1: The vision of the firm and its strategic posture (Hax & Majluf, 1984)

Generally, there are numerous steps that one has to take and follow as the checklists. It normally take into account of purposes, strategies and plans, actions and project implementation, monitoring, control and review. Simply, it means working on the plans after they have been formulated, accepted and approved.

PURPOSES

It really answer a simple question of "What do you want?". In the corporate jargon, they normally talk of "Corporate Missions" or simply means DREAMS. It would just be a dream or a dreamer, if our expressed "wants" were arrived without:-

- a. knowing why you want, and
- b. analyzing your Strengths, Weaknesses, Opportunities and Threats (S.W.O.T).

Science this is a Science and Technology Seminar, it is most appropriate for me to start with Research and Development (R&D). The R&D activities must have either one or a combination of the following purposes:

- a. To generate knowledge for knowledge,
- b. To generate knowledge and knowhow,
- c. To generate knowledge, knowhow and business.

I am not going to discuss generating knowledge. This is highly abstract and very difficult for justification at corporate levels.

In generating knowledge and knowhow for business, one can use trends and postulate on the future needs; and set the R&D activities which will help in developing totally new business or set the R&D activities to improve the existing economic activities. In to-day's deliberation, we are focussing on the latter where R&D activities are prelude to business development. Thus, the considerations or steps to be taken are somewhat similar to the development and commercialization of business activities. These are summarized and given in Figure II.

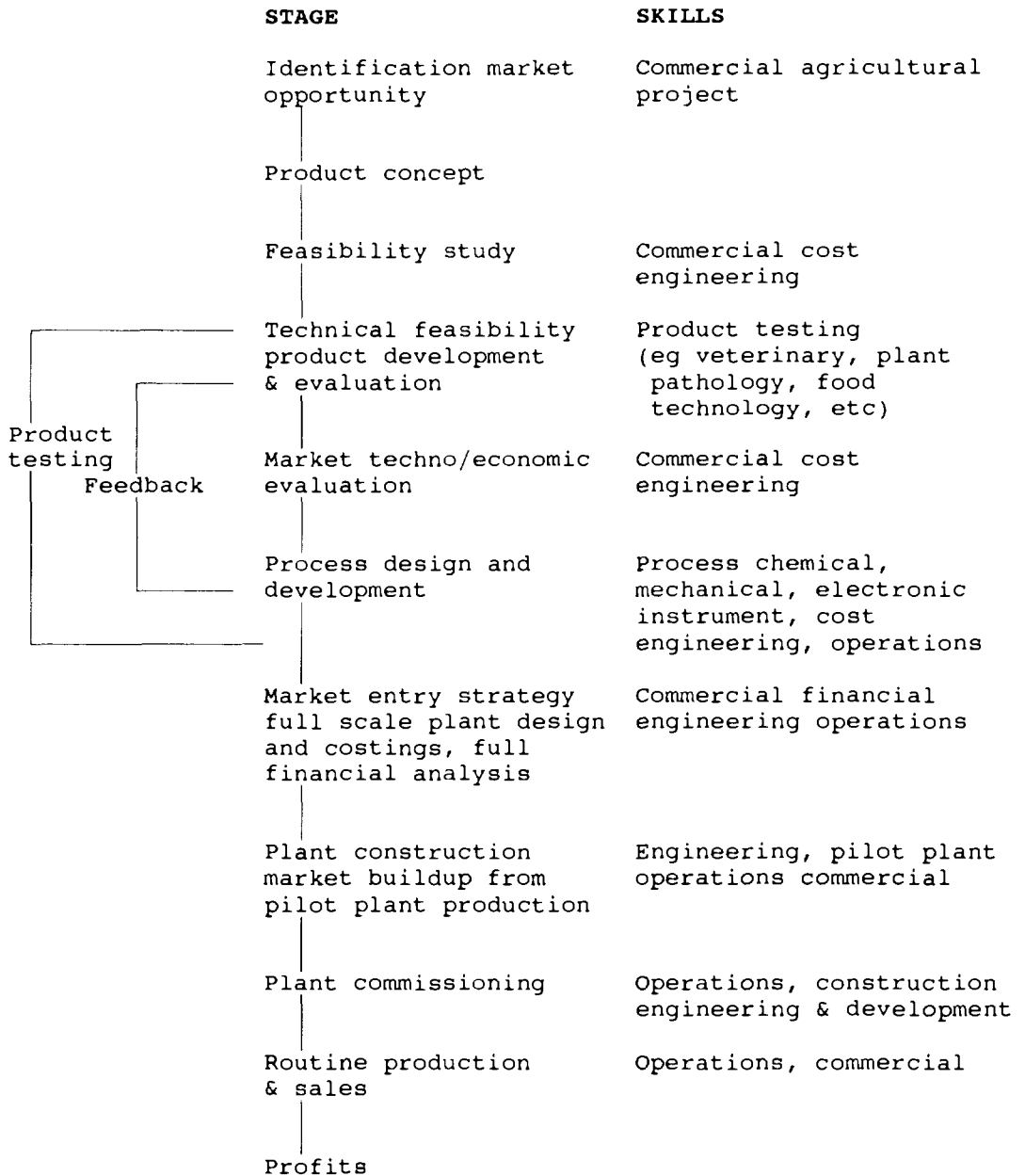


FIGURE II: Stages and skills required in a commercial venture in agriculture

For example, one of our (Kumpulan Guthrie) missions is to be a world leader in tropical agribusiness. Thus, changing from just being a leader in plantation. Why? The answer is simple. Guthrie can no longer be a premier company if she continues to be just involved in plantation operations (Malaysia) in the 21st century and beyond. The paradigm, (Malaysia economy, plantation operation, labour, etc.) are shifting rapidly. And, we need to change.

Thus, to remain healthy, dynamic and progressive, Guthrie has to find new businesses - it has to diversify and broaden its economic base. The rationale or reasons for diversification are as follows :

- a. The company has the structural corporate characteristics and financial flexibilities to go into non-traditional agriculture related business areas which include processing and manufacturing of the products and downstream manufacturing of the traditional products.
- b. Diversification into non-traditional enterprises will somewhat partly relieve the Group from being solely dependent on traditional commodities where prices are highly volatile,
- c. Diversification into non-traditional products which have tremendous growth potentials in domestic and overseas market will strengthen the Group's financial position,
- d. Processing and manufacturing results in value added products which will increase the Group's turnover and profitability.
- e. Last but not least, it is in line with basic thrust of National Agricultural Policy (NAP) and Industrial Master Plan (IMP) of the country. This is important in the context of government enactment, viz, Investment Incentives Act of 1968 which empowered the Government to extent various incentives to promote and expand the industries. The incentives include exemption from company tax, relief from payroll tax, investment tax credits, accelerated depreciation allowances and others.

Nonetheless, it is important to note here the mission must begin with an end in mind.

STRATEGIES AND PLANS

The transition from ideas and concepts to project implementation requires a series of steps, that must be followed. These are guided by the commonly used methodology called S.W.O.T. analysis. The major critical success and failure factors are grouped under the following sub-headings :

- o Market structure of products and services
- o Industrial structure of products and services
- o Competitive strategy of products and services
- o Environmental scan of products, services and raw materials
- o Technology and knowhow in the production of the products and services
- o Human resource requirement
- o Financial and capital management
- o Financial projection and project feasibility analysis
- o Project implementation, monitoring and review

Following the above criteria most plantation based companies' strategy and plan in meeting the mission statement are to focus in business activities that are related to the core business of the company i.e. into agricultural and land related projects.

Ladies and gentlemen,

Although the importance of agriculture in the Malaysian economy is declining in recent years, it still forms one of the most important backbone of national economy.

Taking cognizance of these factors and the long and successful involvement of commodities based companies cultivating, processing and trading of commodity crops, it is most logical for us to diversify first into agricultural related business activities.

Some of the projects that are commonly being assessed and developed are as follows :

- o Real estate and property development.
- o Downstream processing and manufacturing of rubber and palm oil.
- o Plant and livestock food-base industries
- o Agrichemicals and consultancy services, and
- o Landscaping and agro-tourism

It is fairly easy to identify that the new areas of focus are more inclined towards processing, manufacturing and provision of services. This is deliberate.

The changes in the directions are due to fast changing economic reality experienced by our country. We have to redefine our roles because of :

- a. the continuing threat of increasing labour cost and scarcity of labour make the future viability of plantation industry highly uncertain. Similar problems and threats are also faced by the other sector of agriculture production. Thus, we need to constantly review our upstream activities.
- b. threats from other developing countries such as Vietnam, Thailand, Indonesia and others are becoming more intense in

view of cheaper cost of labour coupled with improving political stability in these countries. We need to find ways of making use of their strength to further strengthen our position in oil palm, rubber and cocoa. For example, Malaysia's plantation companies should quickly shift to develop technology to manufacture products and provide financial support and marketing networks for our neighbours.

- c. incompatibility of some projects with corporate management. For example, aquaculture production such as prawn culture requires regular security checks to overcome pilferation. Thus, big companies like ours should focus into products manufacturing and market development and services.
- d. the growth of tropical fruits and ruminant industry in Malaysia is highly questionable in view of inherent constraints. Our experience in tropical fruits cultivation and marketing highlighted critical areas which include:
 - o low and highly variable yield and quality
 - o insufficient pre and post harvest technology
 - o sporadic areas of cultivation leading to high and variable cost of transportation and marketing
 - o poor keeping quality
 - o small and insignificant overseas market growth potential due to insufficient space offered by national carrier (other carriers do not offer competitive rate)
 - o lack of opportunities in processing because of irregularity of supply and high costs of raw materials.
- e. the growth of ruminant industry is equally hampered with the lack of technical information, production systems, suitable feeds and costs, suitable breeds and number; and suitable policy framework to favour the local production. For example, our government liberal policy in the importation of frozen beef and mutton from overseas adversely affect the growth of local industry.

The constraints and suggestions in the development of ruminant industry were deliberated on a number of occasions by Wan Mohamed and Mohamad, 1992; Ani, 1988; Wan Mohamed and Aminuddin 1986, and others.

ACTION PLAN AND PROJECT IMPLEMENTATION

In a naive sort of way, perhaps I can share with you the action plans or steps that should be taken in working out the plan successfully. First and foremost there are three approaches to commercialization:-

- o organic growth - start and grow on your own.
- o joint ventures
- o acquisition and Management Buy Out (MBO).

They are advantages and disadvantages of the above approaches. These are summarized in Table I.

TABLE I: The advantages and disadvantages of three different approaches to business development

Organic Growth	Joint Ventures	Acquisition and MBO
Advantages		
<ul style="list-style-type: none"> o Simplicity of organization o Freedom to make all decisions o Enjoyment of all benefits o Ease of discontinuance o Tax implications 	<ul style="list-style-type: none"> o Ease of organization o Combined skills & resources o More capital available 	<ul style="list-style-type: none"> o No start-up delay o Track record to work on o Staff & expertise o Established clientele o Opportunities for improvement o Corporate structuring
Disadvantages		
<ul style="list-style-type: none"> o Lack of expertise & experience o Slow growth o Slow return in most cases o Long learning curve 	<ul style="list-style-type: none"> o Divided authority o Risk of disagreement 	<ul style="list-style-type: none"> o Loss of revenue o Repairs & replacement of assets o Lack of goodwill o Very costly

Among the most important critical factors in project implementation are the source and management of funds and the employment of personnel who are knowledgeable, skillful, honest and dynamic.

SOURCE OF FINANCE

The source of financing, as you are all aware, can be from one or combinations of the followings :

- o internally generated
- o investors
- o commercial lenders and institutions - several types of products variations are offered by bank
- o government grants, etc.
- o venture capital.

Most often than not, the financial requirement is always understated. These could either be due to several reasons which include :

- o lack of experience in the project - project are awarded/ approved based on reasons other than business.
- o lack of knowledge and experiences in handling/managing new projects.
- o over enthusiastic on the part of the planners.
- o cost over run due to lack of control.
- o cashflow management.
- o lack of integrity and mismanagement of funds,
- o others.

Thus, a clear and understandable financial policies are important to provide a check and balance to protect the interest of the company. The policies should be for greater decentralization of decision but not at the expense of good check and control.

HUMAN RESOURCE MANAGEMENT

The importance of employing, retaining, fixing and promoting the right personnel for the right job is well recognized but commonly not practiced. Examples are everywhere. It is because of this we do not achieve optimum output. A number of critical decisions, are often made based on rational and narrow views rather than on known facts and experiences. In a number of cases, numerous changes were made reflecting uncertainties due to lack of knowledge and experiences.

The situation is worst felt in companies that are shifting or diversifying from one core business areas to others. This is especially so with commodity or agricultural based companies diversifying into a more high profile business areas such as manufacturing, trading and providing services. Without being biased, the corporate culture of these companies are generally conservatives. This is understandable. Management of rubber trees and oil palm does not require urgent and quick decisions compared with consumer products and services.

The conservative nature of the companies and management lead to some problems in the following areas :

- I. Not trying or willing to offer competitive benefits in order to get the right people for the right job to save costs.
- II. Failure to recognize the complexities of new business. It tends to rely too much on inexperienced (internal) and ignorant personnel to take charge of new business.

Existing personnel may be good in managing traditional areas but they are :

- o generally regarded as perfectionist and overbound by traditional values

- o generally uncomfortable with interpersonal relation
 - o too old or established to learn new tricks
 - o very good in a specialized areas of operation
 - o lack of macro- and global view
 - o lack of urgency in meeting deadlines and solving problems
 - o uninterested or not confident in trying anything new.
- III. Believe and recognize that new areas of business are plagued with initial problems but do not have the "will" to focus and solve the problems.
- IV. Tend to have high expectation with low investment and commitment.
- V. Last, the syndrome of "cakap tak serupa bikin", is becoming very common. This management disease must be checked and stopped.

MONITORING AND REVIEW

The key element in monitoring and review is to respond appropriately to adverse operation and business conditions. It is most important at all management levels to understand and set control measures. This include :

- o set standard
- o monitor performance
- o set and make regulatory procedures known and understood
- o make everyone understand and follow the budget and budget control

In setting up standards and monitoring performances, the parameters set must follow that of industry standards. An acceptable measure and comparison of performances among different activities of conglomerate companies are very important.

Finally, a constant and serious review on the progress of new projects must be undertaken at all levels of management. Review should cover the followings :

- o deadlines of learning curves and diagnose the problems, if any.
- o compare against business plan.
- o compare with industry standard.
- o review any changes in environment, markets etc. and make adjustment accordingly.
- o review overall performance.

The question that one needs to ask is who should undertake the critical review? Is a normal meeting sufficient? Based on our experiences, big conglomerate company should have an independent review committee that reports directly to the head of the company

or Board. Members should be those who understand the business but not those who are interested in control for the sake of control.

CONCLUSION

Ladies and Gentlemen,

We believe agriculture and agricultural related activities will continue to play a significant role in the Malaysian economy. This is so provided, we do not confine ourselves to paradigm of agriculture as we know during the last two centuries. We have to continually adjust ourselves to new environment. As they say "when the paradigm shift - everyone start at zero", thus we have to compete with little to no advantage when this happens.

One thing for sure, we must be all aware that all new business are characterized by a degree of volatility, inherent both in their start up and growth process. However, we strongly believe that, "making decisions are taking risks, and a company will not grow unless it takes risks. Secondly, it is generally accepted that successful company is riddled with failures, and there is no other way of doing it ... everyone loves a winner. But at times, one has to lose in order to win. "

Finally, ladies and gentlemen, may I conclude by wishing you all success in your deliberation.

TERAS PENYELIDIKAN DALAM PEMBANGUNAN INDUSTRI BUAH-BUAHAN

Mohamad bin Osman¹ dan Zahari bin Radi²

¹Bahagian Penyelidikan Buah-buahan

²Bahagian Kajian Tekno-Ekonomi dan Sosial

Institut Penyelidikan dan Kemajuan Pertanian Malaysia (MARDI)

Peti Surat 12301, 50774 KUALA LUMPUR

ABSTRAK

Dengan terlancarnya Dasar Pertanian Negara (DPN) pada tahun 1984, komoditi buah-buahan telah dikenalpasti untuk dimajukan sebagai komoditi yang mempunyai nilai ditambah yang tinggi dan berorientasikan eksport. Kebelakangan ini perkembangan industri buah-buahan adalah sangat menggalakkan. Jumlah eksport buah-buahan segar dan diproses terus meningkat dan mencapai \$257.9 juta pada tahun 1991. Durian, belimbing, betik, tembikai, pisang dan nanas diproses paling banyak menyumbang kepada eksport ini. Belimbing pula merupakan buah yang terulung sekali berjaya menembusi pasaran Eropah, dengan nilai eksport melebihi \$23.8 juta.

Bagi mencapai objektif-objektif utama DPN, dua strategi pelaksanaan pembangunan industri buah-buahan telah digariskan. Pertama ialah melalui pemulihan kawasan tanaman buah-buahan yang sedia ada. Kedua ialah melalui pembukaan kawasan tanah-tanah baru yang luas dan diusahakan secara komersial. Kini ramai pengusaha termasuk pihak swasta dan agensi-agensi Kerajaan telah mula bergiat mengusahakan buah-buahan secara komersial. Walaupun demikian tahap penggunaan teknologi yang lebih maju oleh pengusaha-pengusaha kecil dan ladang-ladang komersial adalah masih rendah. Banyak halangan-halangan semasa meliputi aspek-aspek pengeluaran, pemasaran, pemprosesan, kredit, sosio-ekonomi dan lain-lain perlu diatasi sebelum potensi industri buah-buahan dapat dimanfaatkan sepenuhnya.

Selaras dengan hasrat DPN, MARDI telah merangka dasar penyelidikan dan pembangunan (R&D) ke satu tahap yang lebih dinamis dan kini memberi penekanan yang tinggi kepada penyelidikan buah-buahan, yang merangkumi semua peringkat dari pengeluaran, pengendalian lepas tuai hingga pemprosesan. Sebanyak 16 jenis buah-buahan diberi tumpuan. Dari bilangan ini, beberapa jenis buah-buahan yang mempunyai potensi eksport yang tinggi diberi tumpuan penyelidikan yang intensif. Untuk mencapai matlamat penyelidikan buah-buahan MARDI, iaitu untuk mengwujudkan teknologi wajar lagi maju untuk meningkatkan produktiviti dan kualiti buah-buahan bagi memenuhi permintaan tempatan dan eksport, teras-teras penyelidikan berikut dikenalpasti:

- o Mewujudkan varieti buah-buahan yang berhasil dan berkualiti tinggi untuk dimakan segar dan diproses bagi tujuan pasaran tempatan dan eksport.
- o Mewujudkan teknologi pengeluaran buah-buahan yang cekap bagi meningkatkan hasil dan kualiti.
- o Memendekkan tempoh juwana bagi buah-buahan yang mengambil masa lama untuk mula berbuah.
- o Mewujudkan teknologi kawalan bersepadu bagi perosak dan penyakit serta pengurusan organisma berfaedah dalam pengeluaran buah-buahan.
- o Mewujudkan teknologi rawatan karantina bagi buah-buahan yang mempunyai potensi eksport yang tinggi bagi memenuhi keperluan karantina negara-negara pengimport.
- o Mewujudkan teknologi pengeluaran untuk beberapa jenis buah-buahan nadir yang dijangka mempunyai potensi yang baik pada masa hadapan.
- o Pada tahun 1990, pindaan terhadap akta MARDI telah diluluskan oleh Parlimen. Selaras dengan pindaan akta ini penglibatan MARDI ke arah penyelidikan komersial telah dimulakan. Teras penyelidikan ini ialah untuk membangunkan teknologi pakej yang sesuai bagi pengeluaran buah-buahan secara komersial, merangkumi peringkat pengeluaran, pengendalian lepastuai, pemrosesan dan pemasaran. Dengan perlaksanaan penyelidikan komersial ini, MARDI akan memperolehi maklumat-maklumat berguna yang boleh dimanfaatkan oleh pengusaha-pengusaha yang terlibat dengan pengeluaran buah-buahan secara komersial.

POTENTIAL OF GRAIN AND GREEN SOYBEAN PRODUCTION IN MALAYSIA

C.O. Leong¹ and M.N. Ramli²

¹MARDI, Seberang Perai

²Horticulture Division, MARDI, Serdang

ABSTRACT

Grain soybean with an annual import value of over MR\$330m and green or vegetable soybean, a relatively new crop both have the potential to be produced in Malaysia. The targeted production areas include the fringes of existing irrigation schemes as well as abandoned or idle land. In order to increase yields, the concept of saturated soil culture or SSC is introduced where experimental yields of 4.3 mt/ha has been obtained compared to 3.0 mt/ha for conventional irrigation. Mechanized production of grain soybean using the SSC concept or under furrow irrigation (where

water is sufficient for SSC) is advocated. Small scale farming for green soybean is encouraged to be integrated with other crops. Current research to remove production constraints is underway to support soybean production in this country.

BIOLOGICAL CONTROL IN MALAYSIA

Liau, S.S.¹ and Ooi, P.A.C.²

¹Guthrie Research Chemara,

Locked Bag 28, 70990 SEREMBAN

²International Institute of Biological Control,
Malaysian Station, P.O. Box 11872, 50760 KUALA LUMPUR

ABSTRACT

Biological control has been practiced in Malaysia since the turn of the century, applied almost entirely against agricultural pests. With the current emphasis on biologically-intensive IPM, the establishment of the National Coordinating Committee on Biological Control, renewal of interest and increasing activity, it has assumed an important place and role in the Malaysian crop protection scene. This paper examines the recent development at national levels for biological control, and its status, perspective and prospects.

PRODUCTION OF HIGH VALUE VEGETABLES IN THE LOWLANDS UNDER RAINSHelters

Illias Mohd. Khir

Pusat Penyelidikan Sayur-sayuran

MARDI, Jalan Kebun

Peti Surat 186, 41720 KELANG

ABSTRACT

The production of high-value temperate and other vegetables such as cabbage, cauliflower, bell pepper and chilli in the lowlands is often low in yield and quality due to various environmental and soil problems. To establish and increase production of these vegetables will require to make them suitable for the crops. One of the ways is to grow under structures called rainshelters.

There are many types of rainshelters but essentially they consist of plastic roofs with structural framework either of wood or galvanized iron. The benefits of using the rainshelter include protecting the crop from damage by excessive rainfall, pests and diseases, providing shade to the crop and minimal use of pesticides. Temperate and other high value vegetables grown in the lowlands under rainshelters will give yields which are 2-4 times higher and better in quality compared to those from conventional open field planting. The cost of construction of various rainshelter types and the economics of vegetable production under rainshelters are described.

CULTIVATION OF POT CHRYSANTHEMUM IN THE LOWLANDS: AGRONOMIC ASPECT

P. Y. Yau*

Horticulture Division, MARDI,
P.O. Box 12301, 50774 KUALA LUMPUR

ABSTRACT

Pot chrysanthemums or pot mums are becoming very popular nowadays for indoor decorations and landscaping or as gifts during festive seasons. Though they are temperate plants, they could be successfully cultivated in the hot and humid conditions of the lowlands. There is a wide variety of pot mums, in different colours and forms. Detailed descriptions of some pot varieties, techniques of propagation, planting pinching, lighting and application of plant growth regulator are discussed. Pest and disease managements are also included.

THE INFLUENCE OF THE ORGANIC FERTILIZERS AND MYCORRHIZA ON CROP PRODUCTIVITY

Azizah H. Chulan and Nik Mokhtar N. W.
Jabatan Sains Tanah, Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

Greenhouse and field studies were conducted to evaluate the importance of organic fertilizers and mycorrhiza in enhancing growth and yield of six selected crops. The crops tested include

vegetables such as "bayam" and chilli, fruit seedlings in fertilizer applied. However growth of these crops were further enhanced through mycorrhizal symbiosis. Out of the six crops tested, mycorrhizal chilli plants fertilized with an organic fertilizer derived from POME resulted in the highest percentage increase (58%) in yield compared to uninoculated plants. In the mycorrhizal guava seedlings of age 4 months, total dry weight of these seedlings given 40g organic fertilizer were significantly higher with maximum value of 119g compared to a value of only 80g in uninoculated seedlings given the same amount of organic fertilizer. In 4 months old cocoa seedlings, there was a significantly higher percentage P recovery from inoculated plants grown in both Serdang and Munchong soils, especially at the lower levers of POME applied (8.3 - 50.0 g/kg). In mulberry cuttings, mycorrhizal treatments also resulted in 20 - 30g dry matter yield compared to a range of 14 - 23g obtained from uninoculated cuttings.

The results indicated that optimum application of the organic fertilizers incorporated with mycorrhiza gave the highest growth and hence yield of all crops tested. The implication of these findings with reference to the transfer to inoculation technology to the farmers will be discussed.

PENGGOMERSIALAN INDUSTRI TERNAKAN: WAWASAN DAN KENYATAAN

Z. A. Tajuddin

Bahagian Penyelidikan Ternakan , MARDI
Peti Surat 12301, 50774 KUALA LUMPUR

ABSTRAK

Berasaskan analisis persekitaran, kertas kerja ini memaparkan potensi pengkomersialan atau memperluaskan usaha bagi beberapa enterprise ternakan dan poltri. Bagi poltri potensi adalah dalam bentuk diversifikasi dan pembangunan produk. Bagi industri babi usaha ke arah penempatan semula ladang babi menjadi keutamaan untuk mengelakkan masalah pencemaran. Bagi ruminan beberapa enterprise tambahan, berpotensi dibangunkan dengan andaian bahawa daya saingnya adalah baik.

Jelas terbukti bahawa pembangunan dan pengkomersialan industri ternakan dan poltri bukan sahaja memerlukan input teknikal malahan perubahan struktur, strategi-strategi pembangunan dan pemasaran. Beberapa fokus penyelidikan juga dilambangkan bagi mengatasi permasalahan teknikal di dalam satu-satu enterprise.

EXPLORATION AND CONSERVATION OF THE OVAL SQUID FISHERY RESOURCES IN MALAYSIAN COASTAL WATERS

Samsudin Basir
Fisheries Research Institute
Department of Fisheries
11700 GELUGOR

ABSTRACT

The oval squid (*Sepioteuthis lessoniana*) locally known as sotong arus has been exploited by fishermen since 1989. It can be considered to be a new resource in Malaysian fisheries. This squid has a high market value and is commonly caught by traps (bubu). At present, the oval squid appears to be one of the main seasonal fishery resources for the coastal fishermen in Kedah/Perlis.

A study on the oval squid resources was started in 1989 in Kedah/Perlis waters and is still being carried out. The study has been made using 12 specially licensed boats in the states of Kedah and Perlis. Total landings of the oval squid in Kedah/Perlis for the 1990/91 season was 22866 kg while in the 1991/92 season, the landings increased to 36763 kg. The catch per unit effort (kg/haul/day) shows a slight decline from 1.09 in 1990/91 to 1.03 in 1991/92. Generally the high landings of the oval squid seems to occur in November, December and January the following year. The study on hatching the oval squid eggs in cages was also carried out. This study is to investigate a possibility to use this method to conserve the oval squid fishery resource in term of enhancement and sea ranching. Several suggestions to rationally manage this fishery resource have been made.

TOWARDS IMPROVED PRODUCTIVITY: RESEARCH FRAMEWORK FOR DEEP SEA FISHING TECHNOLOGY

Omar Bin Yaakob
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

The development of the deep sea fishing industry mark a new era-in the Malaysian fishery. Since its introduction in 1987, progress has been slow. This paper looks at the development of fishing

technology and suggests that there is a dire need for development of indigenous technology. A review of the works of research institutions and a proposal activities is also presented.

**KEPENTINGAN URUSASUH LARVA DALAM MENINGKATKAN
KEMANDIRIAN DAN PENGHASILAN UDANG GALAH,
*Macrobrachium rosenbergii***

Che Rosli Che Mat
Jabatan Sains Nuklear, Fakulti Sains Fisis dan Gunaan
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRAK

Dalam usaha maksimumkan hasil ternakan udang air tawar maka dicadangkan urusasuah pos larva adalah penting bagi mendapatkan peratus kemandirian yang tinggi dan seterusnya memberi penghasilan yang maksimum. Kajian kinetik pengangkutan naterium dan ketelapan air menunjukkan bahawa pos larva mempunyai ciri fisiologi yang sama seperti induk. Induk dapat menjalankan pengaturan osmotik dengan baik dalam air tawar dan saliniti rendah secara pengangkutan aktif yang dirangsang oleh enzim Na-K-ATPase. Pengaturan yang sama dicerap dalam pos larva; fluks naterium; pengambilan aktif dan aktiviti enzim Na-K-ATPase didapati tinggi dalam air tawar berbanding dengan saliniti 4 bps. Berdasarkan cerapan di atas dicadangkan supaya saliniti medium ditingkatkan antara 2-4 bps bagi mengurangkan kepayahan osmotik dan sebahagian tenaga dapat dimanfaatkan untuk tumbesaran peringkat pos larva sebelum dipindahkan ke kolam ternakan.

SHEEP INDUSTRY IN MALAYSIA: IS THERE ANY FUTURE?

Mohamad, N. and Wan Mohamed, W.E.
Manufacturing and Agribusiness Division
Kumpulan Guthrie Berhad

ABSTRACT

The paper highlights the critical failure and success factors that influence the growth of the sheep industry. These factors include the market, market promotion and key policy issues that will determine the success of the industry. It also suggests the "must" actions to be addressed and introduced urgently for the industry to have a future in Malaysia.

APPLICATION OF MODERN TECHNOLOGY FOR THE CONTINUED DEVELOPMENT OF THE OFFSHORE FISHING INDUSTRY

Ahmad Fuaad Ahmad Sabki
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

The offshore fishing industry is in its fifth year since its implementation in 1987. Much has been said about its impact on the overall performance of the Malaysian fishing industry. Opinion about its success varies from those who say that it is a very successful venture to the sceptics who believed that it has been a total failure. There are also numerous others who holds that no significant improvement has been achieved since 1987.

To critically evaluate the overall performance, it is necessary to keep in perspective five important factors that would contribute to the improvement of the fishing sector, namely economics, human resources, management, legislation and technology.

The importance of appropriate technology for the fishing sector will be elaborated paying particular attention to the basic hardware of the fishing industry i.e. fishing boat. The proper design of an optimum fishing vessel taking into account the local requirement will not only increase the overall performance but more importantly will have way for the further innovations that will benefit the industry at large.

This paper will also discuss the current level of technology that has been in use and the actual level of technology that is required. The use of modern technology not only benefits the fishing industry but have a direct influence on the boat building industry. Reference will be made to the findings of a long term research project undertaken by Marine Technology group in UTM funded by IRPA.

Finally, a methodology for the systematic application of modern technology will be put forward to ensure further advancement of the offshore industry not confining the programme only to the Exclusive Economic Zone.

NATIONAL AGRICULTURE POLICY : TOWARDS A COMMERCIALIZED AGRICULTURAL SECTOR

Abdul Aziz Abdul Rahman
Centre for Agricultural Policy Studies
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

This paper attempts to elucidate the implication and impact of the National Agriculture Policy on the commercialization of the agriculture sector, particularly the smallholder subsector. The rationale for greater commercialization is first reviewed, followed by an elaboration of the strategies and programmes to achieve this. The subsequent part then broadly examines the structural, socio-economic, technical and marketing issues that impinge on the commercialization efforts. The final part in turn provides the major areas and directions for an intensified research and development activities which can form the basis for more specific technical and economic appraisals.

THE FUTURE OF THE OIL PALM INDUSTRY IN AN INDUSTRIALIZED NATION

Chan Kook Weng
Guthrie Research Chemara
Jalan Sungai Ujong, 70200 SEREMBAN

ABSTRACT

The Oil Palm Industry will continue to play a significant role in contributing to the growth of the Malaysian economy. There must be some structural changes made to both upstream and downstream activities. Eight underlying driving forces have been identified; the first is the need to maintain a competitive edge as a low cost producer through agricultural and biotechnical advances. This will require better and higher oil-yielding oil palm varieties, an increase in land/man ratio, better labour productivity and a definite higher capital/labour substitution to reduce labour dependency through mechanization, automation and computerization. Secondly, is the need for the industry to remain a source of employment to uplift of rural living standards. The embedded problem of smallholders in the industry will be tackled by land consolidation of uneconomic holdings and the development of a more effective extension system to overcome hindrance to technology transfer. The third driving force will be that of a greater emphasis on downstream activities into both edible and non edible uses. Strategies for food and non-food uses in all three situations of developed nations, emerging economies and developing countries will differ. Consumer awareness on the elucidation of the nutritive value of palm oil is required in developed countries to shift the opinion on saturated/unsaturated fats and cholesterol on coronary heart diseases. The fourth is the political development of trade blocks and the need to have various linkages through governmental connections to further develop palm oil related industries. Management styles in industrialized Malaysia will change based on principles of market driven rather than technology driven requirement. This forms the fifth driving force which will see more acquisitions, joint ventures and licensing to speed up product generation. As innovation is critical, R&D must be stepped up. This is the sixth driving force where the universities and higher institutions of learning will assist the industry in providing educational facilities to train scientific and technical manpower, particularly in the field of chemistry. All these are done with negligible environmental impact and such changes in technology will be driven by the growing need for environmental concerns. This is the seventh underlying force where the trend will be on sustainable production, renewable resource and biodegradability. Finally, the eighth underlying force is the

change in the business profit philosophy which will be geared towards greater corporate citizenship. The industry will reflect a combination of a caring and green marketing business benefiting the people and the environment. The future is bright for the oil palm industry.

POSTHARVEST TECHNOLOGY OF FRUITS AND VEGETABLES: STATUS AND FUTURE R&D

Adinan Husin, Abdullah Hassan and Mohd. Salleh Punan
Food Technology Research Centre
Malaysian Agricultural Research and Development Institute (MARDI)
P.O. Box 12301, 50774 KUALA LUMPUR

ABSTRACT

Fruits and vegetables are living tissues which continue most of their metabolic processes that exist before harvest. These processes will result in some changes which influence and determine their final quality after harvest. Due to the perishable nature of the produce, it is necessary to handle them properly right after harvesting until they reach the consumers tables. Besides production and marketing, postharvest handling is also considered a major influential factor in the development of the fruit and vegetable industry in Malaysia. Handling requirements for different types of produce are determined by the market, consumer, distance and modes of transportation. For domestic market, improvement in handling practices will result in major reduction in postharvest losses and better quality produce for consumers. Development of appropriate and effective postharvest technology specifically for export will allow the produce to be transported economically by sea to more distant countries, hence opening opportunity for larger market expansion. The present status of postharvest handling technology of fruits and vegetables in Malaysia and research activities being undertaken to cater the present and future needs of the industry are discussed in this paper.

MARKET POTENTIAL FOR HORTICULTURAL PRODUCE: AN OVERVIEW

Mukhtiar Singh

Federal Agricultural Marketing Authority (FAMA)
Ministry of Agriculture, Malaysia

ABSTRACT

The relative fall in value of the traditional export crops of Malaysia, such as rubber and oil palm, gave added impetus to the development of the horticultural industry, beginning in the mid-eighties. Furthermore amongst the larger producers, with the formulation of the National Agricultural Policy (NAP) which encouraged the large-scale development of this industry to secure new sources of income, boost farm earnings and to ensure adequate supply of quality local produce for a growing population.

Market potential can be analyzed in terms of domestic consumption, import substitution and most importantly exports. Domestically, the diversity of the diet of its multiracial society, and rising income have created a very strong demand for local fruits and vegetables. There is also scope to win existing demand through selective import substitution as Malaysians expend heavily on its import bill for these products. The greatest potential still lies in exploiting the vast demand for Malaysian fruits, vegetables and flowers abroad which requires a concerted effort in promoting exports. Over the last five years, there has been a healthy growth in horticultural product exports to traditional as well as new export destinations.

While the horticultural industry has made progress in terms of growth domestically for the export market, further coordination and actions are needed in a number of areas to exploit the full market potential abroad. Such an action plan will include developing a more comprehensive, systematic and effective export marketing management programme spanning from production, post-harvest to marketing requiring the cooperation of both the private and public sectors under the Malaysia Incorporated approach.

MANAGING SMALLHOLDERS' AGRICULTURE FOR COMMERCIALIZATION

Abdul Jamil b. Mohd Ali
Department of Agriculture
Malaysia

ABSTRACT

The agricultural sector continues to be important sector in providing sufficient, reasonably priced and quality food for the growing population as well as raw materials for industry. Commercializing agriculture and increasing farm income of smallholders in the future require technological innovations and structural changes to overcome constraints presently faced by smallholders and the sector. The declining smallholders' land size and rural labour force create opportunities for land consolidation and centralized farm management towards group farming, a situation more conducive for technology transfer and adoption.

Commercialized farming for smallholders would have to take cognizance of effective and efficient management of human and land resources, pests, marketing, research and development as well as information system. Research and development would have to be intensified and enhanced to ensure that the agriculture sector stays productive and competitive.

THE USE OF LIVE SUPPORT IN THE GROWING OF PEPPER

I. Abd. Rahman Azmil¹, J. Varughese¹ and P.Y. Yau²

¹ Horticulture Division, MARDI, 86009 KLUANG

² Horticulture Division, MARDI, P.O.Box 12301, 50774 KUALA LUMPUR

ABSTRACT

Deadwood posts are traditionally used as supports for pepper cultivation in Malaysia. The scarcity and soaring prices of these hardwood timbers over the past few years, however has necessitated the investigation of suitable and cheaper alternative support systems. One such alternative system is live trees which have been successfully and extensively used in India and to a lesser degree in Indonesia. Since the early 1980s MARDI has been investigating the use of live trees as alternative pepper supports in Johor.

As a result of these investigations, *Erythrina indica* (dedap), *Pterocarpus indicus* (angsana) and *Gliricidia maculata* were identified as possible alternatives. Pepper grown

on angsana gave yields comparable to those on Kulim deadwood, but the difficulty in its maintenance precludes its continued use. *Gliricidia maculata*, while suitable as pepper support, reduced pepper yields by comparison. Dedap was by far the most suitable, as growth and yield of pepper grown on it was similar to that on deadwood and its maintenance was relatively easy.

Root activity studies using ^{32}P further substantiated the suitability of dedap as pepper support. Its active roots are fairly uniformly distributed down to a depth of 100 cm, making it less competitive. *Gliricidia*, on the other hand, would be a strong competitor to pepper for nutrients (surface applied fertilizer) as the bulk of its active roots (67%) are located within the upper 5 cm of the soil profile. Pepper of the variety Kuching was found to be the best for dedap support system as it gave the highest yield in a varietal evaluation study.

Based on current prices of Kulim deadwood and dedap supports, 70% of the establishment cost of pepper cultivation could be saved by using live supports. Financial analysis over a 12 year period also indicates that the use of live supports would double the internal rate of return (IRR) while shortening the payback period as compared to deadwood supports. The use of dedap live support system, therefore has the potential to enhance the returns from pepper cultivation.

TETRAZOLIUM STAINING FOR ASSESSING BEAN SEEDS QUALITY

Petrus Bulan

Centre for Applied Sciences
University of Agriculture Malaysia
Bintulu Campus, Bintulu, Sarawak.

ABSTRACT

Tetrazolium (TZ) test is a widely accepted, accurate and rapid technique developed to provide "quick" estimates of seed viability, useful in facilitating the buying and handling of seeds. Mungbean and whitebean seeds differing in initial germinability were used to evaluate techniques for preparation of seeds for effective tetrazolium testing of viability and to categorize the observed staining patterns. Predicted and potential germination from tetrazolium staining responses of the seeds are discussed.

CYTOPLASMIC POLYHEDROSIS VIRUS: A POTENTIAL ALTERNATIVE TO CHEMICAL CONTROL OF INSECT PESTS

Joseph Bong
Center for Applied Sciences
Universiti Pertanian Malaysia Kampus Bintulu
Bintulu, Sarawak.

ABSTRACT

Cytoplasmic polyhedrosis virus (CPV) is capable of infecting a wide of insects. It causes a chronic disease in the midgut of the host. CPV can be readily mass produced in an insect host. The pathology of the disease and strategies for exploiting the potential of CPV as a biological control agent for insect pests are discussed.

PERFORMANCE OF DEEP-SEA TRAWLERS ON THE WEST COAST OF PENINSULAR MALAYSIA

Mahyam M.I.
Department of Fisheries
Fisheries Research Institute
11700 GELUGOR

ABSTRACT

Monthly observations on the landings data of deep-sea trawlers (70 to 100 GRT) at Hutan Melintang, Perak were carried out in 1991. The landings were grouped into five main categories, namely: Grade I fishes, Grade II fishes, Grade III fishes, prawns and trash fish. Investigation on species composition, catch rate and fishing areas were also carried out and the findings were discussed. The majority of the catch consisted of trash fish (55%), followed by Grade III fishes (40%), Grade II fishes (3%) and Grade I fishes (2%). Prawns contributed an insignificant amount to the total catch. An analysis of the species were caught. The Nemipteridae and Sciaenidae were dominant in the catch of the monitored boats. Seasonal changes in species composition were not significant. The catch of compared to about 4892.51 kg/trip/boat of trash fish.

EVALUTION OF LOCALLY AVAILABLE POTENTIAL SOURCES IN LARVAL AND FRY DIETS

Roshada Hashim, N.A.M. Saat, I.C. Omar and W.C. Hoong
School of Biological Sciences,
Universiti Sains Malaysia,
11800 PULAU PINANG

ABSTRACT

This paper presents some of the findings from studies on fish nutrition that were being conducted at the Universiti Sains Malaysia. Three different locally available materials are tested in these studies: Single Cell Protein (fungi) as a larval diets for snakehead (*Channa striatus*) and Red Tilapia (*Oreochromis* sp.), raw seaweed (*Gracilaria* spp., *Sargassum* spp., *Polycavernosa* spp. and *Ulva* spp.) for snakehead (*Channa striatus*) fry and winged bean (*Psophocarpus tetragonolobus*) as an alternative protein source for catfish (*Clarias* sp.) and Red Tilapia fry. Single cell protein is acceptable to the larvae but the growth performance is low, it may be due to digestibility problem. Among the seaweed, 5% *Ulva* spp. has attractive aroma which functions as an attractant. Winged bean gives better growth and feed utilization at 33 to 50% levels as replacement of fish meal in the diets. In general, winged bean could be use in formulated feeds that can serve as alternatives to the soybean presently used by fish farmer.

AN EVALUATION ON THE SIZE OF NETS AND OTTERBOARDS USED BY SOME MALAYSIAN OFFSHORE TRAWLERS

Rosidi bin Ali and Ibrahim bin Johari
Fisheries Research Institute,
Department of Fisheries,
11700 GELUGOR

ABSTRACT

This study was conducted in 1991 to evaluate the suitability of the size of trawl nets and otterboards used by local offshore trawlers. Observations were carried out at trawler bases in Batu Maung, Hutan Melintang and Kuantan. The design of nets and size of otterboards used by three offshore trawlers were recorded (i.e. one boat for each station). Two methods were used to analyze the data. The first method is a mathematical model derived from the Koyama's and Nomura's formulae. The second is a graphical model

cited from the FAO Fishing Manual. Results from both methods show that all three trawlers use bigger nets and smaller otterboards than the optimal size in relation to the vessels' engine capacity. This caused a reduction in the efficiency of trawl nets as well as higher operational cost.

FLOCK PROFILING USING MULTIPLE KINETIC ELISA

Ungku Chulan

Faculty of Veterinary Medicine and Animal Science,
Universiti Pertanian Malaysia, 43400 UPM SERDANG

ABSTRACT

Although poultry farmers appreciate the necessity of monitoring the immune status of their flocks, the hassle of collecting blood samples in syringes, processing the serum, sending the serum in vials in iced containers, and finally getting the results after a few weeks made them wary of the whole exercise. This scenario has changed drastically with the introduction of an innovative and rapid diagnostic service using the ELISA technique. Using 2 drops of blood per chicken collected onto a filter paper strip, the punched-out filter paper disk was processed for the serum antibody titres for Newcastle Disease (ND) and Infectious Bronchitis (IB) using Multiple Kinetic ELISA (MK-ELISA) technique. Unlike conventional ELISA technique, 2 different antibodies (ND and IB) are determined on the same plate, and instead of using the end-point reading of absorbance, the kinetics or rate of change of absorbance over time are used and correlated to the titers based on positive and negative standards. The computer is used to control the ELISA reader and to calculate the titres within a few minutes of reading the substrate reactions. The MK-ELISA has high sensitivity and specificity as well as being more rapid and cheaper than conventional ELISA. The convenience of collecting the blood sample and sending it to the laboratory by fast courier service as well as the low charges for the quick ELISA tests has prompted more poultry farmers to utilize the diagnostic services. The services helped poultry farmers to monitor the efficacy of the vaccines used as well as the effectiveness of the vaccination programmes. In some cases it helped to detect outbreaks of disease in some flocks. In addition, it stimulates the vaccine importers and suppliers to be more concerned about the quality of these vaccines which are being sold to the poultry farmers. The implication of this ELISA technique with reference to the flock health programmes in particular and the poultry industry in general will be discussed.

SANGKAR CONTOH SULUNG TERNAKAN IKAN LEPAS PANTAI

Daud Hj. Abdul Rahman,¹ Hambal Hj. Hanafi²
dan Ismail Yahaya³

¹Universiti Teknologi Malaysia

²Institut Penyelidikan Perikanan, Pulau Pinang

³Marine Culture

No manuscript provided.

WALKING CATFISH, *Clarias batrachus* (Linnaeus), RESEARCH AT UNIVERSITI PERTANIAN MALAYSIA

S.H. Cheah, S.S. Siraj , S.K. Daud, C.R.Saad,
M.S. Kamaruddin, I. Patimah and K.J. Ang
Faculty of Fisheries and Marine Science
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

In the Fifth Malaysia Plan, the Finfish research group was established under the programme for the Development of Appropriate Technology for Optimization of Aquaculture Production (MPKSN 1-07-05-012). One of the priority fish species that was identified for intensive research was the walking catfish, *Clarias batrachus* (Linnaeus). Since 1987, the Finfish group in association with other groups have been working on several aspects such as breeding, larval and fry rearing, nutritional requirements, genetics and diseases of this fish, and the research activities have resulted in the publication of several technical papers. In the Sixth Malaysia Plan, the Finfish research group has matured into a programme by itself called Breeding, Culture and Stock Manipulation of Finfish including Aquarium Fishes (IRPA: 1-07-05-078) to reflect the current needs of the country. This paper reviews the achievements, discusses the results of current projects and also identifies new areas of research for *Clarias batrachus*.

ACUTE TOXICITY OF COPPER TO SEVERAL SPECIES OF FRESHWATER FISH

I. Patimah

Faculty of Fisheries and Marine Science
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

Copper toxicity was studied on three species of freshwater fish namely: red tilapia, (*Oreochromis niloticus* female x *Oreochromis aurea* male, rohu and *Labeo rohita* and keli kayu, *Clarias batrachus*. Fish fry of total length 4.5 ± 0.2 cm were subjected to test solutions which range from 0.08 ppm to 0.20 ppm for rohu, 0.34 ppm to 1.2 ppm for red tilapia and 0.40 to 1.20 ppm for keli kayu under static condition. The 48 hr and 96 hr LC_{50} were found to be 0.191 ppm and 0.153 ppm for rohu, 0.88 ppm and 0.66 ppm for red tilapia and 1.23 ppm and 0.78 ppm for keli kayu respectively. From this study it shows that rohu is very sensitive to toxic substance followed by red tilapia and keli kayu. The lethal threshold value for rohu, red tilapia and keli kayu were 0.015 ppm, 0.066 ppm and 0.078 ppm respectively.

GENE TRANSFER - ITS IMPLICATION TOWARDS AGRICULTURE DEVELOPMENT

I. Patimah

Faculty of Fisheries and Marine Science
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

The success of fisheries depends on the natural population of freshwater and marine life. The extensive construction of hydropower plants on rivers, pollution of seas and freshwater due to the increasing industries and agricultural wastes, over exploitation by commercial and sportfishing and poor stocking programme, have brought the harvest to decline drastically.

Due to the need of aquaculture, genetic studies such as genetic selection and conservation of genetic resources of fish have to be improved. Gene transfer in fish concentrate mainly upon the development of new expression vectors utilising new regulatory elements or structural genes. Two techniques have proved to be successful in producing transgenic fish, viz microinjection and

electroporation. The aim of this study is to determine the possibility of producing transgenic fish using our local freshwater fish using both techniques.

KANDUNGAN ASID ARAKIDONIK DALAM BEBERAPA SPESIES IKAN AIR TAWAR

Abdul Manan Mat Jais, Hassan Hj. Mohd Daud dan Che Roos Saad
Jabatan Biologi Ikan dan Akuakultur
Fakulti Perikanan dan Sains Samudera
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRAK

Ikan-ikan air tawar pasaran di Malaysia seperti Jelawat, Patin, Tilapia, Kap, Keli dan Haruan mempunyai keistimewaannya yang tersendiri terutamanya dari segi rasa, rupabentuk dan perkaitannya dengan perubahan tradisional. Namun begitu, penumpuan khusus terhadap nilai pemakanan ikan-ikan ini, contohnya asid lemak perlulah diberi perhatian. Di dalam kajian ini kandungan asid arakidonik adalah merupakan teras utama menonjolkan keunggulan haruan di dalam membantu penyembuhan luka berbanding dengan ikan-ikan air tawar lainnya dan ini adalah bagi menjawab persoalan kenapa haruan dan tidak ikan-ikan lain. Untuk itu, profail asid lemak ikan-ikan yang berkenaan telah dianalisa menggunakan kromatografi gas Hewlett - Packard 5890 A.

EFFECT OF REMATING INTERVAL AND WEANING AGE ON CARCASS TRAITS IN NEW ZEALAND WHITE RABBIT

Abdul Majid Mohamed and Hanafi Harun
Universiti Kebangsaan Malaysia
43600 UKM BANGI

No manuscript provided.

PANEL DISCUSSION - AGRICULTURE

Theme : "Technology Transfer in Agriculture"

Panelists : Dato' Hj. Abu Bakar Mahmud (Chairman)
Prof Dr Jalani Sukaimi
En. Teoh Cheng Hai
Dr Hadi Dato' Hashim

Prof. Dr Jalani Sukaimi

Farmer's requirements:

1. New inputs: this involves up-to-date information on new varieties of crops, breeds of animals, agrochemicals, equipments,
2. Techniques of production: land use management; rates and techniques of fertilization and irrigation; effective crop protection, etc.
3. Economic factors of production: choice of commodities that can be produced with a profit; information on marketing conditions and prices, techniques for preparing produce for the market, etc.

Current mechanism of technology transfer:

There are several categories of activities; regulatory and surveillance work; advisory work and servicing; promotional work; research and development.

Future trends in agriculture:

1. Emphasis on crop production systems using computer models to integrate information from various disciplines;
2. Rapid expansion of integrated pest management programmes;
3. A greater effort to helping farmers cope with government regulations in regards to improving water quality, involving work on food safety, pesticides, control of plant pests and diseases;
4. More emphasis on limited tillage, soil testing and plant tissue analysis, increased efficiency in the use of fertilizers, etc.
5. More emphasis on animal health, and reduction of residue problems related to the use antibiotics and sulphonamides;
6. More help for farmers in coping with financial management problems.
7. With more families now gardening, more help will be given to urban people with gardening information.

Successful transfer of technology in Taiwan due to:

1. An effective linkage system between all the institutions involved in agricultural development.
2. Overall co-ordination of research and extension activities.
3. Research oriented to the needs of the farmers.
4. Extension does not confine itself to transmitting information.
5. Satisfactory working conditions for researchers and extension workers.
6. Farmers are responsive to innovations.
7. The majority of the farmers are literate. They are eager to learn about new technologies, and adopt them rapidly. Farmers who are considered 'innovators' are highly valued sources of information.
8. Farmers' representatives are involved at all levels of decision-making.

Problem in technology transfer:

Time lag in the adoption of new practices caused by;

1. The time required by research and extension before they are prepared to recommend the adoption of a new practice,
2. The time interval between awareness of the individual farmer of the new techniques and its adoption,
3. The length of the diffusion process in the farming community,
4. The type of innovation and interactions between the new inputs,
5. Environmental factors,
6. Social, economic and institutional factors.

Improving the technology transfer:

1. Need linkages between research and development and extension (interinstitutional linkages) to reduce time lag.
2. Advantages of such linkages are:
 - Improved availability of information on innovations for the extension workers;
 - The research workers are kept constantly aware of the technical, social and economic problems encountered by the extension agents in their contacts with farmers;
 - The time lag between research findings and their adoption is reduced;
 - o Improved understanding between research and extension workers, working jointly towards a common goal;
 - o Involvement of the researchers in the extension work makes it possible to reduce the number of extension specialists;

The research centers can undertake the in-service training of the extension workers.
Efficient agriculture information system, for dissemination of knowledge.

En. Teoh Cheng Hai

New National Agriculture Policy

- to transform the agriculture sector to be modernized, use superior planting material and use related high technology to the optimum.
- Wide difference between yield of smallholders and estates brings out question if transfer of technology to smallholders is effective.

Private sectors' experience:

1. Plantation (private and public) has strong R&D culture.
2. R&D findings are immediately reviewed, evaluated on commercial scale and costing is done for economic viability.
3. Viable findings are adopted as commercial policy within the company.
4. There is good follow up from R&D to practice, with regular training for new techniques (for managers, extension agents etc.)
5. Regular monitoring by planting advisers, managers and researchers to ensure proper implementation of the new practices and also to get feedback from the field.
6. Within major companies there is active R&D and transfer of technology and information.
7. Technical committee represented by private sectors, research institutes, smallholders where new ideas is made.

Dr Hadi Dato' Hashim

Public sector's experience:

1. Technology transfer takes very long time and expensive because new technology developed is adopted by department for evaluation and field trial before being introduced to farmers.
2. Panels established with representations from various departments, institutions and industries to interact, exchange research findings and discuss various issues related to the industry.
3. R&D information from private sectors are hard to come by.
4. Manpower development within government departments too centralized.

Discussion

1. Lack of communication for transfer of knowledge between scientists of various disciplines and also within the same discipline.
2. Accessibility to capital between corporate, private sectors and smallholders. Need for financial facilities for smallholders to adopt new technology.
3. Should have multidisciplinary team for multidisciplinary approach to reduce time lag in transfer of technology from R&D to farmers.
4. Need for agroclimatic zoning of areas for agriculture.
5. Need for focussing and refinement of objectives.
6. Need to address conceptual problem between rural population: change perception to farming for money.
7. Need to educate core group of farmers to produce educated farmers (more knowledgeable in the management and economics of farming) and make farming more respectable.
8. Need to make farmers seek for technology themselves or present new technology they developed themselves.

SUMMARY BY CHAIRMAN:

1. Ineffective communication between scientists,
2. Resource endowment or capital accessibility for technology,
3. Time lag of technology adoption, need for direct contact,
4. Focus and refinement of appropriate technology,
5. Proper zonation of crop is important for better use of land and resources,
6. Need for educated farmers,
7. Encourage queries from farmers.

PART IV

**SEMINAR:
SOCIAL**

HUMAN RESOURCE DEVELOPMENT IN NATION BUILDING

Prof. Glyn O. Phillips

Chairman of Newtech Business and Innovation Centre
and Visiting Professor, University of Salford, U.K.

ABSTRACT

Twenty years ago in Malaysia there was a hustle of excitement associated with individual personal development. Higher education establishments throughout the world were populated with enthusiastic young Malaysians, whose mission was to return to develop their country. Is the same motivation still active today among these individuals? Are they able to transfer the vision that motivated them to their students? What are the needs now that Malaysia is changing gear again with increased industrialization, due mainly to inward foreign investment. Such investment brings along with it problems as well as opportunities. These matters will be discussed and consideration will be given to the roles of:

- o Education
- o Training
- o Innovation (or Enterprise)

Opportunities in these activities will be considered, in relation to the comparable developments in Japan and Europe. Interaction between education and industry can yield creative developments within companies and promote a greater realism within academic research. Mechanisms for promoting such industry-education interaction in Japan and Europe will be outlined and NEWTECH utilized as a specific Case Study.

I marvel at the development of Malaysia today; the transition that is taking place from the developing to the newly industrialized country today. I must pay a tribute to the firm, fair and dynamic leadership that have been provided by your government, in particular your Prime Minister. When I first arrived here twenty years ago the universities were at the embryonic stage. Apart from the University of Malaya, the UTM was the technical college based in Kuala Lumpur, the UKM was just a tiny campus, and everywhere I looked it seemed to be boys doing men's job; and now, today you are working on the eighth university. Let me congratulate you!

* Professor Phillips is the author of **Innovation & Technology Transfer in Japan and Europe**, Rutledge, New York & Lond. 1990, ISBN0-415-03216-4, and **New Fibers** (a study of innovation in the textile industry in Japan), Ellis Horwood, New York & Lond. 1990, ISBN 0-13-613266-9).

Malaysia, a new independent country, is blessed with abundant natural resources such as oil, gas, rubber, palm oil, timber, and many more natural produce, mainly agriculture based. Unlike many other developing and newly independent countries which had similar benefits, Malaysia has progressed. The difference is certainly from the start Malaysia had other which is regarded as the best and most important natural resource i.e. human resource. In the 1970's, your talented young people went abroad in thousands; at one time there were 64,000 young Malaysians being trained in the United Kingdom. I was then a Professor at the Salford University. And those remaining at home, also carried additional burden to administer or manage the universities. Over the years at Salford and as the Principal of the Welsh College I had the privilege in dealing with several hundreds Malaysian students with more than 35 postgraduate research students and now they are moving into distinguished positions here. I am very pleased to be able to play a small part in developing this human resource. The motivation at that time in a sense was the excitement of starting up something. It was the beginning and those coming out at that time were imbued with the excitement of setting up new universities and the new nation.

Of course there are difficulties at the beginning of everything and there are hazards on the way, the dangers appear when the original excitement has worn off. The excitement at that time must be replaced by another driving force if there is going to be continued progress and continued prosperity. I was in Malaysia earlier this year in April, I sensed a change in the mood had occurred. If I can use the analogy of a car starting, Malaysia went into the first gear very quickly, accelerated rapidly into second gear, moved into third gear and now going into third gear looking for the opportunity to get into fourth gear which allow you to cruise and self-generate the situation. When you get to the top gear, it is very economical and certainly it is very easy. This is equally an important period after that initial start.

In April, your distinguished Prime Minister made an appeal for skilled expatriate Malaysians to return to support the new industrialized technical sector that you have. The problems of facing the new investment situation can be quite difficult as the original starters; they are not different overall but can be much more difficult because you have passed the first stage of the development and now you are developing in the context of the science and technological society.

The distinguished historian Professor Herbert Battlefield said that the scientific revolution of the 16th and 17th century outshine anything since the rise of christianity and make the renaissance and the reformation mere episodes, mere displacements in the system of medieval christendom. The scientific revolution has changed the world. Science has changed the condition of man's life, and change the way man think of himself and the world. It has changed the world. The world is different now to the world that we saw in 1970's. The people are different because we

are all conditioned by this change in science and technology. Your national plan of action for Vision 2020 defines very clearly what is needed. I read, "the vision for the future is a nation that can understand, simulate and finally generate its own indigenous technology". You need people who can generate. Now, of course your education and your programme is really quite breathtaking at all levels in the system. Of course you need vocational training, you also need people who can do things rather than people who sit in the offices but most important are generators who can generate the new technologies, who can generate the wealth and these are innovators. May I suggest that now is the time to develop the innovation culture, the culture of enterprise, the culture of creativity. How can this culture be generated or developed? In my book "Technology Transfer and Innovation in Europe and Japan", I compare the methods by which Japan and Europe had in fact developed their technology, innovation and technology transfer. They did it differently and they have been both quite successful; some countries in Europe are more successful than the others. Both Europe and Japan have had their share of success in the innovation field and the technology development. What are the elements and the game plans in these two parts of the world?

First of all is the investment in the research and development. That is the climate in which the innovation occurs. Research is happening already but can research lead on to the development? That is the challenge!

Table 1 shows comparison of the amount of expenditure that different countries are having. About 2.5% - 2.7% of GNP was recorded for the most rapidly industrialized countries in the mid 80's. Japan has moved well over 3% of GNP of which only 0.1% was spent on defense research and development; all the rest on civil research and development. It indicates that Japan has spent almost double the actual expenditure on research and development than any other countries. Japan was a disenchanting country after the last war, in disillusion and really had to start from scratch; the whole emphasis has been on investment.

Figure 1 shows the growth of commitment for research and development in Japan over that period: it is an exponential graph, as the research and development move ahead very rapidly, converts research into a different climate.

Priorities are also different in different countries. In Japan, priority is also given to physical science and engineering but bigger emphasis is on practicality. There has not been any real change but there is fundamental difference between the two; that is small amount of GNP on basic academic research in Japan, almost half that in other countries of Europe. The major emphasis in Japan has been on applied research or development work. First priority of investment in research and development is the climate where the innovators thrive, the climate in which they must operate. It clears the mind in the sort of the direction that provides for practicality, the emphasis is then clear to see.

Table 1: Gross And Government Funded R&D Expenditure On Science, Technology Social Science And Humanities In 1983 For The U.K. & Other Countries.

	Government funded R&D ² as a % of GDP				
	£ billion	as a % of GDP ¹	Total	Defence	Civil
United Kingdom	6.7	2.3	1.33	0.66	0.68
France	7.1	2.1	1.40	0.46	0.94
Germany	9.9	2.6	1.14	0.11	1.04
Italy	3.2	1.2	0.71	0.04	0.67
Japan*	16.8	2.5	0.53	0.01	0.52
United States	48.7	2.7	1.18	0.76	0.42

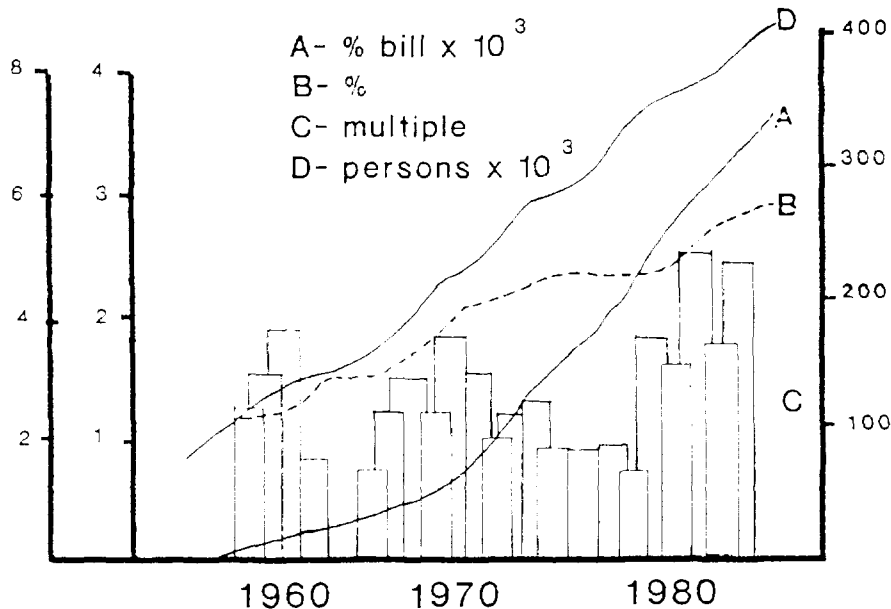
¹ - Gross R&D expenditure, i.e. the sum of intramural R&D, in all sections (government, higher education, private industry and private non-profit).

² - R&D expenditure, intramural and extramural, by Government.

* - 1982 for gross R&D, 1981 for Government funded R&D. There are considerable difficulties in comparing R&D funding by the Japanese Government and funding by the Government of other countries. For example, data available for Japan include only intramural spending and general university funding.

Source: OECD, using OECD rates of exchange.

Fig.1: Growth of R&D commitment in Japan



The second emphasis is on the partnership that exists between the industry and the academia and education. In Japan, even now throughout Europe and the United States, the partnership has been forged between the two to enable the private industry, the universities throughout the whole world, the government, forming one partnership in which the free flow of information, a flow of people and great incentive for the academic to create. Because after all if a country is investing so much money in its academic structure thus it is right and proper that there should be some economic return. And having this close partnership of initiation thus allow the practical nature of the work and the innovation to succeed. This is really happening and there has been of course targeting. For instance in Japan, starting in the 60's right through 80's, measures of academic was related to the practical priorities that have been set up. Donations from industry to the national universities in Japan increased exponentially after a very bad start in the 60's. The students were rebelling as their professors spent more time in industry than they were in the universities and there was a lot of problem; but thereafter the balance started to show and MITI managed to ensure that there are excellent systems of interaction between industry and education to the benefit of both. There is always competition among scientific research, the number of applicants versus number of successful applications; both have increased but the applications have risen faster as well as the number of joint research projects over the years. Joint research projects between industries starting in the early days right through to '86 to '87, and still, has been increasing; in the same way increase in donation by the universities. More interaction has occurred. One complex example is in the telecommunication research area, a specific institute drawn together so each sector of this can work together with the universities providing both input and practical, firms and government institutions work together in the creation which is a glory to behold in the form of the science city in Tsukuba. In the green field of Tsukuba, there are 45 national institutes, the large university of Tsukuba and now there is a great deal of investment by industry in research; all producing a vast science park in which there is a thriving interaction and already the results are coming out. This is the fruit of the industry-education practical interaction that is leading to innovation and new technology. So the second ingredient or emphasis would be the partnership ingredient between education and industry.

The third emphasis is the second runner syndrome, and this is worth concentrating upon. As a second runner, you can sit along side the first one while the first is taking the wind. Just at the last lap, the second runner can pass the first runner and win out. Japan has benefited from the second runner syndrome so far. They can beg, borrow, dare I say, steal the technology from the leading runner. The gap has been closing the whole time and now in many instances they have come together.

In many instances, Malaysia is a second runner and to the extend one should make full use of the second runner status. It is very important to ensure that you do not re-invent new technologies. There are enormous number of technologies or developments just waiting to be completely utilized and to enable that sort of training in entrepreneurship and in innovation to achieve a practical result. So the second runner has considerable number of advantages as well employed by Japan in that system.

I did a survey on 83 technologies of this area. This is the same as the US 10 years ago as well as in term of level. Japan has been targeting in specific technologies. Targeting is vitally important in technological development. The number of technologies has increased considerably. In many instances, Japan has moved along side the United States.

This leads to the other syndrome i.e. creativity. The method by which creativity occurs is different in Japan and in the West. The classical definition of creativity is that of Fleming discovering penicillin; growing bacteria on the agar plates were contaminated by spores coming from the surroundings. He noticed the disappearance of bacteria around the spores or fungus and was able to connect two things (bacteria and penicillin from fungus) that had not previously been connected. That is the element of creativity, by connecting two unconnected things led Fleming to discover penicillin, which otherwise there would have been no penicillin today. Creativity should be hand in hand with practicality. In Japan it is described as associated creativity. The Managing Director of Sony defined associated creativity as a creativity based on hints, in other words, by having just some forms of hints about what is necessary one can plan accordingly. To the western, the independent style of creativity is a target finding opportunity. You look at the target and go for it. I would call this as the TARGET ORIENTATION depend on the western culture on the idea, while the Japanese, on the other hand are completely GROUP ORIENTED. Their action is more cooperative and they want to move into action. Very often in the west, they think that having idea is enough but they do not make practical use out of it and their own idea is highly personal. In Japan they cooperate and modification is more important, improvement, systematize, total quality system and these are all organizational arrangement. Malaysia has a choice in looking at these to take the best out of both systems. Both associated creativity and the western style creativity are equally important but on their own, both have their own weaknesses. The conformity to group is a vital aspect of Japanese life. They are getting considerably worried because they are now becoming the front runner, they need new ideas when they can no longer license anymore new technology, they cannot buy or steal it and now they have to do it themselves. The Japanese system is being reorganized; more basic work is being introduced into universities, schools are now imbued with independent type of thinking, many more western scientists are being invited into Japan whether they can learn this type of creativity. They have

recognized there are weaknesses in the total group system. It is therefore very important to have a creative system but must be properly managed in the same way. That is a great glory in the Japanese system i.e. the management of that area.

Another final indication is the management of innovation. For example the Newtech Innovation Centre where I am privileged to be the chairman. Like many other systems, Newtech is a member of the business and innovation centre network throughout Europe and the point I want to make is that it requires management. Innovation will not happen spontaneously, it requires an organizational system that brings together the partners and enable the individual elements that I have mentioned to come together. Academic training is what universities are sure and able to do. To integrate innovation, training and culture, an enterprise thinking into the system requires another dimension and therefore innovation centres throughout Europe collaborate together in defining and exchanging new technology. We would be able to obtain and utilize any technology, and the very activity of doing that provides the positive areas. Newtech is a collaboration between the North East Wales Institute, the County Council, the Welsh Development Agency and other partners. We are by nature in Wales consider this collaboration as a big job and it is quite remarkable with four organizations could bring together to set this. In this innovation centre the aspect of commercialization is assessed if the research and development comes out either at the institute or anywhere else. The questions imposed are : Can they be commercialized? Is there a market for this? Can a kit be prepared which is practical enough for use? If so what is the production cost? Can a prototype be made? Can the whole exercise go through before commercialization occurs? This is the centre of enormous industrial technology park. Setting up this innovation system and producing the quality out of the investment is the key part. You have to start up, may be you need help from industry eg. hands-on-experience and turnkey operation initially to get the job done but now the job is not so much important but the quality of investment. The innovation centre could provide the total environment for innovation and technology transfer, and could also provide technology based equipments and prototype manufacturing system, training on innovation system, analytical support for industry, evaluation of the system and appropriate consultancy for young new companies without resources and communication skill. The centre is becoming one-stop shop for technology and innovation training.

We need total environment for innovation because all of these individual areas are needed. Research in itself is insufficient therefore I stress on applied research and development. Technical advice to a new company is important; commercial and technical information is needed by specialists who want to evaluate a new system; business advice is needed by small companies, technology transfer is vital today in order to produce new technologies, specialized training which accompanies the situation and advice on

business support system that are available in the country. Management of innovation has to be a selective and developing one and it will not happen spontaneously. The investment can then bring back to the community when worthwhile. One does need to support new technology in the emerging stage of the development. Here are three examples:

Wood consists of cellulose, lignin and hemicellulose. The components can be separated and with new process by passing steam under pressure those components can be collected without any part being discarded. They are turned into various chemicals with high added value and find many useful applications.

Slates from mountain have been used for roofing for years. Now with bacteria entangled on them to excrete some chemicals and when heated up in crucible at high temperature in the flux, fibre is obtained which can turn into strong wool and becoming a high quality fabric. With other new process, other parts of slate can be turned into product with a considerable strength and can be used as tiles.

Bone from human, biomaterial and new bio-compatible materials are at present being developed for useful purposes.

Lastly, can I just draw my points to a general conclusion. Clearly, to develop innovators and generators you need to have those elements which I just want to mention and elaborate to you. Let us accept the fact that innovators have produced an enormous amount of development. I mentioned earlier about the spare part of human body both biomaterials and new materials and there is an emerging field. In Japan, again, I must use example in Japan as they are far better in the commercialization of material; it is called biomimetic chemistry. They studied very carefully the way the silkworm would make silk. The material of the silk can be anything such as nylon but its morphology is what is provided by the silkworm with unique arrangements. However the Japanese are clever; they follow strictly the way the silkworm does and as the result they got synthetic silk, synthetic fur, synthetic wool and even synthetic leather which are better than the original because they do not give the smell and in fact, turn out to be better materials. Camera is better than human eyes with new lens which can see in the dark, microphone is better than human ear, the chromatograph can smell better than human nose and computer in certain area is able to perform better than parts of human brain. In Japan I saw robot with many parts put together and combination of characters can perform exactly as required but robot is incomplete undoubtedly as the product of technological age. Have the scientists created a person that is complete or a fulfilled person. Physicists, chemists and biologists each claims that they are excellent but in their own way or partial. We must also consider other values of life and economy of life. We are also unfortunately the product of this technological age and we also have our flaws and are conditioned by the technological age, either we like it or not. As I said at the beginning we are not like the people in the 1970's. We are different people and must be

aware that this conditioning occurs. We have to look after our intellectual and spiritual self. Only in this way can we find prosperity that we get from technology towards a whole and fulfilled life. We would agree that man is more than sum of his parts, or otherwise man would be responding and becoming more like robots. Remember, human beings can be more than just conquerors. Now, obviously, we need a balanced partnership with technology. Indeed, we need the prosperous life that technology can give us, but what is more important now is that human resource development must lead to a more fulfilled, entire and whole life.

SCIENCE AND TECHNOLOGY CULTURE

Datuk Dr Mohd. Ghazali b. Haji Abdul Rahman
Director General
Nuclear Energy Unit

ABSTRACT

Science and Technology have always been thought as being highly specialized, yet they are not as totally different from other human activities as many people still believe. They are major agents of change and already play important parts in public affairs and there can be no return from that position, though there is room for disagreement concerning the appropriate style of the politics. Science is an occupation. The wider interpretation of it should not only to include natural science but scientific production and administration. Another theme which recurs is the basic distinction between internal and external factors.

QUALITY HUMAN RESOURCE: UNIVERSITIES RECONSIDERED

M Zawawi Ismail
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

The growing shift in the economic process, from one that is dependent on physical capital to one that is dependent on knowledge capital, implies that there is a growing connection between the development pace of a country and the quality and intellectual skills of its people. While the policy implications of this economic shift are somewhat complex, one such implication is that universities, whose core business is knowledge business, must respond, to the changing environment.

This paper examines some salient features of manpower development of the country, and discusses some critical issues and possible responses that ought to come from universities and their governance in order that universities will play their pivotal role in quality human resource development (HRD), the subject the author has been invited to present.

**ROLE OF INDUSTRY IN ASSISTING MALAYSIA
TO ACHIEVE THE STATUS OF AN INDUSTRIALIZED
NATION BY 2020 THROUGH HUMAN RESOURCE DEVELOPMENT**

Henry Lian Aran
Executive Director & Director Personnel
Shell Companies in Malaysia
Kuala Lumpur

ABSTRACT

After 35 years of Independence our country is on the exciting course to becoming a fully developed nation. Our vision is focussed on the year 2020 by which time we can envisage vitality in our economy, technology, society and human resources.

At present we seem to be experiencing a shortfall in both availability and expertise in our human resources in meeting this challenge of nation building. A number of key factors must exist if we are to realize Vision 2020, viz sound government investment policies and management, high level of private investments, growth of export oriented high-value added industries, development of modern service sector, alleviating infrastructure bottlenecks, managing the environment and HRD to attain skills and knowledge to displace labour intensive industrialization.

To achieve a developed nation status, the economy must grow at a certain pace. To maintain that growth, vast investments must be made and investments need people to make it work. The Government has a vital role in providing infrastructure, and in cooperation between Government and industry in the true spirit of Malaysia Incorporated.

**EXPERIENCE ON MATERIALS TECHNOLOGY TRAINING ON
NATIONWIDE - SCALE IN MALAYSIA**

Dato' Dr Mansor Salleh
President
Malaysian Materials Science and Technology Society (MMS)

ABSTRACT

The discipline of Materials Science and Technology is an area which is of utmost importance for technological advancement as can be observed from the emphasis given by developed countries towards this branch of technology. However, in Malaysia there is a lack of awareness and understanding within the industrial community on the

importance of the development of Materials Science and Technology for modern-day applications and the competitive advantages that can be derived. Realizing this fact, a group of scientists and engineers got together in March 1986 with the idea of advancing the technology of materials applications in Malaysia through the formation of a professional non-government organization.

The Malaysian Materials Science and Technology Society (MMS) has been in existence for more than five years. Although the society has no government grant, it has survived through the enthusiastic support from its members comprising of metallurgists, engineers, scientists, technologists, technicians, architects, academicians and even bankers, who have either sponsored or been involved as participants or speakers in events organized by the society.

The MMS today has more than 365 members of which 20 are Company Members. Membership is open to anyone interested in materials technology. The technology as applied to materials may include extraction, processing, manufacture, production, fabrication, testing, performance evaluation, application, design, failure investigations, failure analysis, treatment, modification, improvement, and recycling.

The objectives of the MMS as outlined in the constitution include the following :

1. To promote awareness of Materials Science and Technology in Malaysia.
2. To hold and organize meetings, seminars, conferences and such other activities as deemed conducive to the promotion of the profession of materials technologists, materials scientists and materials engineers.
3. To promote honourable practice and professional etiquette among members of the MMS.

The definition of materials science and technology within the MMS is the study, mastery, and utilization of all materials such as metals, ceramics, plastics, rubber, glass, etc., and the systematic application of the knowledge acquired to practical tasks in industry.

SCIENCE AND TECHNOLOGY HUMAN RESOURCE DEVELOPMENT: THE ROLE OF PRIVATE INSTITUTIONS

Dr Soon Ting Kueh¹ and Dr Quek Ai Hwa²

¹Tunku Abdul Rahman College, Kuala Lumpur, Malaysia

²University of Malaya, Kuala Lumpur, Malaysia

ABSTRACT

Our country, Malaysia, is experiencing rapid economic development with manufacturing and service as the major sectors of growth. We are aiming to become a developed nation by the year 2020. Although capital and natural resources are crucial factors in Malaysia's afford to achieve this developed nation status, human resource will be a key factor that determines the direction and pace of socio economic development.

This paper examines the current status of science and technology education and training with relation to human resource development. It also looks at the manpower needs for rapid industrialization in Malaysia up to year 2000. Meeting the manpower requirement of industrialization has become the main objective of our science and technology human resource development. Universities and other institutions of higher learning are important centres of human resource development. This paper particularly examines the role of private institutions in the education and training of skilled science and technology manpower.

HUMAN RESOURCE DEVELOPMENT FOR TRANSFORMATIONAL CHANGES

Khong Sow Kee

Perunding Setia Suria

c/o Coneff Corporation Sdn Bhd

Lot 34386, Desa Tasik Sungei Besi,
Peti Surat 7002, 57700 KUALA LUMPUR

ABSTRACT

The aim of this paper is to highlight several essential aspects of Human Resource Development (HRD) which should be implemented in order to achieve the goal of making Malaysia an advanced and industrialized nation by the year 2020.

Due to accelerated developments in science and technology, the face of the world is changing very quickly. For example, vast changes are taking place in political, economic, social and cultural climate at a very fast pace. Information technology has churned out so much information that one finds it very difficult to keep pace with all this. The kind of changes before the year 2020 are not merely transitional changes. They are transformational changes.

All changes call for giving up the old, adopting and adapting to the new. Changes always cause a lot of pains to those who resist change. Especially when the change is transformational change. In order to help one to cope with transformational changes which are painful, we should facilitate the development of human resource in the aspects such as: Development of a positive worldview, development of positive attitudes and development of honesty and integrity or character and moral qualities, etc., using a spiritual and scientific approach.

It is suggested that each of these aspects or a combination of them to be designed as a training module. They should be conducted in schools, institutes of higher learning, non-governmental departments or bodies, business and industrial organization, professional institutions, etc.

TRENDS IN MODERN MANUFACTURE: THE ROLE OF TERTIARY TECHNICAL EDUCATION

**S.Rajesham, Nooh Abu Bakar, Noordin Mohd Yusuf and
Syed Azman Shah Syed Nordin**
Department of Production and Industrial Engineering
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia

ABSTRACT

The paper brings to focus the direction in which the educational process must change to meet the need for the modern manufacturing engineers/technicians, in particular, in the context of the vision of Malaysia to become a developed country. The key technology area referred here is Automated Manufacturing Technology or Advanced Manufacturing Technology. Universiti Teknologi Malaysia as a leading technological university in this country has responded to this challenge by establishing the Production Technology Laboratory at the Faculty of Mechanical Engineering with the objectives described in this paper.

**ORIENTASI INDUSTRI DALAM KURSUS IJAZAH (SAINS)
LANJUTAN DI FAKULTI SAINS FIZIS DAN GUNAAN
UNIVERSITI KEBANGSAAN MALAYSIA**

**Baharudin Yatim, Bohari Mohd. Yamin
dan Mohamad Deraman**
Fakulti Sains Fisis dan Gunaan (FSFG)
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRAK

Kertas ini membentangkan hasil satu tinjauan yang dilakukan ke atas kandungan kursus ijazah lanjutan di Fakulti Sains Fisis dan Gunaan, Universiti Kebangsaan Malaysia, bertujuan untuk menentukan kewujudan tahap orientasi industri di dalam projek-projek penyelidikan bagi kursus tersebut. Langkah ini selari dengan rancangan Fakulti dalam reformasi kurikulum yang kini sedang giat dilakukan. Apakah masalah dalaman negara yang perlu diberi tumpuan agar universiti sebagai gedung ilmu dan pusat sumber tenaga manusia dapat memenuhi hasrat kerajaan seperti yang dinyatakan oleh perakuan no. 33 yang terkandung di dalam Industrial Technology Development - A National Plan of Action (Feb. 1990). Perakuan ini antara lain berkehendakkan orientasi industri diterapkan dalam projek penyelidikan ijazah lanjutan di universiti. Beberapa masalah telah dikenalpasti dan beberapa cadangan-cadangan yang dianggap boleh membantu meningkatkan perlaksanaan perakuan tersebut di peringkat fakulti dibincangkan.

SCIENCE AND TECHNOLOGY DEVELOPMENT

Dato' Dr Othman Yeop Abdullah and Norlela Ariffin
Universiti Utara Malaysia

ABSTRACT

Science and technology achievements have appeared to provide strong impetus towards industrialization and the process of wealth creation, as shown by countries like USA, Germany and Japan. Countries that have achieved high rates of economic growth and social transformation have relied highly on a coherent and well directed science and technology policy. The policy cascades from the top or at macro level and diffused within the industries, R&D institutions and universities.

Key elements of management of technology are (a) identification and evaluation of technological options, (b) management of R&D, (c) integration of technology into organization's overall operations, (d) implementation of new technologies in a product or process, and (e) management of obsolescence and replacement.

Studies by UUM and FMM have shown low industry involvement in the R&D projects and poor industry-university linkages. The major concerns raised by industry include slackness in action due to bureaucracy, lack of continuity in research, poor maintenance of sophisticated machines, poor quality of researcher, quality of work and lack of technical confidentiality. Concerns from researchers include lack of commitment by industry and private sector, and conflicting interests and needs of users, institutions and researchers.

EFFECTIVE TECHNOLOGY TRANSFER TOWARDS AN INDUSTRIALIZED MALAYSIA

Hubert Thull

First Secretary

Embassy of the Federal Republic of Germany

Kuala Lumpur

ABSTRACT

As a representative of a highly industrialized country which has long standing relations with your country, nowadays more than 200 German companies, including about 90 manufacturing companies, are operating in Malaysia I will try to develop a few thoughts in your seminar.

Furthermore I will make some remarks about the cooperation between our two countries in the field of technology transfer. You will learn that a lot of things have happened recently. Our economic relations are far beyond that of only exporting and importing goods and products.

INTERACTION BETWEEN RESEARCH INSTITUTE, UNIVERSITY AND INDUSTRY

Harun Ismail and Hashim Shaibon
Faculty of Electrical Engineering
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRACT

The launching of the National Development Plan (NDP) marked an era of remarkable industrialized strategies that will put Malaysia amongst the industrialized and fully developed nations. This has been emphasized by the Prime Minister through the popular and the much said slogan or phrase 'The Vision 2020'. The NDP provides a framework of achieving the Nation's ambition of becoming a fully developed nation at the turn of the century, concisely. Industrialization will not necessarily and entirely depend on foreign industries and technology transfer. Another form that can bring about industrialization, with a more lasting and sustainable economy, is technology innovation through research and development that has a potential of becoming a full blown industry. In the light of this, research institutes and Universities have a significant and leading role to play and offer in developing product based industry and technology. Cooperative research is the keyword. Research institutes and universities can embark on a cooperative research programmes or projects on a national level which of course of national interest. This paper discusses and proposes the collaborative interaction between research institutes and universities and including industries, and charts out a framework or plan that gives the guidelines of establishing and formalizing such collaboration.

MARKETING OF TECHNOLOGY

Hamzah Kassim
Standards and Industrial Research Institute of Malaysia (SIRIM)

ABSTRACT

The impact of technological change on economic growth, industrial productivity and international competition and trade has been widely recognized. The recent debate in Malaysia has been on how to increase the role of the private sector in undertaking industrial research and has focussed on the question of how to

provide incentives to firms to innovate and to spend greater amounts on Research and Development. Another issue is how to increase the interaction between public Research Institutes and industries which may lead to greater utilization of research results from public Research Institutes. Both these issues centered on the need to accelerate technological change in Malaysian economy. Since the public sector now spends 80% of the research in Malaysia, the question has been on how to ensure that investment in the public sector and Research Institutes will lead to wealth creation in terms of new products in Malaysian industries.

As we look over the panorama of technological change, we can discern three distinct types of innovation. First, there is the complex system such as communication networks, or space missions that may take many years and huge resources to accomplish. Such innovation is characterized by through long range planning and it shows that the requisite technologies will be available and that they will fit together when the final development stage is reached. Then, there is the kind of innovation represented by the major radical breakthrough in technology that turns up to change the whole character of an industry. The jet engines, xerography and the micro-processor would be typical examples. The third kind of innovation is what is known as minor technical change such as process adaptation and product development. This type of technical change is essential in upgrading firms' competitiveness at this stage of our industrial development. Such technical change, however minor, will be crucial in enhancing national competitiveness. Due to the absence of strong R&D resources in the private industries, there is a potential role for public Research Institutes to work in collaborative research projects on a contract basis that will ensure that their knowledge and technologies will be absorbed in the productive sectors.

This paper is concerned with the development of a Contract Research System as a means of transferring expertise and technical knowhow to industries. In what follows, I shall attempt to provide an overview of the development of Contract Research and also the findings of the preliminary survey of the market for Contract Research in Malaysia.

PERANAN GEOSAINS DALAM PEMBANGUNAN NEGARA

Abdul Rahim Samsudin

Jabatan Geologi, Universiti Kebangsaan Malaysia

43600 UKM BANGI

ABSTRAK

Geosains adalah satu bidang ilmu yang bersifat global dalam ertikata sains dan persekitaran. Bidang ini melibatkan pemahaman tentang impak sains dalam masyarakat dan hubungkait antara manusia dan bumi. Ahli-ahli geosains memainkan peranan penting dalam banyak aspek pembangunan negara. Mereka sama-sama berganding bahu dengan pakar dari berbagai bidang lain untuk membangun dan memulihara bumi. Proses pembangunan yang dialami oleh negara-negara maju di dunia iaitu melalui eksploitasi sumber tenaga dan mineral yang dipertanggungjawabkan ke atas bahu ahli-ahli geosain. Pembangunan dalam erti kata sebenar bukan hanya setakat menaikkan pertumbuhan ekonomi negara berdasarkan eksploitasi sumber bumi sahaja tetapi lebih daripada itu iaitu meningkatkan kualiti hidup setiap individu rakyat.

Ahli geosain memainkan peranan penting dalam pelaksanaan banyak projek pembangunan negara. Pakar hidrogeologi umpamanya menjalankan kerja-kerja mencari air bawah tanah bagi kegunaan minuman dan saliran untuk pertanian, manakala agrogeologis pula mencari sumber batuan dan mineral yang sesuai digunakan sebagai bahan untuk meningkatkan kualiti kesuburan tanah juga untuk tujuan pertanian. Pakar geologi industri membantu mencari mineral dan batuan untuk kegunaan industri binaan. Ahli geologi ekonomi yang mengambil berat tentang endapan mineral dan tenaga perlu menimbangakan eksploitasi sumber bumi secara kecilan serta lain-lain sumber tenaga alternatif. Tidak kurang pentingnya ialah ahli geologi kejuruteraan yang membantu dan bekerjasama dengan jurutera bina, pakar alam sekitar dan perancang tanah dalam merancang penggunaan tanah supaya lebih rasional serta memberi khidmat nasihat untuk mengawal dan membuat mitigasi ke atas kesan negatif yang mungkin timbul akibat pelaksanaan sesuatu projek pembangunan.

Sesuai dengan geosain ini bersifat global dan memainkan peranan penting dalam konteks pembangunan negara, maka sudah tiba masanya kita memikirkan tiga perkara berikut:

- i) Adakah kurikulum dan penyelidikan geosains di pusat-pusat pengajian tinggi sudah mencukupi untuk melatih dan melengkapkan generasi muda geosains untuk menangani masalah di atas?
- ii) Sudahkah kepentingan dan sumbangan geosains kepada pembangunan negara diketahui oleh pakar-pakar perancangan dan pihak atasan yang membuat polisi negara?
- iii) Sudahkah pengetahuan geosain ini diperolehi oleh semua lapisan masyarakat?

TECHNOLOGY TRANSFER

G. Piper

German Investment Advisor
Malaysian-German Industrial Cooperation Project

ABSTRACT

The core of technology transfer is the provision and absorption of information combined with the acquisition of skills. It is a teaching and learning process; sometimes combined with the sale and purchase of equipment. Technology and transfer do not necessarily go together harmoniously; a complete technology transfer consists of (a) physical transfer of the technology, (b) transfer of knowledge, (c) development of necessary skills, and (d) provision of complete access to and control over the technology within the agreed framework.

Companies need new or improved products and advanced production process to meet their financial goals and to keep or capture new market shares.

In the more socially relevant fields additional incentives for technology transfer and an active role of the authorities may be required.

H.R. MANAGEMENT : A COMPETITIVE ADVANTAGE

David Anderson
Motorola Asia

No abstract provided.

PANEL DISCUSSION: SOCIAL

Panelists: Prof. Glyn O. Phillips (Chairman)
Prof. Dr Mohd. Zawawi Ismail
Datuk Dr Mohd. Ghazali Abd. Rahman
Mr. Stephen Carrig
Mr. David Anderson
Mr. G. Piper

Prof. Dr Mohd. Zawawi Ismail

1. Education or human resource development is the key to future economic success. We should go back to basics.
2. Make teaching of science in school more attractive.
3. Upgrade technical assistants to help teaching in science.
4. Open access to education.
5. Increase our R&D intensity by
 - (i) increasing fund for research
 - (ii) increasing awareness to industry to do R&D
6. Improving the infrastructure of S&T management.
- S&T system in Malaysia is not yet perfect though we have Science Ministry, Science Council & Technical Action Plan.
7. Improve the mechanism of university - industry interaction.
The universities should take more commercial stance.

Datuk Dr Mohd. Ghazali Abd. Rahman

1. In present situation the science subjects do not guarantee good return to individual as compared to non science subjects.
2. This country must have dedicated and well trained labour force without which the realization of the outward looking development strategies is impossible.
3. Target areas in development must be selective base on our primary produce. We should be proactive and go downstream as far as possible so that we are ready before the demand.
4. Concentrate R&D on a few areas such as oil palm, rubber or cocoa and put a lot of investment in man, money and machinery. Avoid "buffet style" R&D.
5. We are not a totally free economic country. The government can plan our major economy before transferring it to the public.
6. We should take advantage of our new SSB scheme. There should be no caste system between work force. Parallel promotion should be the essence and emulate Korean QMN System.
7. Universities and the industry should work together to identify areas to be filled. The universities than can fulfill the manpower requirement where by the industry in return should guarantee employment to the resultant graduates.

8. We may adopt the three tier education system as practiced in the Californian State (USA).

Mr. Stephen Carrig

1. Nurture and foster environment appreciation for technology; education (involvement of universities), taxes and disposable, fund and assistant for basic research.
2. Sustaining technological environments:
 - respect international law and initial copyright.
 - Sustain stable political environment and growing in the name of economy.
 - Recognize consistent legal business.
3. Approach the nurturing process and exploring technological environment:
 - privatization for efficiency and use of economic resources.
 - Fostering joint-venture in which we piggy-back on experience of other nation or corporation on market and regulatory expertise.
4. Recognition of positive support framework which is necessary in Vision 2020. We should be able to translate good thoughts in this vision into positive action.

Mr. David Anderson

1. We should increase the number of graduates, especially post-graduates to an optimum number, but do not overproduce.
2. University / Industry should ensure that indigenous industry developed. Companies should encourage that process.
3. Expenditure of government and university should be increased as human resource is an asset.
4. Technical sciences should begin at school level, thus establishing the mentality toward R&D.

Mr. G. Piper

1. There seems to be different in perception between R&D and Design and Engineering (D&E) between people in Malaysia, and between nations which result in lack of efficiency.
2. There is hardly any industrial research in Malaysia.
3. Should emphasis on vocational science and skilled craftsmen.

DISCUSSION (FLOOR)

1. We should create inquisition and excitement to the younger generation to take up science.
2. Encourage DIY at early stage of life.

3. Management of research should be improved. We should encourage or rather force cooperative research between universities and institutions and between industries. IRPA panels should create this cooperative network. Cooperative projects should be selective and focus on few big projects.
4. Separate teaching from research (in the universities). Most successful universities have research projects with industry where teaching and research are separated.
5. We should develop close relationship between industry, business and education. Allow a system whereby a student can go and work in a company for a semester and come back to classroom for the next semester.
6. Industry should encourage training.
7. Government should look into providing short term courses, vocational training and technical education because we need a lot of people in this level.

PART V

**SEMINAR:
INDUSTRY**

TOWARDS AN INDUSTRIALIZED NATION

Tan Sri Dato' Abdul Aziz bin Abdul Rahman
Former Managing Director of Malaysia Airlines
and Former Chairman of Pelangi Air
(Now as a consultant)

Science dominates the twentieth century, carrying the world on its shoulders like the Greek mythological giant Atlas. We have been debating whether it is to be our master or our slave. Twentieth century scientific achievements are firmly routed in the decade of 1895 and 1905 which is known as the miracle-decade. The twentieth century also gave birth to the technological revolution with the application of the tremendous advance of science and invention to industry. The new machines and new processes which resulted, automation and plastics for example, have changed our lives to a remarkable degree.

With that kind of background, the next decade and thereafter will even be more challenging and exciting. During that period technology and globalization will change our premises, promises and paradigms and all these will have an enormous impact on how we run society and conduct our business. For example, it is generally acknowledged that informationalization is a key competitive approach for the 21st century's business and this means that the commercial world needs to focus its attention to that aspect of technology and its application to business management. The dominance of core information technologies and industries on a global scale is the essential basis upon which to build economic leadership.

Before I go further let me quote the words of Thomas Jefferson, one of the early Presidents of the United States, which reads "I am captivated more by dreams of the future than by the history of the past."

As the twentieth century is approaching its end, futurologists have widely predicted that change will be one of the hallmarks of the next several decades. Changes in technology, of which the computer is the most dramatic example create a constant source of strategic and organizational design changes in business corporations. Change becomes an important management issue. To be effective, managers must be able to introduce changes in strategy, technology and/or organizational design which enable their corporations to anticipate and/or adapt to changes in their external environment.

Extending further this phenomenon of change, I like to echo what many business experts are now saying to the effect that if ten years from now your business is the same as it is today, you will probably be out of business. Our lives and business will in the decades in the next century completely be transformed by

information and biotechnology. Computers and telecommunications are reshaping the basic structure of our enterprise, and any competitive business must utilize the new technology either to improve its products and services or to create entirely new ones. Your business in the future will need constant revitalization if you want to keep pace with the advance of science and technologies. With that general background about the world, I now turn to the topic of my paper.

Ladies and Gentlemen,

Malaysia today is gaining ground as a land of opportunities, where natural resources abound, labour is cost effective, industrial and agricultural land ample, infrastructure adequate and undergoing constant improvement and the currency strong. Our political stability combined with a favourable industrial relations environment should be a strong foundation for investments. The government has provided a framework of official policies and incentives that cater for a dynamic and efficacious economic climate. Even if the policies are not perfect, we do know that the authorities are keen to listen.

We have a broad mix of commodities. We are a leading producer of palm oil, rubber, tin and pepper and we also produce timber, cocoa, petroleum and natural gas and a number of other commodities. I understand that the nation having learnt from the experience of the adverse impact of the recession on our economy in the past has recognized the necessity to diversify away from these primary products and to accelerate the industrialization efforts.

The national economic plan has identified the private sector as the engine of growth in future years and looks to the manufacturing sector as a very important sector to become competitive both in the country and internationally. The country is in fact, moving very fast into an advanced industrial economy by vision, planning and implementation programmes. The planners would like to see the manufacturing sector growing at 10.5% per annum and by the year 2000, the industrial sector is expected to contribute 37.2% of GDP. The export-led industries are expected to generate 255.7 billion ringgit in the year 2000. The increasing export earnings and growth in industrial development will ensure the achievement by the year 2020.

If we have identified manufacturing as an important sector in our industrialization programme, we must focus our attention on the approach which stresses on the development of export oriented, high value added and high technology industries. We must recognize that the international market place is very competitive. In fact, the technology-driven market place and the economic and industrial globalization environment is not an easy playground for our products. If we want to compete aggressively and to have the

competitive advantage for survival, we have no choice but to support our industrialization programme with a strong research and development programme and strong market research. Those involved in the manufacturing sector must be adaptable to adjustments and changes where required as consumers everywhere always demand high quality, defect-free products at reasonable prices. Innovative technology will definitely play a crucial role.

To my simple mind I think we can become competitive in certain products in the international markets if we apply our mind on manufacturing those products using the many raw materials that we have. In fact, the Industrial Master Plan elaborates on several resource-based industries which could come under this ambit.

What about the activities of research and development which are so important if we want to exploit and improve the utilization of the raw materials? Apparently there are a number of institutions, agencies and ministries which are involved in R&D, technology transfer and acquisition, as far as the R&D institutional framework is concerned. However, there does not seem to be an effective coordinating machinery to define science and technology policies, allocation of R&D tasks, determination of priorities and of overseeing the effective transfer of technology. In fact, industrial R&D has received little attention so far and there is no real effort in domestic R&D in the public or private sector. It appears that we are more keen to export most of our raw materials than to process them with semi processed or manufactured products.

Studies have indicated that Malaysian manufacturers are inward-looking, lacking in vision, knowledge and entrepreneurial spirit. They tend to opt to trend on familiar grounds and are not keen to introduce design changes in the product or production techniques. They do very little research and hardly any market research at all.

Malaysian business covers a wide range of activities, from manufacturing to services. Businessmen always strive to find the right measures to fight against reducing profits, losses and rising costs. The panacea could come in the form of orientating their business ideology and planning with emphasis on marketing. Every businessman knows that the survival of a business is utterly dependent upon the ability to compete effectively in markets. Theodore Levitt, one of the world's famous authorities on marketing said that there is one simple dictum that executives must keep uppermost in their minds and that is: "There is no effective corporate strategy that is not marketing oriented."

The Industrial Master Plan consultants have highlighted that the essential ingredient to the development of a modern and competitive industrial structure in the country requires the creation of an industrial R&D. I would like to add to that and suggest that besides the industrial R&D the authorities and the entrepreneurs should seriously look into improving market research activities in the country and abroad.

As we know, corporations that market a technological product or services must conduct a substantial amount of research and development. It is necessary, that in an era of rapidly advancing technology and tough competition, the right goals and priorities are selected. It is also very important that the marketing research function which investigates into market opportunities of the organization is brought into close association with the R&D function.

If I may suggest that a central marketing fund to be managed by a national marketing bureau be established for the purpose of initially promoting selected products in the resource-based industries in certain target market segments. This national marketing bureau would have the important task of identifying and guiding the businessmen towards the right market segments, both domestically and internationally.

In the process of industrialization the services must run parallel and with equal vigour and intensity with the manufacturing industry. The financial, insurance, transport, and other services must be efficient and competitive internationally as well as supportive of the manufacturing sector. It is a truism to state that transport is an essential part of human activity and economic development. The economic and operating efficiency of transport undertakings is dependent upon a multiplicity of factors. Transport operators and policy makers must maintain a flexible approach if they wish their services to remain viable.

As an example, urban public transport in the cities presents a kaleidoscopic mix of political, financial, institutional, management and technical problems to which there are no easy solutions. Thus proper planning taking into consideration such factors and including the development in technology not only in the transport equipment but also in the management systems is crucial. In discussing the various modes of transport of land, sea and air, I cannot help but emphasize the importance of shipping and maritime transport which is evidently one of the essential support of the economies of every country. In fact, shipping like the airline industry, has a direct bearing on the development process of a country; it helps to improve the foreign exchange situation, creates employment, fosters technology transfer and economic integration. In our case, we should seriously examine the traffic congestions in the cities which definitely affect productivity adversely, and the shipping industry which currently is not contributing very much towards correcting the losses in invisibles. The shipping industry must be revamped and in my view it is not too difficult to do that.

In conclusion if I may focus on the challenges in the business arena, I think the key to business success in the future is the ability for people who run a business organization to develop a strategy and chart the direction of the organization taking into account among others developments in science and technology. Those organizations with farsighted managers who are able to put new technologies to use are the ones which will survive and prosper.

Our nation's industrialization drive must give weight to processing our raw materials and must be aggressively supported by R&D and market research and an efficient service industry. We must not lose sight of the changes in the world scene where as we know, the core information technologies and industries dominate in a global basis. This must be addressed with the seriousness it deserves. The machines and manpower must match those of the competitors. Above all, I am of the view that the most important ingredient is the management of our affairs mainly through people who must be constantly trained and whose skills must be constantly upgraded to keep pace with developments. Management is in fact the new technology that can make our economy into an entrepreneurial one.

All these efforts together with the application of the spirit of Malaysia incorporated by both the public and private sectors will contribute to the aspirations of making our country a truly industrialized nation in the near future.

ALTERNATIVE RESOURCE IN THE PRODUCTION OF TRADITIONAL FOODS FOR THE EXPORT INDUSTRY

Sivalingam, P.M.,¹ Subramaniam, P.,¹ Charles, S.V.,¹
Allahpitchay, I.² and S. Hamada³

¹ School of Biological Sciences, Universiti Sains Malaysia
11800 USM PULAU PINANG

² Systems Sciences Consultant Inc., Tokyo 171, JAPAN

³ Nippon Suisan Co. Ltd., 559 - 6, Kitano-Cho, Hichioji-shi
Tokyo 192, JAPAN

ABSTRACT

Local natural resources in the production of shrimp paste and crackers are very limiting and at times seasonal that even meeting local consumption demands is adversely effected. Due to the great popularity of these products within the region and other parts of the world an alternative substrate has been seeked for with a constant supply.

It is a well established fact that the whale population is decreasing tremendously due to overfishing in lieu of the fact that the diet of them is in great availability. Krill meal, the diet of whales, is been extensively harvested in the Atlantic and while it could be used in feed formulations for the aquaculture industry due to its excellent qualities and inherent growth promoting factors, it has been considered for the production of both shrimp paste through fermentation technology and crackers via modification of locally available technology.

It is absolutely necessary to take note that the original quality of the substitute substrate of krill meal is of very superior quality from aspects inclusive of microbes and metal contaminants.

In this presentation the production of shrimp paste and crackers will be discussed from the fermentation stance and its quality category leading to possible mass production at cottage industry level. The economics of its feasibility will also be deliberated.

AN INDIGENOUS DEVELOPMENT OF COMPUTER NUMERICAL CONTROL (CNC) BENCH TYPE MILLING MACHINE

Syed Azman Shah Syed Noordin, Hamidon Musa and S.Rajesham
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

This paper highlights the development of CNC bench type milling machine drawing from the projections outlined in the Industrial Master Plan (IMP) for the decade, 1985 - 1995.

The stages involved in developing the CNC machine together with some of its special features are discussed. The configuration of the prototype machine as well as the working of the control system are briefly described. Finally, some possible benefits from this experience and actions that can be taken to promote indigenous development of technology are put forward.

NOISE ASSESSMENT SOFTWARE

Mohd Jailani Mohd Nor dan Shahrir Abdullah
Jabatan Kejuruteraan Mekanik dan Bahan
Fakulti Kejuruteraan
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

NAS (Noise Assessment Software) is a computer software which is specially developed to facilitate most of the analysis concerning noise. The software consists of five subprograms: calculation of A-weighted sound level, noise control criteria, statistical analysis of noise, noise source criteria and propagation in indoor and outdoor noise. Furthermore, noise contours can be treated and exported to AutoCAD (TM) for further editing processes. The software was successfully used in several EIA (Environmental Impact Assessment) for noise assessment.

NATURAL RUBBER WOODFLOUR AS A FILLER FOR POLYSTYRENE

Leong Yub Choong
Jabatan Kejuruteraan Kimia
Universiti Malaya, Kuala Lumpur

ABSTRACT

There is a potential in using natural rubber (NR) woodflour as a filler for polystyrene. Not only does it serve as a low cost filler, NR woodflour can also be used to improve on the properties of the thermoplastic material. Tensile strength can be increased appreciably subjected to usage of the right loading and size of woodflour. Heat deflection temperature can generally be increased by a few degrees centigrade. Moreover, light brown mouldings of high gloss can be obtained by incorporating fine woodflour into the resin. However, high loading of woodflour is not recommended as it would likely lead to the deterioration of the above properties. Finally, as regard processing, the easy processibility of polystyrene would be maintained provided the woodflour is predried.

IMPROVEMENT OF NATURAL RUBBER VIBRATION ISOLATORS FOR MACHINERY APPLICATIONS

Jawaid Iqbal Inayat Hussain and Mohd. Salman Leong
Institute of Noise and Vibration
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRACT

Vibration isolators are used in noise and vibration control of machinery, where the transmission of vibration is attenuated by these isolators. There had been various dissatisfaction in the use of natural rubber isolators in many instances. These were attributed to the use of inferior pads, inadequate design and selection, and the general lack of understanding of parameters influencing isolation performance.

This paper reports on major findings of an IRPA funded research programme where parameters influencing vibration isolation performance were quantified. The influence of the product design of the natural rubber vibration isolators was also established. High performance isolators designed and manufactured

in natural rubber were tested. Test results confirming superior vibration isolators are presented. An improved second generation high performance natural rubber isolators with superior characteristics are also reported. Commercialization of these second generation high performance natural rubber isolators are currently in progress.

DESIGN AND DEVELOPMENT FOR A SMALL GASIFIER-ENGINE SYSTEM USING PALM KERNEL SHELL AS FUEL FEED

Azhar Abdul Aziz

Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

This paper outlines the development work carried out on a small biomass gasifier-engine system using palm kernel shell as fuel feed material. The system consist of a down-draught gasifier, gas cleaning units and a generator set powered by a single-cylinder gasoline engine. It has been found that the system is capable of producing an average of 2 kW power output.

Studies have been undertaken at the Department of Mechanical Engineering, Universiti Teknologi Malaysia (UTM) to explore the application of the gas produced in areas such as power generation and process heating. Details of the gasifier-engine system suitable for operation on this specific fuel together with its performance are presented. Based on the early experimental results, the technical feasibility of this biomass gasification technology is discussed. In addition, some practical aspects concerning the performance and maintenance of the experimental system are also highlighted.

STRENGTH OF MORTAR IN RELATION TO SPECIFIC SURFACE AREA OF RICE HUSK ASH CEMENT

Mahyuddin Ramli

School of Housing, Building and Planning
Universiti Sains Malaysia

ABSTRACT

Experimental study has been made to establish important characteristics between specific surface area of rice husk ash cement (RHAC) with regards to its compressive strength, flexural strength, workability and hence durability. The duration of grinding of rice husk ash (RHA) for use in cement replacements is investigated and found to have significant effect on the specific surface area of the cement.

It is also known that the performance of mortar is also dependent upon the proportion of RHA in ordinary portland cement (OPC) and the composition of the mortar matrix is also affecting the long term strength. Series of tests conducted on the specimen of cement mortar blended with various percentage of RHA provide salient information on the performance characteristics of the materials. This is also useful in producing lightweight ferrocement components, such as wall panels, roofing elements, facade, etc. which can be of greatest use in low cost housing construction.

The paper will be discussing at length the experimental investigation on the material and its potential application for building structures, particularly in relation to compressive strength, flexural capability, deflection and its resistance to water and combustibility.

ISO-9000 : THE GLOBAL QUALITY CHALLENGE

Lee Ng Chai

Standards and Industrial Research
Institute of Malaysia (SIRIM)
P.O. Box 7035, 40911 SHAH ALAM

ABSTRACT

The ISO 9000 Standards, since its publication in 1987 had achieved worldwide recognition and acceptance. The standards had been adopted as national standards by 52 countries and certification programmes based on these standards are being operated by 36 countries. Certification to the ISO 9000 look set to play an

important role in global trade. Malaysia, in its endeavour to achieve the objectives of Vision 2020, must take cognizance of the importance of the ISO 9000 Standards, and prepare itself to meet this challenge. SIRIM's role in this respect is to provide the catalyst to the adoption of quality management systems by Malaysian manufactures through its Scheme for the Certification of Quality Systems. Manufacturers implementing quality management systems will benefit from enhanced productivity and competitiveness and greater market recognition.

ACADEMIC COMPUTING: THE UTM ACADEMIC INFORMATION SYSTEM (SMAT) METHOD OF IMPLEMENTATIONS AND STRATEGIES

**Zailani Mohamed Sidek, Ahmad Ismail, Noh Abd Samad and
Noor Mohamad Abdul Hamid**
Fakulti Sains Komputer & Sistem Maklumat
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRACT

The University of Technology, Malaysia (UTM) academic information system, or **SMAT**, has many significant contributions to the University's academic excellence and to the advancement of its academic computing environment. In terms of UTM's academic excellence, the project will not only provide a common source for the understanding and use of its own version of the academic and semester systems. In meeting the many requirements of the University's academic computing, the project serves the purpose to demonstrate the use of some of the state-of-the-art in computer technology. The research project endeavours to provide a global solution to the university-wide academic computing needs and addresses many of its problems and issues. However, there are still many opportunities and challenges awaiting the true success of the system. Opportunities like the extension of the research project into building an Executive Information System (EIS) as envisioned by Sidek, Ismail and Samad (1991). And at the same time, there are many challenges that lies ahead in the project, especially in the systems development, testing and implementation.

GEOLOGICAL APPLICATIONS OF SATELLITE DATA IN MALAYSIA: ITS PROSPECT

Juhari Mat Akhir
Department of Geology
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

Satellite data have been found particular application in geological surveys particularly in arid and semiarid areas. However, for tropical areas, like Malaysia, there are very few examples indeed of geological studies based on satellite data. The main reason is due to the tropical terrain condition which has hindered the wider application of the technique. In Malaysia, the lack of trained or skilled manpower in the field and due to inadequacies inherent in the system has made the situation worsen. Unfortunately, the areas, which may be of economic potential, have to be studied. The advantages offered by remotely sensed data is possibly the best alternative available in order get geologic information in such difficult terrain.

The aim of this study is to demonstrate the usefulness of satellite data for geological mapping for part of Peninsular Malaysia. The data were digitally processed with the objective of producing more interpretable images. Geological interpretation of the most informative images was undertaken by visual interpretation. The study shows that many images units correlate well with major mapped rocks. In addition, the study has shown that remote-sensor data can be used in locating known features and additional previously unknown features (probably faults). Despite the difficulties when involving satellite remote sensing work in the area, the study has provided some encouragement that the satellite data could be used to map major solid lithologies of the area. With more expertise and skill interested in the field, more equipment, facilities and user agencies, good quality and higher resolution of data, the full potential of remote sensing technology, in geological applications and mineral exploration in Malaysia, can be exploited.

USE OF GEOPHYSICAL METHODS FOR DETECTION OF SUBSURFACE CAVITIES

Abdul Ghani Rafek
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

The detection of subsurface cavities can be considered a challenging activity in applied geology and applied geophysics. Although such activities have been carried out for many years, their success rate is variable. This paper reviews the ability of different applied geophysical methods in detection of subsurface cavities, together with conditions and limitations that have to be considered.

Subsurface cavities can be broadly divided into two large groups, namely natural cavities and man-made cavities. Both these types can also be classified as either buried, ie covered and filled with overburden material that is continuous with the earth's surface or hidden, i.e. having a roof of rock material and not continuous with the earth's surface. Each of these types of cavities has a different response to geophysical measurements. The size, depth below the earth's surface, and ratio of size to depth are amongst the important factors influencing the success of geophysical methods for detecting subsurface cavities.

Three main geophysical methods can be used in detection of subsurface cavities. These are the seismic methods (reflection, refraction, cross-hole and downhole), gravity method and geolectrical resistivity method.

The gravity method has shown encouraging success in cavity detection, especially natural cavities, as a negative residual gravity anomaly. Under favourable topographic conditions, a spherical cavity at a depth below the earth's surface equal to its diameter can be detected. Gravity surveys require very high accuracy, both for the gravity survey itself and the associated topographic survey.

The geolectrical resistivity method can often be used as a reconnaissance tool to obtain preliminary information about the existence of surface cavities. The effectiveness of this method is somewhat limited and is influenced by the presence of groundwater and the type of cavity.

The success of the seismic methods depend on the sophistication of the method used and expenditure. The basic refraction seismic method can successfully detect near surface buried cavities. Reflection seismic, with digital data processing can detect hidden cavities and provide information about their size and depth. Cross-hole and downhole methods are most effective but require high expenditure and sophisticated data processing.

**SHELL MDS (MALAYSIA) SDN. BHD.: A STRATEGIC
PROJECT UNDER CONSTRUCTION AND DEVELOPMENT**

G. A. Bekker
Technical Manager
Shell MDS (Malaysia) Sdn. Bhd.
Kuala Lumpur

ABSTRACT

In Bintulu, a plant is being constructed which will signify the first step towards the establishment a technology that enables the conversion of natural gas into middle distillates. This technology is of strategic importance for countries with natural gas, remote from significant markets, as well as countries with gas, but little or no oil. As such it is, therefore, highly relevant for Malaysia.

In addition to high quality middle distillates, the plant in Bintulu will also produce other, higher value products, such as detergent, feedstocks, waxy raffinate and wax. With regard to the total product package composition can be changed significantly without changing the total product output.

Plant construction and recruitment have proceeded well and are nearly complete. The first products are expected in the first quarter of 1993.

Based on the current (pre) marketing efforts, it is expected that the plant will succeed in selling plateau levels of middle distillates immediately and the special product within a few years after start-up.

**NON DESTRUCTIVE TESTING AND QUALITY REQUIREMENTS
IN THE OIL AND GAS INDUSTRY - MALAYSIA**

Wong Wei Khiang
Treasurer, MSNT.

ABSTRACT

For the past decade the Oil & Gas industry in Malaysia had developed rapidly. It is anticipated to grow further in the next decade.

Application of NDT and Quality Requirements are always the important elements in the oil and gas development projects. NDT methods and techniques are improving from time to time so as to face the challenge of the stringent quality requirements.

Safe and smooth operation of a petrochemical plant is depending on the quality of the plant facilities. Any failure or mishap will not only cause the loss in property & life, but also may hamper the national economics.

Appropriate application of NDT and inspection, to achieve quality requirements, is essential in the oil & gas industry this will ensure positive contribution in nation building towards achieving the goal of 2020.

EMERGENCY OF NEW DRILLING FLUIDS IN PETROLEUM DRILLING TECHNOLOGY

David A. Frost

Mud Engineering Co. Sdn Berhad
10th Floor, Box No. 44, Menara TR
161B Jalan Ampang
50450 KUALA LUMPUR

ABSTRACT

The drilling of wells for oil and gas exploration and production is a complex engineering task, often carried out in remote, hazardous locations. The process of drilling is made possible by the use of drilling fluids, most of which are complex mixture of chemicals whose formulations are carefully selected to suit the particular conditions.

Fluids based on mineral oils are widely used and offer technical advantages over water-based systems. However, it has been shown that mineral oil systems have a damaging effect on the environment. As a result environmentally conscious nations have taken measures to restrict or eliminate the use of these fluids.

There are however alternative environmentally friendly fluids based on modified vegetable oils and on glycerol derivatives. Since both of these are produced in quantity in Malaysia their potential should be exploited.

QUALITY IMPROVEMENT THROUGH ISO 9000

Tim D. Alcock
Managing Director
QMI-Quest Sdn Berhad
Penthouse Suite, Wisma Muisan
16-1 Jalan Raja Laut, 50350 KUALA LUMPUR

ABSTRACT

Interest in the management of quality is growing. In recent years, the adoption of a systematic approach to quality management and implementation of Quality Management Systems meeting the requirements of the ISO 9000 series of standards has become a major objective of companies world-wide.

Many organizations have approached the implementation of ISO 9000 as a "procedural" exercise and thus have gained little real benefit.

The paper outline how ISO 9000 can be used as a vehicle to provide sustained and permanent improvement to all types of Organizations and relationship to Total Quality and Quality Improvement Techniques.

MACHINE CONDITION MONITORING AND ITS RELEVANCE TO MALAYSIAN INDUSTRIES

Che Abas Che Ismail and Mohd Salman Leong
Institute of Noise & Vibration
Universiti Teknologi Malaysia
Kuala Lumpur

ABSTRACT

Machine condition monitoring is an established technique used in diagnosing and predicting incipient failures of machines, and the need for maintenance. A brief description of such condition monitoring techniques and tools are given. The use of this technology is however not widely adopted in Malaysian industries, except in some major sectors of the industry. There had been instances in the local industry where condition monitoring had been undertaken, but implemented as an independent task uncoordinated with maintenance management.

Direct maintenance costs expressed as a percentage of annual gross output (for Southern Johor industry) for major industry type are given. The data suggested significant maintenance costs in the Malaysian industry. Financial viability of condition monitoring as

reported in the literature for the British industry is examined. Implementation problems in the Malaysian industry are also reviewed. There is the need for condition monitoring to be undertaken as an integrated maintenance task. Issues relating to maintenance strategy, and evaluation of viability of condition monitoring using machine criticality assessment are presented.

THE ROLE OF MALAYSIAN SOCIETY FOR NON-DESTRUCTIVE TESTING (MSNT) IN HEAVY INDUSTRIES

Khazali Haji Mohd. Zin
Malaysian Society for Non-Destructive Testing

ABSTRACT

Non-destructive Testing, NDT can be defined as technology that has been built up around a variety of inspection procedures capable of checking compliance of material quality or structural integrity, to applicable specifications, defines codes and standards; without in any way affecting the serviceability of the objects or components to be tested.

The common NDT methods used are Radiography (X and gamma rays), Ultrasonic, Magnetic Particle Inspection, Liquid Penetrant and Eddy Current. Other advanced NDT methods are Acoustic Emission, InfraRed Thermography, Strain Gauges, Holography, Tomography, Leak Detection, etc.

NDT also helps to reduce costs in quality control. This is due to the facts that NDT does not incur destruction of the product whereas destructive testing for quality assurance must destroy a certain percentage of production.

NDT also eliminates the need for some of the over-design incorporated into parts and structures because of the traditional need to account for unknown defects. In other words, NDT means cost saving in materials because the designer can become aware of the defects by NDT.

Obviously if less materials are needed to fabricate a product and if less processing is done on materials there will therefore be a proportional savings in energy and human resources.

Early failures are chiefly due to undetected defects; thus reduction of defects by NDT means products sold need not be recalled and this will reduce warranty costs.

The ability to detect imminent failure by means of NDT also results in savings in both monetary and human lives. This is especially important in the airline industry where planes need to be stringently tested for any failure since these would be catastrophic.

Thus the important of NDT as a tool for quality, safety and savings in resources are enormous.

TEKNIK PEMROSESAN DAN PENGEKSPLOITASIAN KITOSAN DARIPADA SISA PERIKANAN

**Alimuniar A., M. Zakaria, M.P. Abdullah, M.R. Zainuddin,
M.J. Jais, J. Ujang, Y.K. Samah dan M.Y. Amir**
Jabatan Kimia, Fakulti Sains Fisis dan Gunaan
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRAK

Malaysia berpotensi menceburi dan memajukan pengeksploitasian, penyelidikan dan perindustrian berasaskan sisa perikanan berkitin khususnya dari udang, ketam dan belangkas. Sisa-sisa tersebut mengandungi kitin yang merupakan bahan mentah untuk penghasilan kitosan iaitu polimer semula jadi jenis polisakarida. Teknik pemprosesan kitin ke kitosan yang murah dan mudah dilaksanakan secara industri kampung telah ditemui. Kitosan tersebut telah dikaji keberkesanannya sebagai agen floks dan agen koagulasi-flokulasi untuk perawatan air sungai, air tanah gambut, efluen kumbahan, efluen berminyak dan efluen kilang kelapa sawit. Kecekapan dan kemampuan menggantikan teknik perawatan air dan efluen yang sedia ada dan konvensional serta menggunakan agen floks jenis sintetik, diimport dan mencemarkan persekitaran serta memudaratkan kesihatan akan diperihalkan.

PROCESSING OF MINE TAILING SAND AS A SOURCE FOR SILICA (SiO₂) BY SPIRAL CONCENTRATION

Khairun Azizi, Ariffin Othman and Azmi Rahmat
School of Materials and Mineral
Resources Engineering
Universiti Sains Malaysia
Perak Branch Campus, Seri Iskandar
31750 TRONOH

ABSTRACT

Malaysia has been, for many decades, known for its tin industry. The recent decline in tin price has however, resulted in the closures of many of the tin mining operations in the country. What still remains remarkably today are those fine white to yellow coloured sands that spread for hundreds of kilometers on the surface. Few has contemplate the silica content or the associated minerals that have lain with it. In fact, those mine tailing sand when processed can provide additional sources of

silica to support the secondary downstream industries in Malaysia. This paper briefly describes the processing of raw mine tailing sand using the spiral concentration to upgrade the silica by removal of the mine tailing sand using the spiral concentration to upgrade the silica by removal of the heavy minerals.

APPLICATIONS OF BIOTECHNOLOGICAL PROCESSES IN THE MINING INDUSTRIES

**Wan Azlina bte Ahmad, Zaharah bt. Ibrahim
and Abu Bakar b. Baba**
Biochemistry and Biotechnology Unit
Department of Chemistry, Faculty of Science
Universiti Teknologi Malaysia
LB 791, 80990 JOHOR BAHRU

ABSTRACT

Biotechnological processes have been applied in the recovery of heavy metals. These processes include the use of microorganism for extraction of metals from minerals and concentration and recovery of metals from dilute solutions. Such microbial applications are of potential use for either economic recovery of metals or treatment of waste streams for environmental protection.

APPLICATION OF PRESSURE LEACHING TECHNIQUE ON COMPLEX GOLD ORES FROM SAWARAK

Rosdi Baharom and Ismail Ibrahim
Mines Research Institute
Department of Mines, Malaysia
31400 IPOH

ABSTRACT

Experimental pressure leaching was carried out in a laboratory-scale on complex gold ore samples, from several areas in the Bau arsenopyrite, pyrite and pyrrhotite as the main metallic sulphide minerals, occurring as "preg-robberts", which resulted poor dissolution in conventional cyanidation. Direct cyanidation using sodium cyanide as the leachant, at concentration of 1.0%

CN, was carried out as to confirm this effect. Using a two (2) litre pressure reactor and the same leachant, the ores which the assay values ranged from 1.30 g gold per tonne to 21.0 g gold per tonne, showed better dissolution. The maximum gold recovery was 81% and this can be considered good as until today these gold deposits have not been exploited effectively due to their refractoriness.

RADIATION PROCESSING OF NATURAL RUBBER

Wan Manshol bin Wan Zin
Nuclear Energy Unit
Ministry of Science, Technology and Environment
Kompleks PUSPATI, Bangi, 43000 KAJANG



MY9700860

ABSTRACT

With the realization that Radiation Processing is becoming an important technology in the rubber industry, a research group made up of personnel from Nuclear Energy Unit and Rubber Research Institute of Malaysia was formed in 1988. The aim is to undertake an R&D Programme, to use radiation as a tool in natural rubber technology and processing. The various research programmes being looked into are Radiation Vulcanization of Natural Rubber Latex (RVNRL), Radiation Preservation of Field and Concentrate Lattices, Radiation Induced Modifications of Natural Rubber Latex and Photodegradation of Natural Rubber. Since then, some interesting results have been gathered, particularly in RVNRL where a new processing technique of vulcanizing natural rubber latex have been developed. RVNRL is nitrosamine free and has a low cytotoxicity. It can be used in latex based products using the standard techniques. Besides that, an alternative system of preserving field and concentrate lattices, a simpler process of preparing modified natural rubber latex (MG latex) and a mechanism to understand photodegradation of natural rubber are developed.

LIPASE TECHNOLOGY FOR THE PALM OIL INDUSTRY

Ibrahim Che Omar
School of Biological Sciences
Universiti Sains Malaysia
11800 PULAU PINANG

ABSTRACT

Some useful biochemical reactions catalyzed by lipase such as hydrolysis, esterification and transesterification reaction (acidolysis, glycerolysis and interesterification) using palm oil and palm oil fractions as substrates are discussed. With references to the lipase of *Candida cylindracea* and *Aspergillus niger*, these reactions in microaqueous system are described. Some reaction behaviours governing the reaction rate and product formation in relation to the control of water content in the system is emphasized. The use of pyridine and organic solvent or molecular sieve pellets improved the performance of the enzyme catalyzed reactions significantly.

PROCESSING PLANT DESIGN AND OPERATING FACTORS AFFECTING POLLUTION LOADS: PALM OIL MILL

Abdul Aziz Ariffin¹ and G. Ramakrishnan²

¹Palm Oil Research Institute of Malaysia (PORIM)

²Konsultant Proses

ABSTRACT

In designing a plant, it is very important to know not only the raw material, the desired products from the raw material, but also the unwanted products that are produced.

This paper gives a comprehensive review of various factors that need to be considered in the construction from processing, to containing the generated waste product.

THE ROLE OF SCIENCE & TECHNOLOGY IN MALAYSIA'S INDUSTRIALIZATION

Charlie Mathis Bateman

Chairman of Committee on Technology,
Federation of Malaysian Manufacturers

ABSTRACT

One of the main thrusts of the industrial policy in the Sixth Malaysia Plan (SMP), 1991-1995 and the Second Outline Perspective Plan (OPP2), 1991-2000 is to move the manufacturing sector towards more capital intensive and technologically sophisticated industries, producing high quality competitive products with high value added content. As Malaysia seeks to industrialize, it needs to advance its capacity and expertise in industrial technology, more so, with the increasingly competitive global environment as well as the increasing specialization in technology.

Technology is more than an 'item' to be bought for commercial applications. Before it can be properly developed and applied, the appropriate expertise must already be put in place. Some of the key factors to be considered are:

- a. Technology is increasingly reliant on advances in science and science progress by accumulating knowledge.
- b. The purchase of patents, licenses or technological equipment must be supported by adequate in-house R&D capacity, in which research, design, production and marketing are integrated with one another. Hence, the need to provide for in-house R&D capacity and organizational change - particularly changes in traditional skills towards more flexibility and staff training/retraining.
- c. The Government has the primary responsibility for creating the conditions under which firms can build up their competitive strengths through the above factors. "Interaction" and "accumulation" are the key words guiding governmental policy. The government has a leading role to play in the following areas:
 - i) Access to scientific knowledge.
 - ii) Monitoring and evaluating technological advances around the world through the development of a statistical framework on technology and human resources.
 - iii) Availability of skilled labour
 - iv) Establishment of network for exchange and collaboration in respect of linkages between research-public education and research-in-house training.
 - v) Provision of incentives for the promoting of private sector involvement in R&D and skills training.

The SMP has appropriately address the issue of industrial R&D and enlarging the Science and Technology (S&T) base of the country by spelling out of the following new initiatives:

- Diffusion and Application of Advanced Technology
- Increasing Quality and Design Competence
- Support for Strengthening The Science Base
- Stronger Focus on Enabling and Key Technologies
- Enhanced commercialization of Research and Technology with the allocation of \$ 600 m for the Intensification Research Priority Areas

One of the central issues here is how to increase the private sector role in R&D, to complement the Government's efforts. The following measures need to be considered by the Government:

- a) Establishing an integrated information network for monitoring international technology developments to assist the private sector in staying informed of the scientific and technological advancements around the world. This may require the setting up of a S&T desk in the Malaysian trade offices overseas.
- b) The R&D incentives that are currently provided for research undertaken by approved research companies or institution should be extended to in-house R&D in view of research being more internal to the firm.
- c) The current approval of double deduction incentives (DDI) for R&D is not totally effective because the requirement of detailed disclosure of the research project concerned can infringe on the confidentiality of the project. The approval procedure should be made more flexible either by relaxing the disclosure requirements or by instituting a mechanism whereby no prior approval is required as long as the applicant abides by some stipulated guidelines and criteria.
- d) To further encourage local R&D, specific matching grants should be provided as start up funds for local R&D project aimed at developing new products, processes or upgrading existing products/processes.
- e) The establishment of industry - specific R&D centres by foreign investors is a valuable catalyst in fostering the research oriented intellectual environment needed to meet Malaysia's science and technology goals. To encourage the establishment of such centres, consideration should be given to increase flexibility on equity ownership and the use of expatriate researcher's as well as financial incentives.
- f) To further develop technical capabilities, specific encouragement must also be given for greater usage of computer-aided manufacturing and robotics. Consideration should be given to a better financial assistance package, perhaps through the granting of soft loans. Computer-aided manufacturing (CAM) and computer-aided design (CAD) can

- greatly improve productivity and enhance the competitiveness of Malaysian manufactured products.
- g) Closer linkage between government institutions and industry should be forged to ensure that a high percentage of the R&D done in the former is relevant for industrial application. The Korea Institute of Science & Technology (KIST) is an outstanding example of the successful bridging of the academic and industry in the commercialization of R&D through contract research, as an effective industry-institution linkage mechanism. Consideration should be given to an institute modelled along those lines.

The focus on industrialization and the manufacturing sector as the main engine of growth underscores the vital role of Science and Technology in the country's journey towards the "Newly Industrialized Country" status by 2020. The Government, the private sector and the research community must work together closely and openly to make this vision a reality.

SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT OF SMIS

Dato' Soong Siew Hoong
Chairman, Committee on SMIS
Federation of Malaysian Manufacturers

ABSTRACT

Vision 2020 sets the objectives for Malaysia to achieve "developed nation" status through industrialization, with the manufacturing sector as the main engine of growth. Towards this end, the policies and strategies outlined in the Second Outline Perspective Plan (1991-2000) which embodies the National Development Plan and the Sixth Malaysia Plan have, within the context of the National Action Plan for Industrial Technology Development (APITD), been designed to move the private sector along this path of economic development.

The National Action Plan for Industrial Technology Development (APITD) emphasizes the importance and urgency for industries to adopt a Science and Technology (S&T) culture to promote quality in production and price competitiveness in the domestic and foreign markets. The 42 recommendations contained therein are intended to make Malaysian products attain a high standard of quality while being competitively priced in the domestic and foreign markets. If larger manufacturers and exporters are to be competitive, their suppliers of parts and services, which are mainly Small and Medium scale Industries (SMIs), must be equally competitive in price, quality and delivery.

ACOUSTIC INTENSITY MEASUREMENTS AS A DIAGNOSTIC TOOL IN PRODUCT DEVELOPMENT

M. Salman Leong and Ng Choh Hian
Institute of Noise & Vibration
Universiti Teknologi Malaysia
Kuala Lumpur

ABSTRACT

Acoustic intensity measurements have been one of the more recent noise and vibration measurement tool that could assist engineers in product development. Acoustic intensity is a vector that describes the nett amount and direction of acoustic power flow. The full potential of such measurement techniques are still to be realized by the Malaysian industry, and its use is still in its infancy. Measurement of acoustic intensity allows pertinent noise and vibration sources to be individually quantified, and emissions ranked. Acoustic intensity is also used in sound power determination, and products could be sound rated without the need for special acoustical laboratories. Past industrial experience of the authors in the use of this measurement technique in product development are described. This include a study of noise radiation in the Proton Saga car passenger cabin, and an air conditioning unit; and sound power determination of an air conditioning condensing unit.

AUTOMATED MANUFACTURING TECHNOLOGY IN MALAYSIAN INDUSTRIES

Yahaya Ahmad and Hau Tam Shiam
Advanced Manufacturing Technology Centre
Standards and Industrial Research
Institute of Malaysia (SIRIM)

ABSTRACT

This paper reviews the application of automated manufacturing technology in the Malaysian industries. The overview and the various components of Automated Manufacturing Technology (AMT) are first discussed. It examines the current state of the art of AMT in Malaysia which can be gauged from the results of the Techno-economy study of FMS conducted by SIRIM in 1990. The current status, the effectiveness and the problems associated with the implementation of AMT are highlighted. Recommendations on how to make the AMT as an effective tool to increase our competitiveness in the world market have been put forward.

AUTOMATED GUIDED VEHICLE TECHNOLOGY AND MOBILE ROBOTS FOR ADVANCED MANUFACTURING INDUSTRIES IN MALAYSIA

Iskandar Baharin

Computer Integrated Manufacturing Research Group
Faculty of Engineering
Universiti Pertanian Malaysia

ABSTRACT

Mobility is an important aspect of interaction with the environment for both man and machine. As robotic systems become more capable in terms of sensing and intelligence, and as they move into more demanding work situations, the mobile robot system will need to enhance the capabilities of robots very much. In the simple production line environment, the number of feeders determine the number of task areas. In the mobile robot application, all the task areas can be accessed simultaneously in an unstructured manner. Moreover part fixturing and transporting cost reduces rapidly with the investment of automated guided vehicles and mobile robot technology since they provide complete automation. Likewise the use of autonomous guided vehicle and mobile would help increase productivity of advanced manufacturing system more significantly.

To successfully develop an automated guided vehicle system to do intelligent-based material transportation system, and, to design an intelligent mobile robot system to do decision-based material handling several dominant indispensable factors and criteria's have to be considered. The prominent issues in the subject will be addressed in the paper. The need in more pressing, when the issues on conceptualization and implementation of such technology are needed for a truly advanced manufacturing system of the future. In this respect, industries in Malaysia are fastly growing towards this goal. Thus, to be systematic and constructive in our approach, an in-depth understanding into the problem faced by the research and development community in succumbing these goals needs to be coordinated and orchestrated with the appropriate industrial and government agencies. The state-of-the-art progress in these areas will also be presented in the paper.

**SETTING UP OF DATALINK GROUP SERVICE PROVIDER
NETWORK AND GEARING TOWARDS FUTURE GLOBAL
AERONAUTICAL TELECOMMUNICATIONS NETWORK**

Syed Ahmad Syed Nasir
Malaysia Airlines System
Subang - Kuala Lumpur International Airport
47200 SUBANG

ABSTRACT

Airframe and engine reports relayed from aircraft in flight directly benefits the safety and economy of the aircraft through early corrective maintenance actions. An essential part of the VHF air/ground data communication is the ground service provider network. Malaysia Airlines is setting up this network to allow for greater automation in reporting and transmission of reports. This network will also become a part of the future global Aeronautical Telecommunications Network (ATN) which uses the Open Systems Interconnection (OSI) protocols defined by the International Organization for Standardization (ISO).

ISO 9000 - IRRADIATION TECHNOLOGY FOR THE INDUSTRY

Razali Hamzah and Noor Hasnah Khairullah
Unit Tenaga Nuklear
Kompleks PUSPATI, Bangi, 43000 KAJANG



MY9700861

ABSTRACT

As a developing country, Malaysia should find ways to acquire and adapt technology within the opportune time for the benefit of its industries. The radiation technology in UTN is developed with the participation of local scientists, engineers, local building consultants and a foreign manufacturer. A brief review of the history of irradiation technology at UTN is described.

The ensure that services provided by the facility is recognized and trusted by the industry, a Quality Management System is implemented in order to provide reliable and quality service.

The facility has gained recognition by industry through their strict audit examination and in March 1992, UTN became the first government department to achieve the ISO 9002 Certification.



MY9700862

NATURAL RUBBER - LEAD COMPOSITE FOR RADIATION SHIELDING

Mohd Harun¹ and Kamaruddin Abd. Malek²

¹Nuclear Energy Unit

Ministry of Science, Technology & Environment

²Rubber Research Institute of Malaysia

ABSTRACT

A study of the influence of lead powder additions on radiation absorption and mechanical properties in a NR-Lead composite has been made. The composites of 100 phr, 200 phr, 400 phr, 600 phr and 800 phr lead have been prepared by using a direct mixing method. Additions of Pb powder increased the absorption coefficient of gamma-ray, especially in the 600 and 800 phr. In the mechanical testing, Pb powder agglomerations in the rubbery matrix caused embrittlement to the composites and reduced their tensile strength and trouser tear. The tensile strengths of all the mixtures were reduced when exposed to radiation dosed of 20 and 50 kGy. The trouser tear of natural rubber and mixture of 600 phr were increased when exposed to the dose of 20 kGy but reduced at a dose of 50 kGy.

CHARACTERIZATION OF RUBBER BASED MATERIALS USING ULTRASONIC METHOD

Mohd Jailani Mohd Nor, Nordin Jamaludin and Jaafar Sahari

Dept. of Mechanical & Materials Engineering

Universiti Kebangsaan Malaysia

43600 UKM BANGI

ABSTRACT

The mechanical properties of Thermoplastic Natural Rubber (TPNR) and Thermosett Natural Rubber (TSNR) can be determined using ultrasonic method by measuring the sound velocity in the materials. An experiment has been carried out to investigate the effect of changing the processing parameters such as pressure and temperature and also the rubber content on the mechanical properties of the specimens. The results of this preliminary study will be used to carry out a more detailed study on rubber based materials in the future.

LABORATORY ACCREDITATION TO ISO GUIDE 25

Timothy Alcock
QMI-Quest Sdn. Bhd.

ABSTRACT

Much interest has been generated in recent months in the adoption of Quality Management Systems, particularly the ISO 9000 Series of documents in relation to Companies who wish to explore into Europe. In actual fact, there is no European Legislation which presently requires that organizations meet ISO 9000 requirements, however the EEC has stipulated that certain products will be required to demonstrate that their products and services meet EEC standards.

One means of meeting the European Community Requirements will be for producers to submit their products to 'notified' testing laboratories which are internationally recognized. Such laboratories will be required to demonstrate that they operate Quality Systems which meet internationally agreed criteria, namely ISO Guide 25 requirements.

The paper outlines the background and principles of Laboratory Management Systems embodied within ISO Guide 25 and how Laboratories should go about developing a Quality Management System.

PENGUKURAN KETUMPATAN SEBAGAI PETUNJUK KEPADA KEMATANGAN PROSES DEMINERALISASI TULANG UNTUK PENGELUARAN OSSEIN

Mohd Omar bin Abdul Kadir dan Fadilah Basirun bin Mohamad
Pusat Pengajian Teknologi Industri
Universiti Sains Malaysia
11800 USM PULAU PINANG

ABSTRAK

Proses penyediaan ossein (kolagen tulang) adalah merupakan langkah yang penting dalam menentukan mutu penghasilan gelatin yang bakal diperolehi. Kajian ini dijalankan bagi mencari satu kaedah baru untuk mengubahsuaikan kaedah yang sedia ada. Kaedah penentuan nilai ketumpatan terhadap tulang terdemineralisasi dan mengkaji jarak penembusan oleh asid telah diperkenalkan. Beberapa parameter penting juga turut dikaji bagi mencari pengolahan seoptimum yang mungkin, di antaranya nisbah tulang terhadap isipadu asid berasaskan berat (w/w), penggunaan suhu dan saiz tulang yang

digunakan. Penentuan bilangan hari penyediaan ossein untuk saiz tulang yang spesifik dalam proses demineralisasi secara lengkap telah dikaji. Hasil penemuan daripada kajian ini menunjukkan bahawa apabila ketumpatan mencapai nilai 1.1 g/ml menandakan proses demineralisasi telah lengkap dan mutu ossein yang baik dapat dihasilkan. Pengolahan yang optimum bagi nisbah 1:2 (tulang:asid) adalah saiz tulang 1/8 inci, bagi nisbah 1:3 adalah pada saiz 3/8 inci manakala nisbah 1:4 pula adalah saiz 3/8 inci masing-masing pada suhu 15°C. Secara keseluruhan, pengolahan yang paling optimum dengan mengambil fakta kos asid dan tenaga penyejukan adalah nisbah 1:3 pada suhu 15°C untuk saiz tulang kurang dari 5/8 inci.

KESAN PROSES PENUAAN TERHADAP HOS PENYAMAN UDARA AUTOMOBIL : KAJIAN KES

Che Hassan Che Haron dan Hj. Jaafar Sahari

Jabatan Kejuruteraan Mekanik dan Bahan

Universiti Kebangsaan Malaysia

43600 UKM BANGI

ABSTRAK

Hos penyaman udara automobil mengandungi tiga bahagian utama : i) lapisan dalam (getah), ii) tetulang (fabrik atau dawai), iii) lapisan luar (getah). Lapisan getah yang digunakan di dalam hos penyaman udara automobil adalah bahan getah yang telah divulkan dengan sulfur. Spesimen hos penyaman buatan Jepun dan Amerika Syarikat dipilih bagi tujuan kajian. Spesimen hos yang berbentuk "dumbbell" dikenakan proses penuaan dengan meletakkan spesimen tersebut di dalam ketuhar penuaan udara yang bersuhu 100°C selama 78 jam. Sebarang perubahan pada hos penyaman udara automobil boleh didapati dan perbandingan keputusan-keputusan yang diperolehi dari ujian tegangan terhadap spesimen yang mengalami proses penuaan spesimen yang tidak mengalami proses penuaan mencerminkan ketahanan hos tersebut terhadap proses penuaan. Keputusan ujian ini juga menerangkan perubahan sifat-sifat fizikal dan mekanik (getah) hos penyaman udara automobil. Dari kajian ini jelas menunjukkan bahawa proses penuaan adalah salah satu punca kegagalan hos penyaman udara automobil.

DOWNSTREAM PROCESSING IN BIOTECHNOLOGY: A LOOK AT CHROMATOGRAPHIC TECHNIQUES

Abdul Wahab Mohammad

Department of Chemical and Process Engineering
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

Downstream processing in biotechnology is becoming increasingly important and complicated in terms of economy and purity requirement. Estimates have shown that the cost for downstream processing can be as high as 75% of the overall production cost. In general, downstream processing refers to the industrial scale product recovery of micro-organisms, small organic molecules, pharmaceutical products, enzymes, and proteins. The high degree of purity required of the bioproducts entails several steps of separations which may include 1) conditioning of fermentation broth, 2) solid-liquid separation, 3) preliminary fractionation, enrichment, or product concentration, 4) high resolution techniques or purification, and 5) finishing. Chromatographic techniques which are considered as high resolution techniques play an important role since the purity or quality of the final product depend largely on these techniques. The main types of chromatography that have been used successfully are gel filtration chromatography, ion exchange and affinity chromatography. Various novel techniques such as radial flow chromatography and displacement chromatography have also been introduced to improve or overcome the problems of the conventional chromatographic techniques. In order for Malaysia to have a successful research programme which will lead to commercial production of bioproduct, it is very important to concentrate on the whole spectrum of biotechnology which include the upstream and downstream processing.

MAKING MALAYSIA A MARITIME NATION : A TECHNOLOGICAL APPROACH

Ahmad Fuaad Ahmad Sabki
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

Aspiring to be a maritime country has been the nation's urge for over a decade. Acquiring this status requires enormous efforts, planning and implementation protocols.

Contrary to the belief that a maritime nation is signified by the number of ships she has in millions of DWT, the length of its coastline or its maritime trading activities, a country with the vision of developing her own maritime industry should in every respect be able to nourish the shipping industry, shipbuilding and ship repair industry with new materials for technological developments. She must have basic research facilities, be able to spearhead research in technology and to guide the marine industry into new frontiers of developments.

A strong base in marine technology is a vital ingredient for developing Malaysia into a maritime nation. The application of appropriate technology will not only be benefited by the maritime industry but will enhance the capability of all supporting heavy and light industries at large.

This paper considers the requirement for research in the fields ultimately related to marine technology. The text develops around four principal points ie. projects, procedures, facilities and personnel. The idea presented in this paper were derived by selecting milestones of research in marine technology and analyzing the success. From constructive discussion of these principles it is hoped there will emerge a sound and practicable pattern for research in marine technology.

SATU SISTEM HIBRID PENGKALAN - PENGETAHUAN: SATU KAJIAN KES

M. Ruddin Ab. Ghani¹ dan Maimunah Ibrahim²

¹Fakulti Kejuruteraan Elektrik
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

²Tenaga Nasional Berhad Malaysia

ABSTRAK

Idea mengenai sistem hibrid pengkalan-pengetahuan diperkenalkan. Adalah diakui bahawa sistem ini boleh memainkan peranan penting dalam membuat keputusan kejuruteraan, khususnya dalam perancangan, rekabentuk, penjadualan dan kendalian untuk sistem skala-besar. Penggabungan di antara kaedah carian cabang dan batasan (branch and bound) dengan sistem pengkalan-pengetahuan yang dapat membentuk satu sistem hibrid pengkalan-pengetahuan adalah dibincangkan. Satu kajian kes mengenai perancangan rangkaian kajian kes mengenai perancangan rangkaian agihan elektrik voltan rendah juga dibentangkan.

RANGKAIAN PENSUISAN PUSAT (CSN)

Liza Abdul Latif, Abd. Rahim Seliman dan Mohd Hanipah Muda
Kumpulan Kajian Telemteri, Fakulti Kejuruteraan Elektrik
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRAK

Rangkaian Pensuisan Pusat (CSN) merupakan satu rangkaian pensuisan persendirian berdigit yang menyediakan perhubungan antara pengguna dari berbagai-bagai rangkaian bagi menyokong struktur Kadar Capaian Asas 2B + D seperti yang dinyatakan dalam Cadangan Siri I CCITT. Kertas kerja ini akan membincangkan senibina asas CSN, modul-modul penting, pencapaian terkini dan akhir sekali akan menyatakan cadangan atau kerja yang akan dijalankan.

SISTEM PENGISYARATAN DALAM RANGKAIAN DIGITAL PERKHIDMATAN BERSEPADU (ISDN)

**Alias Mohd, Saiful Bahari Safian dan
Abdul Rahim Sulaiman @ Seliman**
Kumpulan Kajian Telematik
Fakulti Kejuruteraan Elektrik
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRAK

Kertas kerja ini akan membincangkan sistem pengisyaratan yang digunakan di dalam rangkaian ISDN untuk mengawal penyambungan panggilan suara atau data. Keputusan daripada perisian penyelakuan untuk menerangkan bagaimana sistem pengisyaratan tersebut bekerja ditunjukkan. Penyelakuan ini merangkumi pengisyaratan di antara pengguna dan ibusawat berdasarkan siri Perakuan Q.920-Q.931 dan pengisyaratan di antara beberapa ibusawat berdasarkan siri Perakuan Q.700-Q.766.

MODUL ANTARAMUKA TALIAN UNTUK SISTEM PENSUISAN PERKHIDMATAN BERSEPADU (ISSS)

**Abd. Rahim Seliman, Nik Mohd Kamil Nik Yusof
dan Alias Mohd**
Fakulti Kejuruteraan Elektrik
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRAK

Kertas kerja ini menerangkan secara sepintas lalu mengenai modul antaramuka talian yang akan digunakan untuk menyokong sistem Pensuisan Perkhidmatan Bersepadu (ISSS). Dua teknik akan diterangkan. Pencapaian dan isu-isu yang berbangkit dalam pembangunan modul akan diterangkan dengan jelas.

KAD TALIAN ANALOG

Abd. Rahim Seliman, Mohd Hanipah Muda dan Saiful Bahari Safian
Kumpulan Kajian Telematik
Fakulti Kejuruteraan Elektrik
Universiti Teknologi Malaysia
54100 KUALA LUMPUR

ABSTRAK

Kad Talian Analog (ALC) merupakan satu Sistem Pensuisan Telefon Analog yang berfungsi sebagai satu Rangkaian Pensuisan Persendirian (PABX) kecil yang tersendiri. Kad ini berupaya menampung lapan set telefon analog, Dual Tone Multi Frequency (DTMF), dan berkemampuan memberi perkhidmatan yang ditawarkan oleh PABX seperti perkhidmatan ikut saya (follow me), panggilan menanti (waiting call) dan lain-lain. Kad ini merupakan salah satu modul Sistem Pensuisan Perkhidmatan Bersepadu (ISSS) yang dijalankan di UTM. Pada keseluruhan kertas kerja ini akan membincangkan rekabentuk Kad Talian Analog dan pencapaian terkini sistem ini.

MAINTENANCE AND DEVELOPMENT OF SCIENTIFIC INSTRUMENTATION IN MALAYSIA

Razali Hamzah, Mohd Ashhar Hj. Khalid and Alawiah Musa
Nuclear Energy Unit
Ministry of Science, Technology and Environment
PUSPATI Complex, Bangi, 43000 KAJANG

ABSTRACT

Proper instrument maintenance and care is the key to efficient research. In view of the fact that there is a critical need for proper instrument maintenance, this paper offers some observations on the present status of local maintenance and development activities and some suggestions towards a more efficient cooperation in this respect. It will further share UTN's experience in implementing a maintenance strategy and in conducting a maintenance and development of instrument laboratory.

SHORTENINGS BASED ON PALM OIL PRODUCTS

Nor Aini Idris, Mohd Suria Affandi Yusof, Y.A. Tan
and Flingoh C.H. Oh

Palm Oil Research Institute of Malaysia (PORIM)
Ministry of Primary Industries
P. O. Box 10620, 50720 KUALA LUMPUR

ABSTRACT

Several formulations based on blends of hydrogenated palm oil (MP 41.5°C) and palm stearin (IV 44) with other liquid oils, on direct blends of palm stearin with other liquid oils, and on 100% inter-esterified palm olein, were used as feedstocks in shortening production. The shortenings were stored at 20°C over a period of one month. Physicochemical characteristics, creaming properties and baking performance of the shortenings were evaluated and compared with the best shortening on the market. Slip melting point of the shortenings ranged from 41.5 to 45.2°C. Palm-cottonseed oil shortenings had higher solid fat contents at all temperatures than palm-soya bean or palm-low erucic acid rapeseed oil shortenings. The shortenings were rich in C₅₀, C₅₂ and C₅₄ glycerides. Creaming power after 12 min of beating ranged from 1.55 to 1.77 cm³/g. The specific volume of cakes ranged, for the experimental shortening, from 90% to 101% from the control, with low erucic acid-palm blends showing the best performance. In applications for both aerated cream and cakes, inter-esterified palm olein was excellent.

DESIGN AND MANUFACTURE OF AN INTEGRATED CIRCUIT (I.C) MOULD

Syed Azman Shah bin Syed Noordin and Nooh bin Abu Bakar
Faculty of Mechanical Engineering
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

The manufacturing sector plays an important role in the industrial development of Malaysia. Dies and moulds are important tools needed in the manufacture of value added products, in the electronic industry, such as integrated circuit (I.C) chips. Presently the country is importing several million ringgit worth of these dies and moulds every year.

Design and manufacture of dies and moulds require sophisticated technology and skills. University Teknologi Malaysia has recently acquired facilities such as CAD/CAM, CAE and CNC machines which can be utilized to assist the design and manufacture of dies and moulds.

The paper highlights the knowhow in the design and manufacture of I.C moulds and stresses the need to develop local capability in this area.

PANEL DISCUSSION - INDUSTRY

Theme : "R&D Support for Malaysian Industry with Emphasis on Small and Medium Scale Industry"

Panelists : Datuk Dr Mohd. Ghazali Hj. Abd Rahman (Chairman)
Dr Ahmad Tajuddin Ali
Dato' Soong Siew Hoong
Dr Ahmad Ibrahim
Dr Ahmad Zaharuddin Idrus

Problems and shortcomings

1. Lack of trained and skill labour force. Turn out of technicians, tradesmen and vocational trainees and scientists are short.
2. Outdated education system and curriculum, not progressing at the same pace with industrialization programme.
3. Focus on R&D are diffused.
4. Lack of R&D in SMI sector.
5. Misuse of Industrial Technical Assistant Fund (ITAF).

RECOMMENDATIONS

1. Increase number of skilled workers in SMIs and upgrade workers' qualification to cope with the rapidly advancing technology.
2. Reorientate focus of education to be more technology based.
3. Emphasize technology and quality as elements of competitiveness to produce quality product in industry.
4. Promote innovation technology and quality management in industry.
5. Emphasize on industrial R&D especially to improve and exploit the utilization of raw materials.
6. Improve market research activities to introduce design changes in product or production techniques in the country.
7. Establish a central marketing fund managed by national marketing bureau to promote selected product in the resource based industries in certain target market segments.
8. Accelerate industrialization by R&D support for raw material processing, aggressive market research and efficient service industry.
9. Encourage usage of computer-aided manufacturing and robotics to improve productivity and enhance competitiveness of Malaysian manufactured products.
10. Establish industry-specific R&D centres by foreign investors in fostering the research-oriented intellectual environment needed to meet Malaysia's S&T goals.

11. Encourage indigenous innovation by having conducive patent system.
12. Increase more customer-driven R&D activities which are relevant for industrial application to solve and fulfill the needs of industries.
13. Establish contract type of R&D with special benefit sharing scheme to share profit and consultancy between research groups and industrialists.
14. Encourage manufacturer to institute in-house R&D for those who do not carry out in house R&D currently or increase R&D capacity for those who already have in-house R&D facilities.
15. Provide specific matching grants as start-up funds for local R&D projects aimed at developing new products / processes or upgrading existing products / processes.
16. Encourage industrial participation in R&D by enhancing communication among researchers and industrialists.
17. Promote appreciation of R&D in SMIs and to provide effective forum to help SMIs in absorbing technology.
18. Provide directory for expertise so that information is available for SMIs.
19. Set up expertise group to solve SMIs problems to demonstrate as well as to share experience and information with industry people.
20. Set up industry / science park.
21. Facilitate the access to scientific knowledge through an effective and comprehensive information network by establishing an integrated information network for monitoring international technological development and dissemination of up-to-date information to the private sectors.
22. Monitor and evaluate technological advances around the world through the development of a comprehensive framework on technology and human resources.
23. Foster the availability of adequate skilled labour and quality researchers.
24. Establish network for exchange and collaboration between research and in-house training, and between public R&D institution and the private sector.
25. Provide appropriate and adequate incentives for the promotion of private sector involvement in R&D and skill training.
26. Organize industrial fair to encourage and facilitate technology transfer.
27. Encourage grouping of same industry sector to effectively combine their resources, experience and expertise to promote their industry group.
28. Provide appropriate linkage between SMIs and large industries.
29. Assist SMIs on the availability of financial facilities including R&D funds and technical facilities.

PART VI

**SEMINAR:
STRATEGY**



MY9700863

HARMONIZATION OF TECHNOLOGY WITH THE ENVIRONMENT

Rozali bin Mohamed Ali

Institute of Strategic and International Studies (ISIS)
Malaysia

INTRODUCTION

Today's world is dependent upon technology. The well-off are those who can absorb, master, and create technology. Progress is often measured by advances in technology.

In this paper we shall undertake a brief critical review of the role of technology in modern socio-economic systems. We shall examine some of its successes and failures, particularly from the viewpoint of the environment, and we shall also investigate how we must confront the future, with technology, in order that it is in harmony with our goal and objectives.

THE ROLE OF TECHNOLOGY

To begin with, it is now acknowledged that technology is acquiring an increasing importance in man's systems of wealth creation. History tells us how technology formed a critical part of the support system that ensured the success of the industrial revolution. The wealthy countries in the world today are those that are industrialized. Countries with ambition are those that are industrializing. And technology is central to their means of production.

In the past, there have been differing attitudes to the role of science and technology in economic development. Classical economists virtually ignored technological advancement, while Marxian economics held an ambivalent view, some commentators predicting massive unemployment and the fall of capitalism with technological progress. It was only following the work of economists who were intrigued by qualitative factors as contributors to economic growth, that technology and the role of technological innovation began to be recognized. Subsequently the positive impact and contributions of technology in economic development began to be more widely accepted.

Today, therefore, the general view is that technology, as much as the traditional factors of production - land, labour, and capital - holds an important role in creating wealth. Indeed, science and technology during the past one hundred years has moved from the periphery to the centre of the social, economic and political life of many industrial societies.

Because of its close linkages with the industrial revolution, science and technology is often seen as the cornerstone of industrial development, and in those terms alone. The emphasis on industry can be misleading - scientific knowledge and knowhow are central to the development of all sectors of the economy. In areas of primary production, for example technology has radically altered the ability of humankind to utilize land for agriculture, and has as a result defined the structures of agricultural production. Technological sciences have enabled man to identify, extract, and use minerals of the earth for economic growth to an extent which would have been unimaginable only a century or so ago.

Technology is even now spawning burgeoning growth in tertiary sectors of the economy. During the 1980s, it has been estimated that 67 percent of US production came from the services sector, and at the end of that decade about 73 percent of working Americans were employed in service industries. The services sector is of course heavily dependent upon technology. Information technology and its spin-offs and peripheral activities now form the locus of growth of today's advanced economies. Without technology, there will be no post-industrial society.

TECHNOLOGY AND SOCIAL DEVELOPMENT

It is convenient to measure a country's progress in terms of gross wealth creation. But a nation's achievements should not be measured in terms of GNP alone. The overriding objective of a nation is progress and development in all dimensions. This means not only material progress, but also the development of the people's capability to stand on their own and control the factors and processes of wealth creation. It also means developing their ability to maintain political integrity, and positive cultural, social and spiritual identities. In other words, the success of development is measured by levels of attainment within a much broader framework of enlightenment and well-being. A much more holistic view needs to be taken.

In terms of social development, technology has an ambivalent record. It is not too difficult now to see science and technology as an important component of the society of the future, for its pivotal role in the development of social systems is acknowledged. Technology clearly is an important tool in education and communications, and an increasingly important component of human interactions as a whole. But we do not fully understand the ways in which technology shapes society, or vice versa. While we are now aware that technology is an integral part of the rapid changes that we experience today, we do not generally question whether these changes are desirable, or indeed whether rapid change in itself is useful in the context of the long-term development of the human species.

There are therefore fundamental challenges for the future. Is science and technology truly value-free, or does it cast an influential shadow upon alternative futures? Does society exert its free will upon the development of technology, or is its view distorted and its options limited and constrained by technological choices? (For example, the automobile has permanently defined the urban landscape and made it almost impossible for us to conjecture alternatives). In other words, does technology uniquely shape society and its culture? It is in the context of these kinds of questions that we must approach one of the nine challenges of the 2020 Vision: **the establishment of `a scientific and progressive society, a society that is innovative and forward-looking, one that is not only a consumer of technology but also a contributor to the scientific and technological civilization of the future.'**

ACHIEVEMENTS AND FAILURES

We now return to one of our basic propositions, that technology is an indispensable part of life today. Having accepted this to be so, it is incumbent upon us to find ways to build upon our technology capabilities, to guide our development into the future. Clearly, it is not possible to reverse the clock. Technology regression is not an option which is open to us, and we cannot afford negative and destructive attitudes towards technology. Nevertheless we must take to heart the lessons of history, and it is necessary to examine carefully and assess, if only briefly in the context of this paper, the achievements of technology within the course of world development as a whole. This will help us to direct our efforts to ensure a harmony of technology, the environment, and development.

To begin with, we will note the enormous success that technology has achieved in advancing the material wealth of industrialized nations. Technology is the key to achieving and maintaining economic strength. In addition, military technology has enabled some nations to exert their will over others. Further, technology enables the globalization of communications, allowing cultural and psychological influence, if not dominance. Seen in these terms, technology is wealth; technology is power.

The benefits of technology have not been limited to the industrialized world. Technology can also be credited with major successes in many parts of the developing world. The development of high-yielding cereals, agricultural techniques, and intensive use of fertilizers and pesticides has, through the Green Revolution, removed the spectre of starvation from large populations in the Third World (although success has not been unqualified - new agriculture has disrupted traditional farming communities, generated a dependence on exogenous inputs to maintain soil fertility, and resulted in land degradation and other forms of adverse environmental impact). Other basic needs such as potable water, shelter and other social services have been

extended through the use of technology from a privileged few to billions in poorer countries. Advances in medical science and technology have defeated diseases, significantly reduced child mortality rates, and increased the human life span. Technology has both stimulated and provided means for increased levels of education in the developing world, resulting in higher literacy rates and the opening of new opportunities for advancement and self-determination in the Third World. Seen in these terms, technology is freedom.

These are but a few of long catalogue of successes that technology has facilitated. Humankind can be proud of these achievements, but we must also be shamed by our failures. Even as the world is in food surplus, almost one-fifth of the world's population is chronically malnourished, and the inhabitants of large tracts in Africa continue to be threatened by famine. It has been estimated that 25,000 people die daily from contaminated drinking water. Despite the end of the Cold War, technology continues to drive the development of weapons of mass destruction, and enables conflicts of appalling brutality in many corners of the world. It has been estimated that the world spends US\$36,000 per soldier for military development, but only US\$1,100 per student for education.

Most of all, wealth and opportunity are not evenly distributed. As the millennium approaches, North-South inequities stand out in stark clarity as hindrances to the attainment of a new age of enlightenment. Quite simply, science and technology has not been effective in redressing income disparities between the rich and the poor.

A technology gap between rich and poor is not the natural order of things; as Abdus Salam reminds us, the gap between the industrialized and the developing world is a relatively recent phenomenon. This makes the failures all the more shocking. In the Third World, the progress of science and technology is slow. Pockets of technology are often found in huge projects which, even if they succeed, often do not contribute towards income distribution. Technology is often the means by which powerful multinational corporations exert control over resources and factors of production in the developing world. Even in the United States itself, the richest country in the world, 32 million people or nearly 13 percent of the population live below the official poverty line, and millions are homeless. Throughout the world, the benefits of the technological utopia have not trickled down to the poor.

TECHNOLOGY AND THE ENVIRONMENT

Prominent in the litany of problems that technology has caused or failed to address is environmental degradation, and this is the principal subject of this paper.

Consider these dramatic images listed by the Club of Rome in its report 'The First Global Revolution':

December 3, 1989. - Bhopal, India: a leak at the Union Carbide pesticide factory poisons the air with methylisocyanide, killing 3600 people and wounding 100,000, of which 50,000 remain permanently disabled.

April 26, 1986. - Chernobyl, USSR.: an accident at the nuclear power station at Chernobyl destroys the reactor and projects 5 tons of fuel into the atmosphere (50 million curies of radiation). A radioactive cloud goes around the world, especially affecting Ukrania and Bielorussia (USSR), Finland, Scandinavia, Poland, Germany and France. Immediate human consequences: 32 officially dead (29 from radiation), 150,000 people evacuated, 119 villages permanently abandoned, 499 seriously wounded, 600,000 exposed to radiation of which 12 have become invalid and 7,000 to 25,000 are expected to develop cancer. Food crops and animals exposed for several years to radiation all over Europe. In 1990, approximately 3 million persons under medical supervision, with reports of two persons dying daily as a consequences of the nuclear accident.

March 24, 1989. - Prince William Bay, Alaska: American oil cargo ship SS Exxon Valdez runs aground, spilling 40,000 tons of oil and polluting over 1744 kilometres of coast, killing 980 otters and 33,126 birds. US\$1.9 billion spent to clean up and in compensation to fishing villages.'

To the above we can add the graphic descriptions in Dickens of poverty and social degradation during the Industrial revolution in 19th century England; industrial disasters at Seveso, Italy and Flixborough, UK; the Three Mile Island incident in the US and continuing tension between proponents of nuclear power and the public; the dire environmental conditions that prevail in industrialized eastern European countries; and the state of mega cities in the Third World, clogged by pollution, urban congestion and urban squatters, perhaps the 20th century's slave class, relatively the poorest of the poor.

These images fuel the suspicion that technology is inherently not in harmony with the environment. For even if technology is not the root cause, surely it is an integral part of these problems. Clearly some hard thinking is needed and some new options carefully explored to ensure that the effects of future technology development and application are in harmony with our overall objectives.

Speculation about the future is no easy task. In the 1930s the American president Franklin D. Roosevelt commissioned a major study of coming technologies. The study was impressive and enthralling, but it was seriously flawed. It did not predict the coming of television, nor that of plastic, or jet planes, or organ transplants, or laser beams, not even of the ball-point pen. We can be quite sure that we will do no better if we do the same today.

For while we may be reasonably certain that change will occur, and that some of it will be induced by technological advancement, we cannot be certain that it will mean progress. We can have little confidence in our ability to predict the forms that it can take, or its effects.

As an example, freons and halons could have remained more scientific curiosities when they were first developed in the 1930s, until technological applications were developed. When this happened, chlorofluorocarbons - colourless, odourless, nonflammable, non-toxic, stable and cheap - were hailed as an impressive achievement of science. It was not until many years later that the effect of CFCs on the protective ozone layer of the outer atmosphere was discovered. Widespread alarm galvanized nations of the world into action and as a result, today international agreements are in place to limit and eventually eliminate the use of these man-made chemicals. Could we have anticipated this fifty years ago?

I have deliberately painted a gloomy and pessimistic picture of the effects of technology on the environment, for we must continually remind ourselves of the need to guard against complacency and arrogance. On the other hand, despite its patchy record of technological achievement, the beneficial impact of technology must never be forgotten. Technology has been termed a double-edged sword, with the ability to engender both beneficial and adverse consequences. Thus, even as we criticize the failures of technology, we must at the same time mourn the potential that lies unfulfilled. The fault more often lies in ourselves. The power of the great social, political and economic machines which utilize technology as a tool, and the threat that they can pose to the future of humankind must never be underestimated. It is our lack of understanding and control of these phenomena and mechanisms which should give us cause for alarm, rather than technology in itself.

TECHNOLOGY AND SUSTAINABILITY

Events such as Bhopal and Chernobyl are certainly tragic. But in many ways the tragedy lies deeper, for these catastrophes are symptoms of a fundamental unsustainability in our current patterns of development. These underlying trends, far less dramatic and very subtle, pose a greater and more profound danger in the long

term in their potential effects on our biosphere and the very existence of the human race. Schumacher has reminded us that while there are beneficial economies of scale, these are often offset by severe diseconomies and adverse effects in a variety of ways. In addressing the future, we must critically review our economic systems which encourage over-consumption of resources, and unmanaged and uncontrolled use of common resources.

As a result of this new and growing awareness, the fundamental forces that impel the world's development are now undergoing serious re-thinking, and this must take consideration of the ability of technology to meet the requirements of the new age. There are serious doubts as to whether the earth's carrying capacity will be able to accommodate the legitimate needs of the majority of the world's population, who are under-developed. It is now recognized that the consumption levels of the rich exert great stress on the world's physical resource base. The world's population is an added problem - it took about 10,000 generations of humans to reach the current level of 5 billion, yet it will take only 50 years to double it to 10 billion. Consumption and population growth together form a potent recipe for disaster in the not too distant future.

Nations of the world as a whole have yet to find the collective political will to confront these problems. But when they do, the full force of technology development must be mobilized and directed towards seeking efficient, equitable, and humanitarian solutions.

The recent United Nations Conference on Environment and Development has highlighted many of the major issues that face the planet. The treaty on climate change recognizes the dangers that are posed by uncontrolled releases of greenhouse gases that can raise global temperatures and cause major and perhaps catastrophic of biological diversity acknowledges the critical importance of conserving valuable biological resources to support humankind's future existence on the planet. Both in the preparations leading up to UNCED and at Rio itself, the threats and inherent instability in the inequitable distribution of wealth and opportunity through the world have been emphasized. And in Agenda 21, the blueprint for action agreed to by the world community, technology holds a major place in virtually all of the 40 chapters of the document.

KEY AREAS FOR THE FUTURE

There is clearly a new impetus in actively seeking technologies critical for sustainable development. For example, a recent report from the World Resource Institute assesses broad classes of technologies and identifies the following as important for the United States:

- o energy capture, storage, and end-use
- o agricultural biotechnology
- o alternative agriculture and precision agriculture
- o manufacturing modelling, monitoring, and control.
- o catalysis
- o separations
- o precision fabrication
- o materials
- o information
- o contraception

Such efforts should also be made in Malaysia, and even as we consolidate our ability to acquire and digest technology, we must focus our attention on areas where technological development will be of particular relevance for a future harmonization of technology and sustainable development.

Firstly, pollution prevention and control technologies are clearly important in the context of an industrializing economy. Industry and the environment are not necessarily in conflict. Faith in the ability of technology and management to meet stringent goals is typified by the chemical company Monsanto's slogan for itself, its contractors, suppliers, and shippers: '**Zero spills. Zero releases. Zero incidents. And Zero excuses**'. Good design, competent operation and careful management all contribute towards reducing emissions of noxious substances to the environment. Driven by public concerns and the policy environment, most firms in the industrialized world are making great advances through technology and management in reducing pollution, without eroding their competitiveness.

The challenge, then, is for us to accelerate the development of technologies for pollution control. It is no less relevant, and by no means impossible for firms in industrializing countries. Such countries must realize that it is in their long-term interest, as they acquire technologies, to develop the ability to assimilate, understand, improve, and eventually generate indigenous technology through innovation. They too must aspire to the attainment of the highest standards. The performance of rubber and palm oil processing industries in waste-processing in Malaysia attests to what can be done, and we must build upon these achievements.

Second, efficiency improvements are another area where technology can provide an important and substantial contribution. The chain of energy extraction, delivery, utilization and storage provides a good example. Virtually everyone in the energy supply business understands that investment in technology is quickly repaid in terms of reduced losses and higher quality of product. Efficient energy use through technological enhancement such as through energy-saving machinery, control devices and systems, and operational practices is an objective that can be achieved quite readily by industry.

Other areas where technology is well-placed to provide efficiency improvements are in transportation and climate control of buildings. In all cases, the returns to investment for efficient technology are likely to be high.

Third, another way of looking at efficiency improvement is through the reduction of waste. This includes recycling and alternative uses for waste products. These are particularly important areas for process and manufacturing industries. The implicit value of raw materials as natural capital will, sooner or later, provide a compelling incentive for the development of less material-intensive production systems, and the technology options must be prepared early.

Fourth, in addition to less energy- and material-intensive applications, redesign of systems provides a fertile ground for technology-led improvement. The potential offered by information technology includes new systems of operation which can complement de-urbanization, thus lowering the intensity of environmental loads. New transportation systems can modify lifestyle patterns towards more environmentally-benign directions. New renewable energy systems, including in particular hybrid or combined systems, will improve the productivity of energy use, and reduce environmental ill-effects.

And finally, there is a wide range of new technologies. As identified by the Action Plan for Industrial Technology Development, these areas include biotechnology, advanced materials, automated manufacturing, micro-electronics, and information technology. Technology development in these areas will reduce intensity of resource use, and can maximize environmental benefits. The potential of biotechnology in particular are considerable and of special interest to Malaysia; apart from applications in food production and pharmaceuticals, other areas could be in mining through biological metals extraction and processing of ores through bacterial action. We need to take a long hard look at these possibilities.

CONCLUSION

In conclusion, technology development provides significant opportunities, and the potential contribution towards a sustainable future is considerable. For a country like Malaysia, the future is tantalizing. An industrializing economy benefits from a late-comer's advantage; it has the option of leapfrogging in certain areas. We are also in a position to observe and avoid many of the mistakes that have been made elsewhere.

But in order to achieve our goals effectively, we first demonstrate the will and the capability to master technology. At the same time, we must utilize our knowledge to analyze our options carefully. We must also find the courage to make difficult

decisions. Above all, we must mobilize our social, political, and economic systems to contribute to the fullest to setting the framework for a sustainable future.

It will not be easy to find the wisdom to manage our future. But it must be found, if technology is to contribute towards providing us the means to self-determination. And it must be found if Malaysia in 2020 is to be a contributor to the scientific and technological civilization of the future.

**ADVANCED SOLAR ENERGY TECHNOLOGY FOR RURAL AND
VILLAGE ELECTRIFICATION AND URBAN WATER HEATING IN
MALAYSIA - ENERGY TECHNOLOGY IN HARMONY WITH NATURE**

Mohd Noh Dalimin

International Solar Energy Society - Malaysia Section
FSFG, 43600 UKM BANGI

ABSTRACT

In the coming decades we are going to be hearing more and more of the word "environmentally friendly", "in harmony with nature" and "sustainability". In energy terms, this means that the energy of the future must be the one live on the "interest" of our natural resources and not on the "principle". Clearly, our present energy policies and practices do not fit the above criteria, based as they are on fossil fuels such as oil and coal which have taken millions of years to form.

For rural village communities especially in Sabah and Sarawak, which are not linked to national grid system, because of both expensive and difficult to build and for home diesel and gasoline - powered engines require costly fuel and parts, there are already available advanced solar energy technology that can provide power for lighting, refrigeration and health, TV communication, water-pumping and cottage industry. Solar technology is indeed clean, safe and harmony with nature.

Furthermore as the nation develop, demand for hot water increases dramatically. In part this is due to greater awareness of personal hygiene and sanitation, along with higher level of disposable income. Hot water usage reduces diseases, spread by contamination and need of hot water in hotels, hospitals, schools and industrialization, will also increase. Domestic and commercial hot water is produced by burning of fuels or use of electricity which are costly and normally requires an environmentally unfriendly sources of energy.

It has been proven and equally cost-effective solar water heating can be used using the free and abundance solar energy, both for domestic and industrial use.

In this paper, we provide the various development and research that has been done to provide solar power, both for rural electrification and urban hot water supply and the recommendations to enhanced the use of solar energy technology to in both areas - energy technology which is in harmony with nature - solar power.

STRATEGIES FOR ENERGY EFFICIENCY

Letchumanan Ramatha
Kementerian Tenaga, Telekom dan Pos
Malaysia

ABSTRACT

Although Malaysia possesses reasonable quantities of energy resources, these are mostly non-renewables such as oil, gas and coal. Malaysia's oil reserves is expected to be depleted in 15 years whilst natural gas is expected to last for 100 years. New and renewable energy is also available in abundance, however the utilization of these resources are still at the research and development stage. Thus in line with the national energy policy objectives, a need arises for the commercialization of new and renewable energy technologies as well as efficient utilization of our energy resources through careful planning and optimization of our energy supply options in order to sustain the fast pace of development. Special emphasis on efficient utilization could be placed at the users end. This paper present the achievements of energy efficiency activities in Malaysia and proposes a set of strategies and activities for the future. Focus is placed on education, incentives, technology transfer and legislation as instruments to promote energy efficiency. Industry, buildings, electricity and transport sectors have been identified as target areas. Proposals are made for the establishment of demonstration projects, which can become working models for many to follow.

SOLAR POWER SYSTEMS ITS APPLICATION AND CONTRIBUTION TO THE DEVELOPMENT OF THE COUNTRY

Michael Yip
BP Malaysia Sdn Berhad

ABSTRACT

Traditionally developing countries like Malaysia have concentrated on large scale energy projects such as hydro schemes, nuclear, coal fired, gas or oil based power stations to assist in the long term development of their people.

The primary function of these projects is to provide energy to the major population and industrial centres.

In Malaysia this means that nearly 30% of the population does not have access to the national grid supply, 10% Peninsular and

50% East Malaysia). The vast majority of these would be rural communities consisting of about 7,000 villages.

If the supply of electricity is regarded as an essential services then there is obviously an equity problem between those receiving the service (together with the possibility of a cross subsidy) and those who are not.

All countries in the region are aware that without a balanced rural energy policy large scale energy projects tend to further encourage the drift of rural populations to urban centres, reducing their chances for real advancement.

What has often been required and until recently, not existed, is a more decentralized and flexibility energy supply system to meet the immediate needs of a widely distributed rural population.

Over the past ten years Photovoltaic (OV or Solar) Technology has emerged as the promising new energy technology that is rapidly becoming an integral part of rural energy development.

NUCLEAR POWER PROSPECTS FOR MALAYSIA AND REQUIREMENTS FOR ITS INTRODUCTION

Jamal Khaer Ibrahim

Nuclear Energy Unit

Ministry of Science, Technology and the Environment

Kompleks PUSPATI, Bangi, 43000 KAJANG



MY9700864

ABSTRACT

Nuclear power planning studies was first officially conducted in Malaysia in 1979, by the then National Electricity Board (NEB) under an International Atomic Energy Agency (IAEA) Technical Assistance Programme. The study culminated in a report entitled The Possible Role of Nuclear Power in Malaysia: 1985-2000. An updated study, entitled The Nuclear Option Review for Malaysia, was subsequently jointly conducted by the NEB and the Nuclear Energy Unit, then under the Prime Minister's Department, in 1985. Since then several other studies have been conducted for specific areas of interest within the context of nuclear power planning, including and involving improved techniques in energy and electricity demand forecasting, preliminary assessment of national uranium resources, industrial capability assessment, financial implications analysis, manpower availability assessment, public information activities and an on-going preliminary site survey of nuclear power plants.

Based on the Nuclear Option Review of 1985, which covered the period from 1985 to 2010, under the most optimistic scenario analyzed, the first nuclear power plant was expected to

be connected to grid in the year 2005. Only 900 MWe nuclear plants were used in the study. An update to this study, to take into account recent growth trends as well as future growth policies, notably the Vision 2020 objectives, is to be initiated.

With the consequent anticipated rapid growth in electricity demand, it is highly likely that Malaysia may have to change its present four-fuel policy to a five-fuel policy in the next century. The decision to change should, however, be made early given the long lead time required for a smooth introduction of nuclear power.

Besides the relatively long construction period required for nuclear power plants, the long lead time is also required to ensure adequate preparations of supporting infrastructure, manpower as well as appropriate legal and organizational frameworks. The long preparation period required for a nuclear power programme implementation, compared to the introduction of other energy generation technologies, is largely attributable to the nature of the technology and its demanding safety and reliability requirements.

A number of national policy issues will also have to be decided prior to the implementation of the nuclear programme, especially those pertaining to international nuclear weapons non-proliferation safeguards, technology transfer, nuclear fuel cycle and waste management strategies, and emergency preparedness. These decisions, particularly the nuclear fuel cycle policy, will determine the nuclear power plant type to be used throughout the programme.

This paper attempts to give a comprehensive overview of the issues involved in planning for an introduction of nuclear power.

CONSERVATION - A RENEWABLE ENERGY RESOURCE

K.S. Kannan

Faculty of Mechanical Engineering
Universiti Teknologi Malaysia

ABSTRACT

Energy conservation seems at present the ultimate and most acceptable strategy out of a worldwide dilemma; on the first hand, one has to meet the increasing demand for energy especially in developing countries, on the other hand mankind must tackle the growing problem of increasing 'carbon dioxide' levels in the atmosphere and pollution by other waste gases. Energy conservation is important for long term economic well-being and security because of three major reasons. Firstly, it will

'expand' the availability of the finite energy resources; secondly, it reduces the detrimental effects of energy production and use; and thirdly increasing the efficiency of energy use is often more attractive than investing additional resources to increase the domestic energy supply. In Malaysia, the growth in energy consumption is around 8 per cent per annum and effective energy conservation is necessary to avert a possible energy crisis brought about by an increase in demand by the various industries. A typical energy conservation implementation programme is outlined. Finally the growing prospects for energy conservation makes it one of the world's major energy resources today and for the future.

865

ENERGY OUTLOOK TO 2020: OPPORTUNITIES AND CHALLENGES FOR RESEARCH COMMUNITY IN MALAYSIA

Mohd Zamzam bin Jaafar, Hanidah Hashim dan Kamsiah Katan
Tenaga Nasional Berhad



ABSTRACT

MY9700865

Malaysia is poised for accelerated gas utilization, to displace oil as a primary energy source, when major gas-based power and downstream projects become operational. At issue is whether the country will continue to pursue the four-fuel policy, especially with regard to using coal for electricity generation. Fuel security in the 1990s must somehow be reconciled with the need to protect the nation's huge investment in gas supply. As penetration of gas to displace petroleum products in industrial, transport, commercial and residential sectors is uncertain, domestic refinery input and output mix is simultaneously being modified so that it conforms more closely to the specification of domestic crude and consumption pattern thereby reducing to need to import petroleum products.

If large scale gas use is unchecked, the country may become overly dependent on natural gas with the corresponding risk, but most importantly, our gas reserves will be completely depleted within less than two generations. There is some concern whether the present Malaysia generation should use our gas reserves to sustain economic progress to 2020 or leave the gas in the ground for future generations? On the basis of preliminary results obtained from a study 'Integrated National Energy Plan', this paper argues that a strategy of using oil, natural gas, hydro, coal and nuclear energy for electricity generation will lead to a more balanced primary energy supply mix, while satisfying the goals for industrial development and

leaving adequate national resources as inheritance for future generations. Under the Vision 2020 scenario (7% GDP growth p.a over three decades), final energy demand will grow by more than eight times while electricity will increase at least ten-fold in 2020 compared to 1990, despite significant progressive gains in energy efficiency (20 percent). Our progress to 2020 introduces major constraints and challenges to energy corporation responsible for providing adequate and reliable energy supply. It is very likely that the present practice for farm out specific problems to research bodies and institutions of higher learning (outsourcing) would be continued and expanded, presenting vast opportunities for the research community in the country. The challenge is to provide cost-effective solutions to ensure reasonably priced energy supply to power the nation's progress, as well as the profitability of private sector entities like Tenaga Nasional and subsidiaries and production sharing partners of Petronas.

NGV - ITS MARKET AND TECHNOLOGY

Ir. Dr. Baharudin Ali and Dr Sohif Mat
Product Development Department
Petroleum Research Institute



MY9700866

ABSTRACT

The Natural Gas for Vehicles (NGV) industry is poised to take off significantly transpiring from the Peninsular Gas Utilization (PGU) program and the regional supply of natural gas undertaken by Gas Malaysia. Its setting could also be due to variety of other reasons such as the environmental pressure exerted by the government and community, or simply for economics and security reasons. What ever the causes are, it looks certain that the industry is there to stay. This paper highlights the developmental needs of the market, its potential and technological support required to sustain the credibility of the NGV industry. Various options in NGV technology and the future direction of R & D were also discussed.

NATURAL GAS UTILIZATION IN THE TRANSPORTATION SECTOR: CNG AND LNG FUELING

Z.M. Meratla
CDS Research Ltd.
Vancouver, Canada

ABSTRACT

Natural gas is an abundant source of energy and is already a strong competitor to other fuels, including oil. The combination of a number of factors (environmental benefits, price, existing infrastructure, favourable institutional and regulatory guidelines, new power generation technology based on natural gas, etc) accounts for the current forecast for a significant and sustained increase in natural gas demand worldwide. Transportation is acknowledged to be the sector with the greatest potential for growth.

867

ELECTRIC POWER DEVELOPMENT AND THE ENVIRONMENT

Zainal Abidin bin Othman and Zuhir Ali
Tenaga Nasional Berhad



MY9700867

ABSTRACT

Electricity is a basic infrastructure in developing the economy of Malaysia. The current electricity requirements are increasing at a faster rate than in the past. The faster growth rate in demand for electrical energy is attributed to the rapid growth in industry, demographic factors and technological changes.

The increase in electricity consumption has precipitated accompanying environmental problems since every steps of energy generation, transmission and utilization has an input on the natural environment.

The adverse environmental impacts of energy resources development are becoming evident world-wide. It must be recognized that the key to the future is in the national use of energy that is to say in the improvement of the efficiencies at which the energy is used rather than for ever increasing the supply of energy.

Energy unit of energy saved is a unit of energy which does not have to be generated and whose environmental impacts do not have to be dealt with. This may suggest a change in attitudes towards energy.

THE POSSIBILITY OF METAL POISONING IN MAN AND ITS PREVENTION IN MALAYSIA

Sharifah Barlian Aidid
Physics Department
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

Symptoms of metal poisoning in man and cases of metal poisoning in other countries were cited. The increased trend of toxic metals in the Malaysian environment and its impact on metal contamination in food products locally grown by the farmers for home consumption were discussed. This raised the question on the possibility that many cases of food poisoning occurred recently might be due to the undetected metal poisoning and due to the ignorance of some villagers in ingesting metal contaminated foodstuffs. A few proposals were put forward with the aim to increase the awareness of the village folks on environmental issues so that the occurrences of food poisoning due to toxic metals could be prevented in future.

ENVIRONMENTAL POLLUTION - EFFECTS ON NATIONAL DEVELOPMENT

Mahyuddin bin Ramli and Mohd Fadzil bin Mohd Idris
School of Housing Building and Planning
Universiti Sains Malaysia,
11800 PULAU PINANG



MY9700868

ABSTRACT

Environmental pollution is among the major issues highlighted in many discussion between the Government and Non-Government officials whether in the developed or developing countries. The problems becoming worsen when not many people are concerned on its detrimental effects on the future generations. The increasing number of forest activities without proper replanting will also exposed to flood problems, soil erosion, landslides and many were as results of environmental impacts. The urbanization process with the rapid industrial development, without having proper planning and inadequate control, may also create a long term disasters. Penang island territory has been experiencing the most highly physical development growth in this country. Hence, environmental problems are becoming the major issues. This paper

will discuss on the various environmental problem, particularly in Penang and possible remedial to be taken by the state and federal authority to overcome the problems. The type of pollutions such as air and water pollutions, acid rain and of course the reduction of ozone layer. Besides that the increase of heat in our climate will also be of our concerned in the process of urbanization.

ENVIRONMENTAL NOISE AND NOISE MODELLING - SOME ASPECTS IN MALAYSIAN DEVELOPMENT

Mohd Salman Leong and Mohd Shafiek Hj. Yaacob
Institute of Noise & Vibration
Universiti Teknologi Malaysia
Kuala Lumpur

ABSTRACT

Environmental noise is of growing concern in Malaysia with the increasing awareness of the need for an environmental quality consistent with improved quality of life. While noise is one of the several elements in an Environmental Impact Assessment report, the degree of emphasis in the assessment is not as thorough as other aspects in the EIA study. The measurements, prediction (if at all any) and evaluation tended to be superficial. The paper presents a summary of correct noise descriptors and annoyance assessment parameters appropriate for the evaluation of environmental noise. The paper further highlights current inadequacies in the Environmental Quality Act for noise pollution, and annoyance assessment. Some example of local noise pollution are presented. A discussion on environmental noise modelling is presented. Examples illustrating environmental noise modelling for a mining operation and a power station are given. It is the authors' recommendation that environmental noise modelling be made mandatory in all EIA studies such that a more definitive assessment could be realized.

201002019

A CLEAN TECHNOLOGY OF DISPOSING ELECTROPLATING SLUDGE WITH PROFITABILITY

Chew T.Y and Tee G.H

Standards & Industrial Research Institute of Malaysia (SIRIM)
P. O. Box 7035
40911 SHAH ALAM

ABSTRACT

A clean technology known as diaphragm electrolysis has been investigated to assist the industries in their disposal of toxic sludge and reducing the cost of wastewater treatment with the ultimate aim of conserving heavy metal resources and re-utilizing the valuable metals recovered from the sludge. This process eliminates sludge quantity tremendously saving on treatment and disposal costs. Bench-scale studies were carried out to determine the optimum conditions for good recovery of nickel from factory segregated nickel sludge. A scale-up on a 140 litres prototype confirmed similar good recovery of 86 - 99 % cathode efficiencies using factory segregated nickel sludge. The product was tested for its purity. Economic assessment was attempted which showed good returns especially if the treatment and disposal costs were included. This process is applicable for recovery of other heavy metals such as copper and zinc.

WILDLIFE AND THE ENVIRONMENT

Kiew Bong Heang

Department of Zoology
University of Malaya
59100 KUALA LUMPUR

ABSTRACT

Man lives in the biosphere on earth with a host other life-forms. What is not domesticated by man is considered as wildlife. Wildlife are not wild in their behaviour in the environment. There are homoeostatic mechanisms in operation in the maintenance of the Balance in Nature. The wild aspirations man and the growth in his population are the chief causes of upheaval in the environment. Pests and weeds are man's own making. The use of financial indices as feed-back homoeostatic agents in the regulation of man wild behaviour is not effective. There is a need to include moral and environmental indicators as feed-back agents as well. Technology alone will not provide the solutions

to our environmental problems. Man has to see himself in the appropriate perspective as part of Gaia and stop behaving like a cancer on her body. The extinction of wildlife species and their habitats is similar to the operations conducted on Gaia leading to her demise and ours. The way to a sustainable future for making lie in self regulation.

INDUSTRIAL DEVELOPMENT & WASTE MANAGEMENT STRATEGIES IN MALAYSIA

Yew-Seong Chen
(ENSEARCH)

Chemasia Industries Sdn Berhad

ABSTRACT

Unsustainable industrial development of yesterday has caused the ecological destruction of today. Malaysian's industrialization strategy towards 2020 will be guided by environmental obligations declared at the World Summit in Rio.

The Manufacturing sector will spearhead the nations economic growth. The complex industrial waste problem (in particular the safe disposal of toxic and hazardous waste) is best resolved by adopting Waste Minimization strategy.

In-house waste reduction and treatment is the first priority, leaving the toxic waste to be handled by the Central Treatment Centre at Bukit Nenas, Negeri Sembilan.

The "Zero Liquid Discharge" concept saves water and reduces pollutant discharge. A case study on a paper mill in the Klang Valley illustrates the use of a Waste Audit to determine the flowsheet design.

The successful treatment of the highly polluted effluents from the Palm Oil and Rubber Industries as a model of sound and well-planned R&D contribution. The emphasis now is on re-use and by-product recovery from waste products.

The timber industry will reduce the rate of logging to ensure "sustainability" in line with our "greening the world" policy.

The Government should facilitate action in:

1. D.O.E and State Governments to implement Environmental Regulations more expeditiously using privatized services if needed.
- ii. Upgrade our technology competence through training courses and utilizing NGO's, professional bodies and foreign specialists in technology transfer.

- iii. Promote ethical standards to regulate the consultancy and contracting practices and encourage industrialists to commit to be principles of "sustainability".

AKTA KUALITI ALAM SEKELILING; PENGKUATKUASAN DAN KEKESANANNYA

Jalaludin Ismail
Jabatan Alam Sekitar
Kementerian Sains, Teknologi dan Alam Sekitar
Kuala Lumpur, Malaysia

ABSTRAK

Di dalam usaha untuk mencapai pembangunan ekonomi, perhatian yang sewajarnya perlulah diberikan kepada pemeliharaan alam sekitar dan ekologi supaya dalam jangka panjang, pembangunan dan sumber negara dapat dikekalkan secara berterusan di samping meningkatkan taraf hidup (RRJP2). Pengurusan alam sekitar dan sumber asli negara yang cekap melalui teknik pengurusan yang mengintegrasikan pertimbangan alam sekitar di dalam pembentukan program dan projek serta kawalan pencemaran merupakan kaedah yang penting di dalam menentukan kejayaan pembangunan negara yang berterusan (RM6). Tujuan utama kertas kerja ini disediakan ialah untuk menggariskan beberapa skop kawalan dan perundangan Akta Kualiti Alam Sekeliling (AKAS), 1974, dalam menangani isu-isu utama alam sekitar di Malaysia, serta menggariskan kekesanan penguatkuasaan dan beberapa kekurangan Akta tersebut di dalam mengawal, mencegah dan mengatasi masalah pencemaran alam sekitar. Adalah menjadi tujuan kertas kerja ini juga untuk menggariskan beberapa keperluan dan dimensi baru mengenai pengurusan alam sekitar selain daripada kawalan perundangan dalam menangani isu-isu alam sekitar yang lebih mencabar serta berkaitrapat dengan pelaksanaan pembangunan berterusan di Malaysia.

RECENT DEVELOPMENT IN SANS TECHNIQUE IN MALAYSIAN CONTEXT

Shahidan Radiman¹ and Abdul Ghaffar Ramli²

¹Jabatan Sains Nuklear

Universiti Kebangsaan Malaysia

²Unit Tenaga Nuklear

Kompleks PUSPATI, Bangi, 43000 KAJANG

ABSTRACT

The 1980's have seen small-angle neutron scattering (SANS) techniques being developed around the world. Analysis using Guinier, Zimm and Porod plot have become fairly routine. While theories and experiments on polymers (both in melts and in solutions) have benefited greatly using SANS recent method of spin-labelling and multiple SANS have not been fully exploited. A brief review of these methods is given. We also show some use of SANS in analyzing Bragg amplitudes from liquid crystals as well as in studying anisotropic complex fluids.

A brief review of the SANS instrument being developed at UTN is given, showing experimental set-up and instrumental optimization based on latest criterion. Computer-controlled sample changers and automated alignments will be described. Methods of data acquisition and model fitting incorporating Maximum Entropy method and Tikhonov regularization will be described.

The general use of SANS technique on material science, physics, chemistry and biology will be reviewed and its role in the Malaysian industrialization programme is outlined with specific examples from ceramics and powders, rubbers, organometallic compounds, alloys, resins and lubricants.

INFRARED LASER-LIQUID INTERACTION AND ITS APPLICATION

Mohd Kadim Suaidi, Noriah Bidin and Ramli Abu Hassan
Applied Optics Unit
Department of Physics
University of Technology Malaysia
80990 JOHOR BAHRU

ABSTRACT

When Albert Einstein discovered the physical principle responsible for the amplification of radiation in materials in 1916, it took another 45 years or so before T.H. Maiman constructed the first laser and thus establishing the laser as a scientific and technological discovery of great magnitude. It has found applications in most areas science and technology with laser techniques being employed in such diverse field as spectroscopy, metrology, diagnostics and inspection, communications, fusion research, defence and medicine. The laser interaction mechanisms in different media and their applications have become areas of intense research activity. The nature of these interactions have been found to depend on the wavelength and intensity of the incident laser beam as well as on the thermal and optical properties of the medium in relation to the laser beam parameters. The specific phenomenon of laser-liquid interaction with respect to generation of acoustic waves in host media has also found a variety of scientific and practical applications. The investigation of the properties of infrared laser induced optical breakdown in liquids has become increasingly popular. Among liquids, water either in distilled, deionized or ultrapure form, has been extensively studied as a plausible model for ocular media due to interest in the field of eye surgery. Laser induced optical cavitation formed as a result of dielectric breakdown of the liquid in the close vicinity of solid surface is also a useful technique for studying the phenomenon of cavitation erosion under laboratory conditions.

SISTEM PENDERIA - BERBILANG SERABUT OPTIK

Rosly Abdul Rahman
Jabatan Fizik, Fakulti Sains
Universiti Teknologi Malaysia

ABSTRAK

Penggunaan kaedah optik dalam penderiaan mempunyai beberapa keistimewaan seperti jaminan keselamatan daripada kebakaran, pembawaan isyarat penderiaan yang bebas daripada gangguan elektromagnet dan keupayaan memberikan kepekaan pengukuran yang tinggi. Dengan munculnya berbagai jenis penderia optik yang terdiri daripada serabut optik itu sendiri, peranan serabut optik dalam penderiaan berpotensi untuk diperluaskan.

Di dalam suasana yang memerlukan penderiaan berbagai jenis parameter, keupayaan serabut optik untuk membawa isyarat dari berbagai jenis penderia perlu dikaji dengan teliti. Antara faktor yang terpenting adalah kesusutan kuasa yang berlaku di dalam setiap komponen sistem seumpama itu. Hasil kajian mengenai kesusutan kuasa yang berlaku dalam beberapa komponen seperti pencantuman (splice) dan pengganding dwiarah, dikemukakan dalam menyediakan satu belanjawan kuasa sistem.

Di dalam kertas kerja ini dikemukakan juga dua contoh sistem penderiaan, iaitu bagi kelajuan serta dwiarah angin dan bagi pengesanan debu. Kedua sistem ini menggunakan penderia serabut optik yang menghasilkan isyarat berdigit. Usaha sedang dijalankan untuk membina sistem gabungan kedua penderia tersebut dengan menggunakan kaedah multipleksan panjang gelombang (wavelength-division multiplexing).

PENENTUAN KUALITI KAYU TROPIKA DENGAN KAEDAH ULTRASONIK

**Sidek Hj. Ab Aziz,¹ Mohd Salleh Mohd Deni²
dan Abdul Halim Shaari¹**

¹Jabatan Fizik
Universiti Pertanian Malaysia
43400 UPM SERDANG

²Jabatan Fizik
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRAK

Ujian memusnah lazim digunakan bagi mendapatkan ciri kualiti kayu terutama dari aspek nilai kekuatannya. Walaupun begitu kaedah tanpa musnah ultrasonik juga berkemampuan untuk mengkaji sifat fizik kayu dan seterusnya menentukan kualitinya. Kaedah ini masih kurang dilaksanakan di Malaysia sedangkan aktiviti seumpama ini dijalankan di luar negeri secara meluas. Objektif kajian adalah untuk mendapatkan maklumat terperinci bagi sifat fizik kayu-kayan tropika pada suhu bilik. Nilai halaju gelombang ultrasonik yang merambat dalam sampel kayu-kayan tempatan yang bersimetri ortotropik digunakan bagi mendapatkan set pemalar membujur (longitud). Nisbah pemalar kenyal terhadap ketumpatan dapat digunakan bagi mengkelaskan jenis sampel kayu.

AERIAL PHOTOGRAPHY USING MINIATURE REMOTEY-PILOTED VEHICLE

Aminuddin Ghazali¹ and Ahmad Nazri Mohammed Ludin²

¹Fakulti Kejuruteraan Jentera, Universiti Teknologi Malaysia

²Fakulti Alam Bina, Universiti Teknologi Malaysia

ABSTRACT

Aircrafts have been used for aerial photography and land survey of large, usually inaccessible areas. This paper outlines an ongoing project at UTM to use miniature remotely-piloted aircraft

weighing about 5 kg for the same purpose, with an objective towards drastically reducing cost and turn-around time. Issues include aircraft performance, photographic equipment setup, and modification to the flight-control system to fulfill those requirements.

RECENT ADVANCES IN SATELLITE REMOTE SENSING AND ITS APPLICATIONS IN MALAYSIA

Nik Nasruddin Mahmood
Malaysian Centre for Remote Sensing (MACRES)
No. 13, Jalan Tun Ismail
50480 KUALA LUMPUR

ABSTRACT

Recent advances in space technology has seen the expansion of airborne remote sensing system into a satellite-based system; with parallel advances taking place in its applications for managing earth's resources and the environment. In realizing the potential of this technology to be used in the country's development efforts a National Remote Sensing Programme was implemented with full participation of government user agencies.

The development of user segment is being given emphasis in the first phase of the implementation of the programme. Under this initiative, some inroads have been made by user agencies in the use of satellite remote sensing and related technologies for resource management, environmental protection and strategic planning of the country. With the advent of new higher resolution and microwave satellite remote sensing systems, further advances are expected in wider application areas of this technology.

ANALYSIS AND DESIGN OF MICROSTRIP SENSOR FOR OIL PALM FRUITS

Zulkifly b. Abbas and Kaida b. Khalid
Pusat Sains Asasi dan Jabatan Fizik
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

There is an optimum time in the life span of each bunch of oil palm where the oil yield and oil quality are in optimal balance. This is indicated by the variation in oil content or moisture content during the development of the oil palm, (*Elaeis guineensis*) fruits.

In this article the analysis and design of microstrip sensor for quick and accurate determination of moisture content in fresh mesocarp is described.

A functional relationship has been developed between insertion loss $|S_{21}|$ of the sensor and moisture content in mesocarp and a close agreement has been found between computed and experimental results. This agreement suggests that a realistic optimization-based design approach with respect to the effects of the geometrical and electrical parameters of the sensing area can be developed.

ADVANCED COMPOSITE MATERIALS FOR AN INDUSTRIALIZED NATION

Daud Hj. Abd. Rahman
Fakulti Kejuruteraan Jentera
Universiti Teknologi Malaysia
80990 JOHOR BAHRU

ABSTRACT

The roles played by laminated composite material (categorized under advanced engineering material) in the advancement of technology is brought to light apart from the more general use of

the material. Among others, the scope that will be covered in the presentation also include the areas of applications of composite material how the advantages of the tailor-made properties of the material can be exploited for engineering purposes, the fabrication techniques of making structural components using the material, the technology required in the fabrication processes, the potential use of the material which has yet to be exploited, the present status of the use of the material in Malaysian context as well as the problems it encountered, the programme for transfer of technology required, the integration of the subject with other areas of studies and research. Finally the paper summarizes how the acquisition of the technology in this field can play a role in order to realize vision 2020, to make Malaysia a truly industrialized nation.

CONVENTIONAL SINTERING AND HOT-PRESSING OF MAGNETIC AND SUPERCONDUCTING CERAMICS

Abdul Halim Shaari, Mansor Hashim and Sidek Hj. Ab. Aziz
Department of Physics
Universiti Pertanian Malaysia
43400 UPM SERDANG

ABSTRACT

Advanced ceramics such as ferrites and high temperature superconductors have been prepared by conventional firing in ambient environment and hot-pressing in semi-isostatic condition. Ferrites prepared by hot-pressing poses excellent microstructure and may approach zero porosity. High density and homogeneous/fine grain size may be readily obtained. Coupled with the resulting good magnetic properties, excellent ferrites for use as recording heads, permanent magnets and in microwave devices can be produced by this technique. Although hot-pressing technique is required to produce ceramic with superior quality, however for many commercial application, conventional sintering is sufficient.

STATUS OF RESEARCH AND DEVELOPMENT ACTIVITIES ON SOLAR CELL IN MALAYSIA

Muhamad Yahya
Jabatan Fizik
Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

This paper presents an overview of activities on photovoltaic power in Malaysia. Research in the semiconductor physics of solar cell was started in the early seventies in various universities but the progress was slow due to a limited resources. An attempt is made to summarize the current research interest at UKM particularly in thin films solar cells. The basic principles of photovoltaic energy conversion are briefly described. Performance parameters such as, efficiency, short circuit current and open circuit voltage will be discussed based on the published materials data. Applications of photovoltaic system in telecommunication and power generation will also be presented. The last section of the paper will focus on the possible future direction of research and development in photovoltaic study.

RUBBER AS AN ADVANCED MATERIAL

Nordin Jamaludin¹, Jaafar Sahari¹ and Ibrahim Abdullah²

¹Department of Mechanical & Material Engineering

²Department of Chemistry

Universiti Kebangsaan Malaysia
43600 UKM BANGI

ABSTRACT

The main objective of this paper is to study the effects of rubber on the mechanical properties of glass fibre-reinforced composite (GFRC). The investigation is important in order to find a new application of Malaysian rubber since rubber cannot stand by itself to become an advanced material. The material is

produced by adding liquid natural rubber (LNR) to GFRC. The results acquired show that the Young's modulus and tensile strength decrease as the rubber content increases. On the other hand, the fracture toughness increases with the addition of LNR in the matrix. High fracture toughness will increase the energy to break the material and the crack growth resistance. The optimum mechanical strength is achieved by adding 5 to 10% LNR to GFRC.

PENYEDIAAN SUPERKONDUKTOR SECARA KACA - SERAMIK

Idris Matali

Pusat Pengajian Kejuruteraan Bahan dan Sumber Mineral
Universiti Sains Malaysia
Kampus Cawangan Perak, Seri Iskandar
31750 TRONOH

ABSTRAK

Sebilangan komposisi daripada sistem Bi-Sr-Ca-Cu-O dilebur dan dilindapkejutkan antara dua kepingan logam dan didapati sebahagian daripada sistem tersebut dapat membentuk kaca. Bagaimanapun hasilan ini dilindapkejutkan ini bukan fasa superkonduktor dan teknik lindapkejut ini pula perlu untuk mengekalkan sebahagian daripada komposisi ini hadir dalam keadaan kekaca. Tempoh rawatan haba yang lama lebih daripada 20 jam pada suhu yang hampir dengan takat lebur sekitar 820°C diperlukan bagi pembentukan fasa-fasa yang bersuperkondukt. Rawatan haba pada sampel-sampel yang dilindapkejut membawa kepada pembentukan fasa berbagai hablur. Terdapat perimbangan dan hubungkait yang rumit antara faktor-faktor termodinamik dan kinetik yang terlibat dalam sistem ini akan dalam semua kes didominankan oleh fasa T_C - rendah 2212.

FRONTIERS IN MATERIALS FOR NON-CONVENTIONAL ENERGY CONVERSION DEVICES

Suresh Chandra

Centre of Advanced Studies, Department of Physics
Banaras Hindu University, Varanasi 221005, India

ABSTRACT

The prosperity of all nations is closely linked with the development of advanced materials in the general area of : (a) Structural engineering material including special alloys, composites, polymers etc. (b) Electronic and opto-electronic materials, (c) Bio-mass (d) Bio-materials, (e) Energy conversion device materials (f) Special Application materials/exotic materials like High Tc Superconductors, Fullerene etc. The present paper concentrates on non-conventional energy conversion, device related materials.

The historical lead gained by many nations in energy sector gave them globally prime positions in the past. With imminent exhaustion of fossil fuel (oil or coal) and hydroelectricity production reaching saturation, all nations must choose their own new energy options like nuclear, wind, ocean, hydrogen, solar etc. It is argued that hydrogen and solar energy routes have high futuristic prospects in many sectors of energy consumption. This paper concentrates on frontiers of development in:-

- (i) Hydrogen storage materials for motorized transport. LiAl alloys, Palladium, Fe-Te alloys are some examples.
- (ii) Materials for H_2/O_2 fuel cells and Solid State Battery. Proton conductors particularly hydrates and polymers would be discussed.
- (iii) Solar Photovoltaics including storage systems. Materials choice is governed by efficiency and stability vis-a-vis cost. A low cost "electrodeposition technique" for obtaining films of semiconductors like Si, GaAs, $CuInSe_2$, $MoSe_2$ doped CdSe etc. is described.

PANEL DISCUSSION - STRATEGY

Theme : "Towards Environmentally Sustainable Development"

Panelists: Datuk Dr Augustine Ong (Chairman)
En. Nik Nasruddin Mahmood
Dr Mohd Zamzam Jaafar
Prof. Suresh Chandra
Dr Abu Bakar Jaafar

Datuk Dr Augustine Ong

1. Meaning : Adopt life style in harmony in environment.
2. Identify views in four priority areas
 - i. Environment / conservation
 - ii. Energy
 - iii. Advanced materials
 - iv. New technique / technology
3. Legislation with regard to these areas; Laws, acts or regulation that needs to be change, implemented or enforce.
4. Increase development and utilization of resources in harmony with the environment.
5. Access weaknesses and propose solution to the problems with respect to the different areas.

En. Nik Nasruddin Mahmood

1. Remote sensing (RS) is not given enough priority presently.
2. RS is applicable to environmental monitoring and management; earth data inventory, dynamic effect of environmental degradation.
3. With the complement of computer RS is highly accurate and fast.
4. Adopt open sky policy i.e. data available to all countries.
5. National RS committee should formulate programme to be implemented by Kementerian Sains Teknologi dan Alam Sekitar.
6. Presently only government bodies and universities are actively using RS facilities & technology.
7. Private sector should be encourage to use RS facilities.
8. Create awareness by including RS in schools, colleges and universities curriculum.
9. Constraints: (i) skilled and trained manpower, and
(ii) data supplied by outside sources.
10. Should speed up the establishment of our own ground station; But develop user capability first with help from neighbouring countries.

Dr Mohd. Zamzam Jaafar

1. Two issues:
 - (i) Efficient use of energy
 - (ii) Environmental protection
2. 38,000 hectares of land under transmission lines need to be developed productively e.g cultivation or recreational.
3. Should design compact substation in urban areas.
4. Ash from coal powered plant should be utilized. Presently problem of storage and disposal of this ash.
5. We should design aesthetic power plant.
6. TNB should reduce design base energy loses. Current efficiency is 35% in advance countries.
7. TNB should become energy conservation promoter by
 - (i) encouraging customer energy efficiency and
 - (ii) load management programme
8. TNB can encourage customer energy efficiency by introducing trade-in programme for non efficient devices.
9. Proper load management will reduce peak hours demand and change the shape of load duration thus need not have to built more plants hence good for the environment.

Prof. Suresh Chandra

1. Hydrogen will be the energy of 21st Century. Should encourage research on production of hydrogen through (i) solar energy and (ii) bioroute. Interdisciplinary approach of hydrogen energy production, storage and devices related to hydrogen should be found.
2. Fossil fuel as energy source should be reduced. They should be conserved as source for chemical industry.
3. Nuclear energy is unavoidable. This nation should be prepared for it, hence the programme should be continue.
4. Photochemistry and photobiology has to be brought into the stream of R&D activity.
5. Inexpensive semiconductors production e.g simple electric deposition and chemical deposition methods has to be strengthen.
6. Composite material will play important role, and should be developed.
7. Malaysia should have waste material management board.
8. It should be mandatory on the industry to develop through their R&D, - their waste management processes.
9. Those industry with recyclable waste should contribute to the research sector of government or university to develop processes.
10. Energy conservation should be part of curriculum in school at early stage.

11. There must be energy conservation legislation.
12. Information technology play important role.

Dr Abu Bakar Jaafar

1. Should develop concept in sustainable development.
2. Should have priority area in environment.
3. Reduce utilization of fossil energy. Should move to renewable energy such as wave, hydrogen, wind, water etc.
4. Stop using exotic materials, heavy metals or aromatic compounds.
5. Ceramic as advance material should be developed.
6. Look for new technique and materials in biology.
7. We should have good knowledge of the nature so that we can make good decision in assessing our environment.

DISCUSSION (FLOOR)

1. Public are not really exposed to RS. Rigorous awareness programme should be launched.
2. Most unfriendly energy user is the transport industry. To conserve the environment the transport industry should be considered.
3. Development of hydrogen energy and the storage material should be developed. But meanwhile, nuclear energy should be considered first.

PART VII

OVERVIEW

OVERVIEW

The role of Government is paramount in the development of S&T infrastructure. The goals of its economic development are clear. The exhortation is to feel dedicated to commerce and to generate the sense of technological awareness. The main emphasis at the moment is on the country's industrialization policy. The emphasis on market mechanism is thus an important basis for economic reforms.

In our society to increase production of goods is the basic measure of social achievement. Technological advance for increasing the production and also multiplying the products from the available resources is paramount. Two goals stand out, one of which is social balance which relates to goods and services we consume and the other is economic growth - the expansion of economic output - which requires an increase in the quantity of the productive plants and equipment of the country or in its quality or in both. The increase in quantity is capital formation. The increase in quality is technological advance.

The country must try to effectively combine technology, existing and new with social requirements which themselves will change, at least, in their ranking or priorities. The problems of the future will be the problems of technology assessment than of technology itself.

The social function of science implies more than the impact of the products of science and technology. It encompasses a vision of society where social affairs are permeated by methods, ways and thoughts of science.

We are at the state of the development of the scientific method. Science is also an occupation. The wider interpretation of it should not only to include natural science but scientific production and administration. The scheme should concentrate on the practical application in industry of advanced technology whether in the form of service (system), process or product. The felt need is to encourage effective innovations, not abortive inventions and innovations singled out are representation of the kinds that contribute to national wealth. The overwhelming fact about innovation is the formidable complexity and variability of the circumstances surrounding it. It is more than inventing. For success in innovation requires clear definition and thorough understanding of user needs acquired by careful study on such factors as market and even direct collaboration with potential users and followed up when there is a product to market by adequate publicity, user education and continuing effort to anticipate customer's problems.

Vigorous commercial and scientific management is every bit as important as an idea which is being exploited. There is the need for technological and commercial ability particularly in

the later and more costly parts of the process of innovation. It is in the final stages of the process of innovation, in tooling up, in introducing improvements in processes, in skillful and aggressive marketing, that the biggest effort in terms of the professionally trained manpower is called for.

In this case science helps by improving service, processes or products that already exist. In other words the goals of the work of the scientists are directed towards achieving aims external to science in the wider society. Would it not be good if qualified people were more flexible and willing to let themselves be deployed into fields picked by criteria external to science.

There is the need to develop the innovation culture, the culture of enterprise and the culture of creativity that encompasses associated creativity. There need be investment in research and development; that is the climate in which innovation occurs. Partnership between industry and the academia is playing a vital role as well as the government that require targetting. Targeting is vitally important in technological development especially in specific technologies. Measures of academic must be related to the practical priorities that have been set up. Interactions between education and industry can yield creative development within companies and promote a greater realism within the academia. The emphasis on the second runner syndrome is of added advantage that can prevent the reinvention of "new" technologies. Numerous number of technologies or developments are waiting to be completely utilized.

In all scientific projects it is clear that a small elite group of scientists is not enough by itself to give modern societies the benefits that science is capable for conferring. There need be organization and technology management. Complex projects can only be undertaken by teams whose work is organized. This does not mean only in industry or mission oriented agencies where a team are deployed to attain objectives specified by "political powers" outside but also in the purest of pure research. Control is exercised by hierarchical authority within the research groups and by political powers outside them. The organizations must be run by organization men. This is paramount for technical innovation in industry. Outstanding individuals are important in the form of product champions with the ability to pilot projects through the bureaucracies of the modern industrial system.

We need a strategy for science and technology. It must include economic, scientific, moral and political aims and be regarded as one of a planned operation. The plan must be based on a comprehensive economic development strategy based on outward-looking development policies. The plan should emphasize on export growth based on efficient use of the already existing manpower, potential and infrastructure. Here is the dilemma

whether to go for development of labour intensive industries or research-based industries. Our domestic market is too small for efficient production of many items. There is the need to supplement the domestic market with export growth. This will allow industries to reach an efficient scale of production, creating jobs, enhancing technological level as well as the enlarging of horizons.

The realization of a vital economy through the promotion of technical innovation is paramount. The nature of the present pre-occupation of the promotion of production and the devices by which this preoccupation is sustained is the centre of concern. The preoccupation with production that is forced on us is the result of the tight nexus between production and economic security. Increase concern for economic security advances productivity. A high level of production is indispensable for economic security. The preoccupation of economic life has now narrowed down to a preoccupation with production and productivity. There are production pressures when mass-production industries are impelled by a great drive to produce all they can result in marketing gets neglected. There is much difference between marketing and selling. Selling focuses on the needs of the sellers, market on the needs of the buyers. Marketing is a sophisticated and complex process and customer driven, in a sense creating value-satisfying goods and services that customers will want to buy.

In the process of becoming industrialized, we need to introduce modern technology in production and manufacturing to increase efficiency and economic benefit. We are also regarded as an agricultural base society as well as a producer of primary produce and there is the need to give emphasis to the improvement of these sectors and build up our industry on them. It is possible to be involved in all the endeavours simultaneously. It has far-reaching consequences. There need not be a conflict between the priorities of industry and agriculture/primary produce in a nation's development. They remain closely interdependent. A vigorous industrial society can well subsist only on the foundation of adaptability to the changing modus operandi of labour, on stable employment and on constantly created opportunities.

The current energy situation, environmental pollution, and increasing concern about the availability of raw materials and energy along with the protection of the environment, must be taken into account if we are to guarantee continuing growth and productivity. This is vital for Malaysia. Progressive steps must be taken to convert agricultural economy to agro-industrial economy. Market oriented finished products from these raw materials include the primary produce must be explored.

Easy adjustment to changes in the international environment and productivity improvements are added advantages.

The country must have a dedicated and relatively well-educated labour force, without which the realization of the outward-looking development strategies will be impossible. The continued emphasis on education as well the skill, hard work and discipline is essential for growth in the nation.

Modern economic activity requires a great number of trained and qualified people. Investment in human beings is prima facie, as important as investment in material capital particularly with the development of great and complex industrial plants and even more in the development of a great and sophisticated body of basic science and of experience in its application. In addition to the entrepreneurs who are more or less forthcoming, modern economic activity now requires a great number of trained and qualified people. This is essential in the process of innovation which is now a highly organized enterprise. The extent of the result is predictably related to the quality and quantity of the resources being applied to it. The resources are men and women. Their quality and quantity depend on the extent of the investment in education, training and opportunity. They are the source for technological change. Without them investment in materials capital will still bring growth, but it will be an inefficient growth that is combined with technical stagnation.

There is one major threat to production which is not the normal wastrels which unquestionably exist, who are the lazy and malingering workmen and the unenterprising boss. It is the art of genteel and the elaborately concealed idleness which may have reach its highest development in the upper executive reaches in the modern corporation whilst at the universities its practice has the standing of a scholarly rite. The loss of production from the involuntary idleness of workers and the ruthless frustration of entrepreneurial initiative is large especially as the result of depression compared to the loss of production from the conventional shirking. For the same reason, the potential gain in production from eliminating such involuntary idleness and from widening entrepreneurial opportunity by expanding markets is far greater than anything that could be hoped for from the most sweeping strengthening of individual incentives resulting in the most radical increase in the willingness of individuals to work or expand executive energy.

There is the financial crisis that has slightly subsided which is due to major debtor countries having successfully rescheduled their debts and made adjustments to avoid default. Nevertheless structural problems remain in many industrialized countries due to the rigidities that developed in their economic systems over a long period of time.

The trend toward increased protectionism is not showing any sign of waning. Restriction on technology exports based on essentially unwarranted worries about boomerang effects, are limiting productivity gains in many developing countries. The

increasing constraints on the free operation of the world market threatens the economy of not only these countries but will hamper the growth and prosperity of the world.

The emergence of other developing countries provides powerful competitors in the world market for labour-intensive products. Wage increases will aggravate further. The next step might be difficult due to opposition of industrial countries. Direct competition with foreign producers is inevitable for our industries to become truly competitive on the international market.

The country's economy should continue to expand at a relatively high rate since many of the factors that brought about past growth will still operate. Intensified technological development and manpower improvement will also stimulate growth. This is possible because the country's labour force will continue to grow thus helping to keep the country's wages competitive. The quality of the labour force will continue to improve as the country's standard of education rises and the vocational training system develops and improves. This in turn will help to develop a more skill and technology intensive industrial structure.

While maintaining a relatively high growth rate, our economy will undergo major structural changes. Above all technological innovations now gaining momentum in many industries will have a decisive effect on future patterns of industrial development. Simple assembly-type industries, which have flourished on low-cost labour will yield to more skill or technology intensive fields i.e. in electronics and other high-technology areas as well as in our fledgling automobile industry. Development of domestic computer and telecommunications capabilities will also greatly improve the productivity of service industries.

To create wealth from science and technology one has to pay due attention to market and commercial factors beyond the realm of science and technology. Effective leadership by management is necessary to secure the required integration of technological and trading policies. The general management should have the responsibility of setting up an overall policy which takes into account of all technical, production, financial and marketing factors, and then ensuring that the various departments of the organization understand the need to coordinate their activities within the framework of this policy, at the same time securing the full cooperation of the whole labour force in the ensuing technological changes. There must be the ability to carry out an idea through to the final product without a break in the innovative chain. There must be the readiness of banks and private investors to finance the total technological innovation, and, lastly the scale and impact of Government purchasing policy.

Projects conducted by government organizations that have reached transition stage for commercial use, the technologies of which include the possibility of practical application as

well as economically feasible, be evaluated and targeted for practical use by the private sector. The promotion of technical development is shifted from the government sector to the private sector. Close cooperation among industries, the government and the responsible enterprise is vital. To contribute to smooth commercialization the government must conduct R&D actively so as to improve the economy of ventures and plants to be built before reaching the transition stage for commercial use, while industries are required to participate in the R&D activities of the government, as well as in the operation of governmental R&D facilities.

The Industrial Master Plan highlights the need to improve market research activities. In the high-technology world, strategy often revolves around the innovation activities of the scientists on the floor and to business people whose decision will require ratification by top management. Innovation involves welding marketplace opportunities with inventive technology and new technical knowledge. This requires substantial skill and it is by no means a simple decision-making process. Three elements must be brought together by R&D managers and/or new-venture managers in their efforts at strategy formulation i.e. technical competency, market need and corporate interest.

In the process of industrialization the services must run parallel and with equal vigour and intensity with the manufacturing industry. The financial, insurance, transport, and other services must be efficient and competitive internationally as well as supportive of the manufacturing sector.

ACKNOWLEDGEMENT

The Committee wish to thank Pn. Asnah Hassan, Pn. Roziah Puteh, Pn. Maizatul Aknam Mohd. Nasir and En. Azmi Morad for their help in preparing this proceeding