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# A CRITIQUE OF SCIENCE RESEARCH IN MALAYSIA

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Abstract

The aim of the paper is to give a general overview of the state of science research in Malaysia today, i.e. to try to evaluate its successes in terms of the needs of the nation and the problems that it faces. In doing this the authors try to argue for the case of encouraging a greater component of indigenous science to be considered in the research fraternity. Finally some suggestions as to how the above could be implemented are given.

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## 1. Introduction

1.1 As a developing nation we in Malaysia do not differ from the rest of the world in our hopes and expectations towards science as a vital means of attaining the so called "higher standards of living" or "better quality of life" for ourselves. It is because of this that quitely and unobtrusively (until lately that is) science and technology have changed much of the face of our life, and today we come to a point where amongst other things, economic considerations have forced us to stop, and examine this new institution, to see if its orientation could be changed (if this is at all possible) a little so that science and technology could be integrated and become one with the most important needs of our country as well as being at peace with our traditions and beliefs.

In what follows we would like to focus our attention on that little known and understood activity, called science research and in doing so see whether indigenuity can be injected into it so as to make it in line with our own needs.

At the same time we would also like to highlight some of the major problems this effort would/could entail. A brief overview of several aspects of science research (especially in the universities) will also presented.

Finally some suggestions for improvement will also be offered.

### 1.2 Defination(s) of science

The Latin scientia (scire, to learn, to know), in its widest sense, means learning or knowledge.But the English word "Science" is used as a shortened term for only natural science these days. Science therefore may be defined as an ordered knowledge of natural phenomena and the rational study of the relations between the concepts in which these phenomena are expressed.(1) So basically, science is knowledge and science research ought

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(1) Dampier W.C., A History of Science and its relation with philosophy and religion. Murray Printing Co., U.S.A. 1979. pg. xiii.

to be, among other things, the conscious use and manipulation of this knowledge to obtain even more knowledge about nature.

It has also been suggested by historians of science that its origin could actually be traced in the observations of natural ocurrences, such as the apparent movements of the heavenly bodies, and in the invention of crude implements, in the case of the physical sciences; and in the observations of plants animals and man in the case of the biological and medical sciences.(2) In both cases man have found some ingredients for increasing the safety and comforts of his life. Perhaps this original and humble beginnings of science should be taken special note of as it has a bearing on the problem that we face in deciding what is important in our science research.

Throughout history there has always been a debate on the question of whether science should primarily be carried out for its own sake or is science mainly to serve the multifarious needs of man mainly? To put it slightly differently then, should the first criterion for doing science, in a developing country like Malaysia be for the improvement of the quality of life of the people, especially the poor? This is a very important question that needs to be considered seriously as it is basically upon its evaluation that we think the theme of the paper has been chosen. We shall see what types of answers are given by some scientists in the following section. The scholars as usual are divided in their opinion and analysis to this problem but we think that it should lie sufficiently outside of the inherent 'objectivity' and 'neutrality' of science for everyone or anyone who is at all concerned to give their value-laden (science is often thought to be value-free) feelings and rational opinion on the matter. To say otherwise would be to admit that the accusation that 'science has become a religion of its own' is a true one.(3) The following are a few quotas about what science should be to man or what purposes it should hold for man.

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(2) op. cit.

(3) Feyerabend P. "How to Defend Society Against Science" Radical Philosophy No: 11, 1975, 3-5

Ideally science arises out of our endeavours to experience that which is significant and beautiful in the world around us. The purpose of science is to establish a good relationship between people and cosmos, and people and people.(4) Science is something that is created by people as a result of their attempts to realise desirable human ends. At its ideal best, science is the outcome of people seeking to discover, know, experience, apprehend, understand and appreciate that which is significant, interesting, fascinating, and beautiful in the world around us.(5)

From the above it should be clear to us that there is nothing wrong with, nor are we being too naive if we say that we can determine ourselves how we want to influence the directionsof our science research. Our scientists should not be too upset if they will no longer be jumping on the band-wagon of the big popular science of the west for it has been estimated that big science can never thrive in the third world anyway as the limited resources in the nations concerned will be an unsurmountable constraint.

1.3 Indigenous science - the answer?

It seems that more and more people seem to be having the opinion that the solution or at least partial solution, to the above dilemma could lie in what we may call 'indigenous' science. For the purposes of the discussion that might follow, we would first of all like to define what we mean by this term.

Certainly not much have been researched upon and documented on the subject. This perhaps would make our task less hazardous although by no means any simpler. This is not surprising perhaps as the concept itself most probably has not originated from the west but it has arisen perhaps as a result of needs which are similarly indigenous. Having said the above perhaps indigenous science can be taken to mean :-

" that a certain scientific idea (theory, method etc.) whether of local or exotic origin (after all, science is supposed to be universal) is applied or used locally or that the technology that is attached to it is constructed in line with, local needs and as far as possible using local materials "

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(4) Maxwell N., "What's Wrong with Science", Bran's Head Books Ltd. Great Britain 1976., pg. 2

(5) op.cit. pg. 4.

OR

" by indigenous science, we could also mean scientific ideas or knowledge (again developed locally or otherwise) about the local natural environment, as opposed to foreign environment. "

Perhaps it should also be included that one implicit quality that an indigenous science should also possess is it being utilitarian. Also, in this context, indigenous science could also be closely related to appropriate technology, a term which perhaps we are more familiar with.

No matter how much claim science have on neutrality and objectivity, the research that scientists carry out nevertheless should not escape social, cultural and economic scrutiny as science affects the life of even those who do not practise it to a very great degree, as can be seen among others in the environmental problems that we are facing at the moment, for instance. Our problems and needs dictate that our science too must do its equal share, and it is in playing this prescribed role that we hope indigenuity can help.

## 2. Current state of research in science

### 2.1 Universities

So far no comprehensive study of the current state of science in Malaysia have been carried out. There are one or two seminar papers pointing out the need for cooperation between universities and the other research organisations (see Abdullah Mohd & Ong Khong Seng and Chee Peng Lim & M. Sahathavan, for example),(6) but these do not give any complete overview. We did feel the urge to conduct the research ourselves, but the time factor did not permit us to do so. How then can we go about answering the question of whether enough money is being spent on indigenous science? Besides, as has been stated in the previous section, the concept of indigenous science itself has only been recently been brought to our attention.

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(6) Abdullah Mohammad Yusof & Ong Khong Seng 1980
Chee Peng Lim & M. Sahathavan 1980

However there has been a limited survey (on about 80 scientists from the various universities, a large proportion of who were from the U.M.) carried out by Abu Hassan Osman in 1977.(7) Most of the description about the scientists and their research activities in the following sections, will be based upon this study and our own observations. We feel that this is quite valid because most of the conclusions drawn in the study is quite relevant to or quite true of the majority of the scientific community in Malaysia.

(i) Time spent in research

Only a small proportion of the scientists consider themselves to have enough time to do their research (about 20%). The rest felt that time has been a major constraint which limits their effective role as effective researches; this is apparently due to their heavy involvement in teaching, administration and committee duties. Many who have reached senoir academic positions eventually may become competent administrators but certainly it reduces their capacity "for active production of knowledge". In conjunction with this the overall university research system is relatively weak, since the major organisational structure puts emphasis on teaching of undergraduates and not on research oriented graduate studies.(8) Moreover, research positions as a system of vertical mobility have not been created independent of administrative positions in the university system. Therefore any form of upward social mobility that scientists can aspire to is primarily academic administrative positions.(9)

In sum, the work of the academic scientist is confined largely to teaching and administrative duties. The organisational structure supports this arrangement. Some scientists carry out routine administrative responsibilities, planning, decision making, recruiting, and budgeting. Others find a heavy teaching load - on the average, 15 - 20 hours a week - an obstacle to creative research. In fact for the majority of scientists the scarcity of time is a true situation and not a kind of defence mechanism for them to hide their lack of involvement in research, scholarly productivity and intellectual vocation behind a respectable cloak.

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(7) Abu Hassan Osman 1978
(8) Op. Cit.
(9) Op. Cit.

Obviously, scientists are heavily engaged in instructing a major part of the future intelligentsia & the professional,, technological, managerial and teaching personnel who are essential for the implementation of the national development plan. Consequently, given the present internal structure of the university, with the principle of financing - built around purely didactic categories (especially the newer universities), the balance between teaching and research will remain heavily on teaching. Research careers as opposed to teaching careers have yet to be created in the university system.(10)

Factors influencing choice of research problems (11)

Autonomy and independence are basic to the satisfaction the scientists find in their research work. The question put forward to the scientists was 'Do scientists work on problems which they consider "their own"?'. It was found that on the whole, 97% work mostly on their own initiated choice. In contrast, only 3% work on problems that were recommended either by private industry or international organisations. None was involved in any studies at the request of the national government. A breakdown of the data collected gave the following figures :-

About 71% indicate that their current research projects are perceived as important to government policy makers and to the future of the country; about 40% reported that their present studies are a continuation of the same problems which they started in their graduate schools overseas; about 30% have embarked on new lines of research (from those of their graduate period); and about 21% have modified their research interests in order to suit local conditions. In addition there are some others (about 20%) who are working on projects because there were funds and facilities available to enable them to carry out specific studies in which they have been recommended by foreign and international organisations. Only one in the sample was working on a problem recommended by a private industry.

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(10) Op. Cit.

(11) Op. Cit.

By scientific disciplines, among those who perceived that their current studies are important to government policy-makers and to the future of the country, predominant are life-scientists-agricultural (100%), and general life sciences (71%). In contrast, the physical scientist (58%) and engineering scientist (38%) are less certain that their current research work is important to the government and the future of the country. The latter are also the ones more likely to continue working on the same scientific problems which they started in graduate school overseas (50 and 69% respectively). A partial explanation for this is that probably there are fewer sectors in the country to which they can relate their research activities.

It may also be due to the fact that they specialise in studies that are less development-oriented and therefore inversely receive little public recognition and support for their work. Also, of those who work on studies which they perceive to be of direct concern to government policy-makers and are important to society are scientists in the older generations. Apparently, the length of time since their return from their education and training overseas has made it possible for them to settle down in their professional activities and to relate their studies more directly to the problems that concern the country.

RESEARCH PARADIGM : Basic or Applied (12)

The distinction between basic and applied research is a matter of great complexity. It is not always possible to make a clear cut distinction. But for the purposes of our discussion, basic research is aimed at a further knowledge or understanding of the subject matter of the study, rather than a practical application thereof. In basic research, it is more likely that the scientist have no specific policy or problem-related objectives but are free to follow their scientific curiosity where ever it might take them. In applied research, the scientist are motivated by a desire for the outcome of the research to be useful whether or not for profit or for humanitarian purposes.

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(12) Op. Cit.

From the study it seems that on the whole, about 59% of the scientists reported that from their perspectives, they perceived themselves as being engaged in applied-oriented rather than basic-oriented research.

Approximately about 40% view themselves as being engaged in basic research. On further examination we find that in describing their work orientation as "basic", often, it may just be tangential to or at the fringe of the central thrust of the larger international science. Such knowledge may indirectly be of international scientific value eventually, but it is not part of the global major area of interests.

Roughly 58% of the sample are oriented to applied research in which they envision their present work as being of immediate use in Malaysia. Examples of such work are those dealing with agriculture i.e. genetic studies in cattle production for example : biological such as orchid physiology, genetics and enzymes of food, plant genetic resources & conservation, parasite serology etc. This group envision that science is meant to serve many ends, of which the search for absolute truth and new knowledge is important, but not the only objective. For most of them, they prefer that the training, methods, and factual knowledge gained by scientists to be directly related to areas of public needs. The application of knowledge is for them as important as the creation and gaining of new knowledge.

The physical scientists are only moderately involved in applied-oriented studies. Some in these fields are found to have less opportunity to relate to practical-oriented studies; they lack sectors or organisations or professions that are ready to support or accept the product of their research findings. They often view their work as not having any forseeable technological or other applied consequences. They believe that a pure scientist must not be deflected from pursuing fields of study by worrying about social consequences. They suggested that a researcher cannot possibly anticipate the practical derivatives of his work, and therefore cannot be held responsible for the potential use or misuse to which his discoveries might be put to. They strongly feel that the research for new knowledge in their own specialised field is important.

In short a majority of the scientists in the physical and life-general share the norms that encourage the open-ended explorations of new ideas, which is incorporated into the concept of basic research.(13)

DEGREE OF COOPERATION BETWEEN THE UNIVERSITIES AND THE OTHER SECTORS

There is limited participation on the part of the professional groups and its agencies, business, local private industry and other segments in the country in contributing to the growth and use of the nation's academic based scientific research capacities.

Approximately 85% of the scientists actively engaged in research are to be found in the universities. Most of them also indicate that they are constantly in touch with recent developments in the world-wide scientific literature, and that they are excellent sources of information on current developments in their own fields of specialisation. Yet overwhelmingly, their skills and knowledge with respect to research are evidently seldom recognised in the wider society. They are rarely approached by policy-makers, administrators in any sector outside the academic world for any professional or technical advice, for conducting specific studies or research that concern the people and the country.(14) A possible reason for this current unsatisfactory state of affairs is that the differences in the aims and time schedule of university and government research cannot easily be reconciled. Government research involve classified information which cannot be published or released to the press and such research must often be completed within a relatively short period. However academics can maintain confidentiality, also there are also a large number of areas in which research does not utilise classified information. For example, there is an urgent need for research on problems of natural resources and the environment. Security problems are not likely to arise out of the publication of such projects. In fact, as a rule, research on technological problems is unlikely to raise any security problem and very often it is precisely in these areas that the government lack expertise and require assistance.

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(13) Op. Cit.
(14) Op. Cit.

Instead, foreign academics under the auspices of various technological assistance programmes are given access to the so-called "confidential information". It is difficult to see why Malaysian academics are not suitable or are regarded as security risks while foreign academics are not.(15)

Other suggestions also include the fact that the university system in Malaysia continues to be structurally rigid and traditionally patterned in some ways. Current university policies are focused largely on teaching. Universities have not assumed an important function in the growing professionalisation of science as an occupation, and in introducing research and development as an aspect of business, industry, administration and the institutional life of the society. None of the universities studied have established any kind of independent research centres or institutes that focus their activities primarily on research.(16)

Under these circumstances, the university system in Malaysia remains an influential system of higher education and its scientists engage in moderate research activities organised primarily for achieving delimited scholarly goals and purposes. Given the confines of this situation, it will not yet become an effective system of research in the country.

Any form of linkage between the universities, the government, and the govt.-sponsored research institutes, business and local private industry are only in the form of a loose structure, created and maintained mainly by ad-hoc individual efforts of individual scientists and their counterparts.(18)

It is not surprising therefore that the general under-development of linkage systems has slowed down the establishment of viable communication, collaboration and mutual confidence between the academics and those outside the academic institutions. It has also slowed down the creating of shared understanding and inhibited the selecting of problems, technical and financial support for research, and in the transmission of research findings to prospective end users.

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(15) Chee Peng Lim & M. Sahathanan 1980
(16) Abu Hassan Osman 1980
(17) Op. Cit.
(18) Op. Cit.

Accessibility to facilities for research

Almost all of the scientists interviewed reported that they hace enough of items such as textbooks, journals, bulletins, teachnical reports, laboratory space, equipments and specimens. However there is a complaint that there is not enough of literature in the vernacular language. About 99% of the journals are imported. Therefore there is a heavy dependency on foreign sources as media of references for their scientific work.(19)

Physical dimension

The presence of adequate physical facilities are important as they make for enthusiasm, dedication and feeling of involvement in work among scientists as well as making possible the work itself. Those who do not have the necessary equipment, specimens and other materials to conduct their research are mainly the engineering scientists and to a lesser extent the general life scientist. Complaints from the engineering group include:- that the quality of equipment that they have are mostly less sophisticated, less adequate than they need for engaging in the kinds of projects that they want. Examples of disappointments from the life sciences on the other hand, include the frustrations of having to wait for a long time, between 6 months to a year or more for the arrival of equipment or specimens and other materials ordered from abroad. They reflect that these up-setting delays almost without exception have diminished their inner enthusiasm and lessened their capacity to fulfill projected research targets as well as affect their further work time table.(20)

Social dimension

About two thirds of the scientists said that they require help such as lab. assistants but that they do not get this kind of assistance at all. There is also the complaint of the lack of colleagues who are in the same field. Many report that they are one of a kind in their own field of specialisation, and therefore have practically no opportunities to interact

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(19) Op. Cit.
(20) Op. Cit.

as well as to relate to other scientists with common interests in their institutions or even in the country. This problem it seemsis moreprominent in the physical and engineering sciences. These scientists stress the greater need to increase the training of the present staff in their own field and to expand the number in their field in order that they will have colleagues with whom they can not only talk over the content of their research but also with whom they can embark on new team research.

There are also grievances over the lack of encouragement from superiors, passive leadership and excessive bureaucratic atmosphere maintained by superiors in their units.

Distribution of research projects

From the study it was shown that the highest number person of research projects have been done by the life general and the medical scientists; moderately so for the engineering scientists and is the lowest among the life and agricultural scientists.(21)

How Malaysian scientists envision their own professional roles IN SOCIETY.

From the study, it appears that there are two dominant categories of opinion as to what is the role of the scientist towards society. (1) Those who feel notivated to contribute knowledge which might benefit their own society. These are common among the life sciences but less so in the physical and engineering science (2) Those who primary interest is either in the "search for truth in their own field, no matter who benefits". These are to be found more in the physical and engineering sciences. It is thought that the second group may have developed such sentiments as a result of the poor supporting systems of their knowledge where as in contrast to this, the life-sciences have generally been conventional fields in the country with better developed supporting systems.(22)

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(21) Op. Cit.

(22) Op. Cit.

3.1 Research and Development

The purpose of national development is to improve the quality of life of our citizens - to provide for all our fellowmen a life of joy and creativity embracing physical, mental, moral and spiritual well-being; a life in which there is economic security, political integrity, social justice, environmental amenity, peace of mind, cultural enrichment, morality and spirituality. It is not to provide material gratifications alone because human well-being is not necessarily equated to materialistic possessions.(23) Science and technology should not only help in providing the necessary prerequisities for material well being therefore, but it should also play a role in political decision making, in economic planning and other roles of the government as well as the people, by providing the relevant scientific information about the facts to be considered, say. Therefore scientific research must take into account the developmental needs of the nation in order that it may truly play the role that has been set out for it in the above.

It has been pointed out that it is better for us to be a nation of adaptors rather than of great scientists as what tends to exist in developing nations (especially so in the extreme cases) is a scientific capability which is not oriented to local needs but which instead is pursuing (and often failing to reach) the fashionable fleeting coat - tails of the international scientific community.(24) This assessment has also been found to be true of the case amongst our own scientists (see section 2).

There is also no correlation between high expenditure on pure research with financial returns.(25) Besides, even if scientific research were to result in a high GNP it only often means that only a small section of the population is living in luxury, whilst the majority of the people still live under appalling conditions, such as in the rural areas for example with no amenities and facilities worth mentioning available to them.(26) It has also been pointed out the present mechanisms for applying science and technology can be perceived as introducing or

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(23) Cin Fung Kee, 1978: 2
(24) Oke O.L. 1980: 125
(25) Mohd. Hashim 1978: 6
(26) Op. Cit.

reinforcing a "dualistic society", i.e. a society in which only a privileged minority, mostly in the urban areas, benefit from it. The resulting disparity in living standards should be of concern to all of us.(27)

It is in view of all these considerations that we feel that indigenous science is an important, at least 'partial solution' to the problem because its goal would be, the spreading (?) utilisation of scientific know-how to the greatest number of people, in the most thorough extent possible. We are not saying that we should stop or discourage research in basic or fundamental science because we definitely need this for the scientific capability and scientific integrity of the country, as well as it being important in principle. What we would like to see is a situation in which we build up a strong and successful indigenous scientific knowledge and capability. We are at the same time aware that there is a strong opinion that regard it as a general rule that an increased understanding of the universe, however out of the way, Peculiar, however ethereal however useless a new knowledge may seem, it has always ended in some practical/ useful application even if sometimes indirectly. The question we must consider however is, are we willing to wait?

Our opinion is that time and money is against us. We cannot afford the luxury of too much curiosity-oriented research and even the traditional pure science teaching without modifying it to include indigenous components if we really want science to make the impact on our country's development.(28)

Areas where indigenous science can be developed

Of course we do not pretend to be experts in the field of indigenous science, neither are we going to be able to give a very deep understanding of what forms exactly it should have. This would have to be the task of all our dedicated scientists. In any case, to begin with, it seems that successful cases of appropriate technology

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(27) Op. Cit.

(28) Oke O.L. 1980

or appropriate science in non-western countries are quite difficult to find and document, or that not much has been documented. There was an example of a dry cell manufactured in southern India in which it was claimed that a non-capital intensive method is genuinely competitive against large-scale 'western technology'. But how many of such cases can we cite in the developing countries?(29)

Therefore having borne this difficulty in mind we nevertheless have laid down the following examples of areas where indigenous science can be developed and applied. Most people would be quite familiar with these fields. The list is not drawn according to degree of priority nor does it pretend to be exhaustive.

| Fields | Tasks/Problems to be addressed | Subjects could be involved |
|---|---|---|
| AGRICULTURE<br>fisheries<br>fruit cultivation<br>farming technology<br>animal breeding | Development of better breeds for higher yields<br>Better, safer pest control.<br>Better fertilisers that use more organic, local materials.<br>Devise technology for preservation of local fruits, vegetables, and other farm produce for export and cheaper local supply.<br>Look at more traditional methods as they are more dependent on cheap indigenous resources. | Genetic Chemist<br>Microbiology<br>Sociology |
| ENVIRONMENT<br>air<br>water<br>land<br>sea | forests - flora, fauna, national parks. Need for conservation.<br>Safe exploitary techniques.<br>Minimise pollution, damage to landforms, Management of natural resources | Zoology Botany<br>Physics Chemistry<br>Geology<br>Engineering |
| ENERGY & Transport<br>solar<br>water<br>wind<br>organic matter | Recycling; transformation of one energy form to another. Cheaper and cleaner and less polluting petrol; more efficient transport. | Microbiology.<br>Physics<br>Engineering<br>Chemistry<br>Computer-technology |

(29) Op. Cit.

It should be pointed out perhaps that indigenous science as applied in the areas mentioned above would require a multi disciplinary approach for its implementation and that it would also require a high degree of cooperation between all the sectors involved in research. That is, it seems to call for exactly what is lacking at the moment in our country as discussed earlier in section 2.

## 4. Problems

### 4.1 Obstacle against indigenous science

The idea of indiginous science itself may not be very well received as many scientists normally are still not concerned with the development of the country, but are only concerned with the growth of science only for its own sake. This is perhaps because of the fact that we in the developing countries feel that science in conjunction with technology, has contributed greatly to the economic development of the industrialised countries and so we assume that expansion of scientific research & teaching as is done in these countries will automatically lead to wealth. We also seem to forget that these countries have between 80-90% of the world's research power but only 25% of the world's population.(30)

The feeling of the scientist is perhaps understandable if we look at the early days of his training as a scientist. In an area of pure science, if you want to become a star you normally have no choice but to jump on the band-wagon of the most topical subject in the area. The topic may be one initiated by an eminent scientist, which is described by the experts as the hot spot for potential stars, and the fact that all the big names are there is sufficient to attract young potential researches, who after obtaining their Ph. D. will find it difficult to change their field but instead, in turn will attract more people into the same field. Also, most if not all of the initiating ideas come from the western countries and none from the developing nations. Even if we were to try to initiate one here it will be difficult to filter through because we have not got the manpower, the equipment and the necessary funding and

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(30) Op. Cit.

influence to project them. Ideas initiated by eminent scientists are more readily accepted and diffuse more rapidly down the line from elsewhere.

4.2 Lack of communication and cooperation between the universities and the other research bodies.

Those who are in the research business know under what difficult situations they are working in, and in many cases the country does not appreciate or understand what they are doing. They are therefore criticised and their work seen as not relevant and they are said to be living in an 'Ivory Tower' . Whenever there is an economic crisis, the university is the first place that feels the pinch due to a drastic cut in research and teaching equipment, no grant for chemicals and equipment, no travelling funds for conferences etc, Most unfortunately also, our industrialists do not see the value of research carried out in the universities, & they overlook the results (unlike those in the industrialised countries) or the impact it could make in industry and so they are not ready to pump money into research. As has been mentioned earlier, there is also little consultation done by the government, as evident from the minimal involvement of the scientists in government-based projects.

All this inevitably will lead to a lot of wastage in the form of duplication of efforts, underutilisation of equipment., manpower etc.

The task entrusted to the NCSRD is to coordinate and monitor research activities of the nation to ensure maximum utilisation of resources avoid wasteful duplication. However lack of concerted national leadership exists due to the organisation not having financial and administrativ controlover the various research organisations.

Possibly the lack of greater cooperation between the sectors and

the universities is because of the fact that the government planners and politicians in power have a negative view of the competence of our local scientists. The long period of colonial rule which did not end until 1957 saw the growth in the Malaysian public of a compelling preferences for things foreign. It would be naive to believe that this preference does not extend to the question of joint research, as well.(31)

4.3 University credit system

As has been pointed out earlier, whilst the existing university system imposes a heavy teaching burden on the scientists, it does not at the same time give them due credit for it. Criteria for promotions are still, largely based on the amount of research carried out by the scientists. This is felt to be quite an unsatisfactory arrangement as it is a well known and understandable fact that those who have heavy teaching commitments will no longer have enough time to devote to research.

4.4 Misconceptions about science itself (especially in the light of its social and cultural contexts)

Our inadequate understanding of science (for example, what do we know about its ethos, its philosophy in relation to others, its relationship with the cultural, social and religious aspects of our lives as well as its limitations) can sometimes lead to immature ideas about what we should and should not expect from it especially if we were to consider that development and progress should not only be looked upon as purely materialistic in nature.

Assuming that this seminar has as one of its objectives the enhancement of positive values in science education, it should also be pointed out that in any debate between pure and applied science, there is also the need to understand more deeply (philosophically for example) this thing that we all call science.

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(31) Chee Peng Lim & M. Sahatharan 1980

How long have we known and dabbled with science as a nation? History tells us that starting with the industrial revolution especially in England, science has brought man closer and closer to the utopia that Bacon envisaged it would in the 17th century. But lately we hear that it was science that resulted in the decline of religion in the west in the 17th and 18th centuries. It has even been accused of having become a religion in its own right with its own priests. 1 (32) Should we nod our head and agree that the same would and therefore should happen with us too? Perhaps it will not be too presumptuousto mention too the fact that science is confronting our traditional beliefs even at this moment. By this we do not mean to be anti-progress and modernisation but science we must remember has largely been a western cultural manifestation and that to be truly fair to our selves we must make it go through a process of acculturation before it is really a part of ourselves. It may be alright for those who are lucky enough to know better perhaps, but what of our younger and more vulnerable generations? As science educators do we not owe them an explanation of or an exposure to alternative thinking systems besides that of science. This is especially necessary at present because increasingly it is becoming obvious that science cannot provide man with all the answers. Hence thers is a need for science to be couched within a viable cultural setting and it is left to us to decide what kind of setting that is most suitable for us.

5. Problem 4.2

This problem can perhaps be overcome by 'developing a national strategy which could amongst other things maintain a balance between mission or goal-oriented and pure or curiosity-oriented research; ensure that there is a close communication system between the government, university and industry so that the expected and the unexpected results of research could be tested and put to use rapidly; ensure that in both pure and applied research there is a high degree of coordination so that there can be in turn, a high degree of cross-fertilisation and minimal duplication of efforts.* (33)

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(32) Feyerabend P. 1975, 3-8

(33)* Hall V.M.D. ; NST 3.7.83

To also overcome the problem of duplication of efforts and wastage of facilities and manpower, it has been suggested that a specific information centre be set up.*(34) It could be an independent organisation or it could form one wing of the NSCRD. This centre could be called the Malaysian Scientific, Documentation and Information Centre (MASDIC) and it would play the multi-purpose role of collecting, documenting and disseminating information relevant to Malaysian science and technology.*(35) MASDIC could also function as the national centre chiefly to coordinate the nation's scientific information resources, tap the world's store of information resources and disseminate the information collected. MASDIC would also be very valuable as researchers, agriculturalists and industrialists so far can only obtain their information from no further than their own library. MASDIC then, would be able to widen their horizon more. In England for example industries can go to special libraries that give them information about their latest field of interest.*(36)

5. Problem 4.3

It has been shown that contrary to popular belief there is no correlation whatsoever between the quality of teaching in a university and the quality as well as the quantity of research.*(37) As a matter of fact it seems that teaching and research need not necessarily go hand in hand and that a good teacher may sometime do very little research while the brilliant researcher could be the worst of teachers.*(38) As such it has been suggested that "Malaysia should recognise this fact by placing the university-based research under the wings of a body or ministry which is not primarily concerned with education - a sort of National Research Organisation whose function is to plan and finance research within the public sector, to coordinate private and public researchers and to do all this with the aim of maintaining a balance between applied and pure research.(39)

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(34) * Yoong, Sim-joo, Monica 1982

(35) * Op. Cit.

(36) * Op. Cit.

(37) Hall V.M.D. (N.S.T. 3.7.83)

(38) Op. Cit.

(39) Op. Cit.

5. Suggestions for improvement (4.1 & 4.4)

We believe that one key solution to these two problems is through education. Indigenous science could perhaps be instituted in the existing curricula not only at the university level but also before that. Through this means students could be taught to appreciate what already exists, by giving priority to local examples in their science curricula. Perhaps this is something to be emphasised even more at the university level. Postgraduate students should as far as possible be encouraged to work on problems that actually exist or are relevant to the local environment.

As for the social-cultural and religious contexts of science, a subject such as the history, philosophy and sociology of science could be made compulsory for all university and college students say. Such courses could also be introduced in the training of administrators such as at INTAN and other government training agencies.

It should also be emphasised that over-specialisation could sometimes be a disadvantage. Very few practical problems in nature are mono-disciplinary in nature, knowledge in more than one branch of science are always necessary. In this context science subjects which are multi-disciplinary in nature should be given great emphasis. Such an important science subject as environmental science cannot afford to be left out for example. Over specialisation is also a disadvantage at the degree level as it has been found that science graduates from universities are not generally tailored for research work upon their graduation, and there is a necessityty of training guiding and upgrading of capability once they enter the respective research organisations.* (40) Could this also be a side-effect of the scientists not having enough time on their hands as a result of their heavy schedule as already been mentioned earlier?

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(40) *See Mohd Ali Hassan - Proceedings and Report on "Geoscience education Workshop" 1982, K.L. GSM.

6. Summary and Conclusion

(1) In view of the fact that as a developing nation Malaysia faces the need for an evaluation of the amount of money spent on science research, it is thought that perhaps indigenous science can play a role.

(2) by indigenous science is generally meant science that is based on local materials, conditions, needs and environment.

(3) Most university scientists feel that they do not have enough time to spend on their research because of heavy teaching and or administrative duties. Hence it is hoped that the authorities concerned could change the situation, since the scientists are playing a vital role in instructing a major part of the future scientific intelligentsia and personnel who are essential to the nation.

(4) If we are to view indigenous science in the context of applied research for a start as well as research that have importance to the future of the country it seems that quite an important contribution is being made by scientists who are predominantly in the life and agricultural fields, as well as some in the general life sciences. This is in contrast to those who are in the physical and engineering sciences who more often are of the opinion that their work is not relevant to the country.

(5) It was found that the older scientists are going more goal-oriented research projects as compared to the younger scientists. This is perhaps due to the fact that the former would have had more time to acquaint themselves with the local conditions and therefore the problem areas that need attention.

(6) On the whole, about half of our scientists feel that they are actually engaged in basic research. Hence if we were to agree with the point of view that the best situation that we could have is by having

a balance between both pure and applied research, it seems on the surface of it at least that at least in the universities the balance may have just been achieved. However, a majority of the physical and life scientists still have the "science for science sake" philosophy.

(7) A problem that must be highlighted when considering science research as a whole is the lack of cooperation between the various research sectors in the country. It is felt that this has led to wastage in the form of duplication of efforts, under utilisation of expensive equipments as well as 'expert' manpower. It is also stressed that the government and public should get rid their greater preference for things that are foreign and rely more on the local scientists. This too could save the country an enormous amount of resources. It has been suggested that this problem could be solved perhaps by the setting up of a coordinating body and a sound national science policy.

(8) Current university policies are focussed largely on teaching and the scientists can only engage moderately in research. Given the confines of the situation therefore it may not yet become an effective system of research in the country.

(9) Examples of fields where indigenous science could address itself to have also been given. From this it is clear that a multi-disciplinary approach is very necessary. One way indigenuity in science could be instituted is perhaps through special emphasise on it in the science curricula.

(10) The need for a greater understanding of the social and cultural relevance and importance of science is also discussed, and this need could perhaps be fulfilled by the introduction of courses called the history, philosophy and the sociology of science. Such courses are already taught at the science faculties at the University of Malaya and the National University respectively for example.

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## BANTUAN PENYELIDIKAN YANG DILULUSKAN UNTUK 1982

| Nama Kakitangan | Tajuk Penyelidikan | Jumlah yang diluluskan |
|---|---|---|
| **Akademi Islam** | | |
| 1. Dr. Lutpi Ibrahim | Perkembangan pemikiran Islam (teologi) di Indonesia | 3,120.00 |
| 2. Encik Mohamad Kamil b Hj. Abd. Majid | Ibn Taymiyyah: Satu kajian tentang pemikiran aqidah dan politik serta pandangan kontraversi ulama terhadapnya. | 5,900.00 |
| **Canseleri** | | |
| 1. Dr. L.J. Fredericks | (a) Mengumpulkan satu senarai projek penyelidikan & penerbitan di Universiti Malaya 1977-1981. | |
| | (b) Mengumpulkan satu senarai kelengkapan-kelengkapan yang telah diperolehi di bawah Peruntukan Pembelian Kelengkapan (Vot E) hingga tahun 1981 dan Vot F. | 35,500.00 |
| **Fakulti Ekonomi & Pentadbiran** | | |
| 1. Dr. L.J. Fredericks | Inter disciplinary Analysis of Irrigated Farming Development in West Malaysia. | 10,000.00 |
| 2. Dr. L.J. Fredericks | Penyemakan kajian-kajian yang dibuat di kampung-kampung di Malaysia semenjak 1945. | 5,470.00 |
| 3. Cik Sulochana Nair | Inter disciplinary Analysis of Irrigated Rice Farming Development in West Malaysia. | 7,397.00 |
| 4. Encik Chong Yew Kiang | Financial Data as a predictor of Corporate Failure. | 7,580.00 |
| **Fakulti Kejuruteraan** | | |
| 1. Dr. Ong Kok Seng | Solar Energy, high temperature collection and utilisation | 8,300.00 |
| 2. Dr. Khalid b Mohd Nor | Development and documentation of interactive Engineering Application Packages. | 5,400.00 |
| 3. Dr. Ang Ha Ming | Anaerobic digestion of Palm Oil Effluent under Thermophilic conditions. | 5,670.00 |
| 4. Encik Mun Kwai Peng | Consolidation and settlement characteristics of soft clays. | 30,810.00 |
| 5. Prof. Madya Tengku Mohd Azman Sharif-fadeen. | Realtime and interactive Computer Operations. | 40,000.00 |
| 6. Dr. Mohamed b Awang Lah | Kajian Penggunaan dan Penjimatan Tenaga Elektrik dalam Bangunan. | 4,000.00 |
| **Fakulti Pendidikan** | | |
| 1. Encik Nik Aziz bin Nik Pa | Kajian berhubung dengan kefahaman murid-murid menengah mengenai Pecahan. | 2,008.50 |
| 2. Encik Lee Voon Mun | Satu kajian melihat keberkesanan teknik pengajaran 'Peer Group Instractional Programme' dalam pengajaran kursus Pedagogi. | 1,020.00 |
| 3. Dr. A.G Politzer | Penafsiran perhubungan yang logik oleh penuntut Sains dan Sastera. | 600.00 |
| 4. Prof. Isahak b Haron | Kajian keberkesanan mengajar membaca kaedah Gabungan Bunyi Kata di Sekolah Rendah. | 4,292.40 |

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|---|---|---|
| 5. Dr. Ferninand A. Gui | (i) To what extent and how is standard costing and variance analysis used in the Malaysian industrial sector? | |
| | (ii) Does the current provision of Management Advisory Services (MAS) by the audit firm affect the perceived independence of auditors? | 8,657.61 |
| 6. Encik Low Yok Lin | The administration of Rehabilitation programmes in Peninsular Malaysia. | 703.20 |
| 7. Dr. Wang Chee Woon | Cellulases and laccases of Thermophilic Microorganisms. | 8,500.00 |
| 8. Encik Yap Wai Ho | Purification and biochemical characterisation of bacteriocins. | 7,530.00 |
| 9. Encik Sekaran Muniandy | Biochemistry of the Glutathione Transfereses from the latex of hevea brasiliensis. | 8,600.00 |
| 10. Dr. Nor Azila bt Mohd Adnan | Mekanisme posfolipid menstabilkan enzim cyclic-AMP posfodiesterase (PDE). | 7,000.00 |
| 11. Ketua, Jabatan Biokimia | - | 30,844.00 |
| 12. Dr. Ong King Kok | Mechanism of action of insulin. | 6,950.00 |
| 13. Dr. S Balabaskaran | Factors causing browning of Latex from Hevea Brasiliensis. | 2,500.00 |
| 14. Dr. Zubaidah Hj. Abd. Rahim | Menentukan secara kimia asid amino-amino wajib yang penting (try, lys dan net) dari kacang botol. | 3,875.00 |
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| 5. Dr. Koh Boh Boon | Effectiveness in the Diploma of Education Programme: A Survey of the perceptions of the Former Bahasa Malaysia Method students of the Faculty of Education, University of Malaya. | 4,404.50 |
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Fakulti Pergigian

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| 3. Dr. Hashim b Yaacob | Peranan tisu sementoid ke atas resorpsi luar gigi. | 300.00 |

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## Jabatan Antropologi & Sosiologi

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| 3. | Puan Azizah Kassim | Politik Patron-client dan setinggan Melayu di Kuala Lumpur. | 2,413.00 |
| 4. | Encik Abdul Hadi Zakaria | Kesan-kesan sampingan dari tindakan mengurung pesalah-pesalah dewasa dan remaja-remaja nakal. | 3,285.10 |
| 5. | Encik Raymond Lee Lai Ming | Survey pola-pola agama Kultus di Kuala Lumpur dan Petaling Jaya. | 595.00 |
| 6. | *Encik Mohd. Nor. Hj. Nawawi* | *Persepsi dan sikap ras: Suatu kajian perbandingan di antara dua kelompok yang berlainan situasi dan tempat kerja.* | *1,931.50* |
| 7. | Prof. Madya Mohd. Fauzi Yaacob | Kelantan: Isu-isu dan Stratigi Politik dalam Pilihanraya Umum 1982. | 4,704.00 |

## Jabatan Geografi

| | | | |
|---|---|---|---|
| 1. | Encik S. Sothi Rachagan | Pilihanraya Tahun 1982. | 2,713.80 |
| 2. | Encik Hamirdin b. Ithnin | Changes in surface water in Kuala Lumpur metropolitan area due to urbanization. | 2,600.00 |

## Jabatan Inggeris

| | | | |
|---|---|---|---|
| 1. | Dr. Irene Wong | Ciri-ciri sintaksis di Bahasa Inggeris seperti digunakan di Malaysia. | 400.00 |
| 2. | Prof. Madya Ooi Boo Eng | Pengkajian kritikan kesusasteraan baru. | 300.00 |
| 3. | Encik Salleh b Joned | English Writing on the Malay World. | 500.00 |

## Jabatan Pengajian India

| | | | |
|---|---|---|---|
| 1. | Encik Jebagnanam Rabindra Daniel | A sociological study of India Christian community in Peninsular Malaysia. | 4,060.00 |
| 2. | Encik R Rajakrishnan | Sejarah orang-orang Malaysia berKeturunan Sri Lanka dan sumbangan mereka kepada pembangunan Negara Malaysia. | 2,250.50 |

empat puluhan. 2,247.00

Jabatan Pengajian Melayu

| | | |
|---|---|---|
| 1. Encik Abu Hassan bin Mohd Sham | Pulau Penyengat sebagai Pusat Kegiatan Sastera Melayu Lama di Abad ke 19. | 2,626.00 |
| 2. Prof. Madya Lutfi Abas | Basaha Jawa di Johor. | 2,241.00 |
| 3. Dr. Rahmah Haji Bujang | Bentuk lakun Tradisi Melayu. | 2,770.00 |
| 4. Encik Abdul Latiff b. Abu Bakar | Menganalisa kandungan akhbar dan penglibatan wartawan Utusan Melayu berhubung dengan Pilihanraya Persekutuan 1959, 1964 dan 1969. | 2,450.00 |
| 5. Encik Zainal Abidin b Borhan | Ethnografi Orang Seletar di Kampong Bakar Batu, Johor Bharu. | 2,406.00 |
| 6. Puan Ku Zam Zam bte Ku Idris | Muzik Tradisional Melayu. | 3,625.00 |
| 7. Dr. Nik Safiah Karim | Penyelidikan Bahasa Mah Meri (bahasa Orang Asli). | 1,702.00 |
| 8. Profesor Mohd. Taib Osman | (i) Pengumpulan dan penyelidikan pantun:<br>(ii) Tambahan semua bentuk puisi lama Melayu, terutama syair. | 5,765.80 |
| 9. Profesor Mohd. Taib Osman | (i) Mentranskripsi pita-pita rakaman dari Ulu Tembiling dan tempat-tempat lain:<br>(ii) Mentranskripsi bahan-bahan dari teks lama dan buku-buku. | 4,680.20 |
| 10. Jurusan Antropologi/ Sosiologi<br>Profesor Mohd. Taib Osman,<br>Dr. Wan Abd, Kadir Yusuf,<br>Encik Abd. Rashid Hj. Ahmad,<br>Encik Zainal Abidin Borhan | Komuniti - komuniti Melayu Bandar dan Luar Bandar - satu kajian mengenai struktur sosial dan kehidupan kebudayaan. | 9,614.00 |
| 11. Encik Norazit Selat | Pilihanraya 1982 di Negeri Sembilan: Tumpuan Khas Kuala Pilah dan Jelebu. | 980.80 |
| 12. Dr. Peter Laird | Temog Shamanism, Religion, Traditional Medicine and Folklore. | 3,023.50 |

Jabatan Pengajian Tionghua

| | | |
|---|---|---|
| 1. Encik Tan Chee Beng | Sistem kekeluargaan Orang Peranakan (Cina) di Melaka. | 1,460.72 |
| 2. Profesor Ang Tian Se | Kajian Kampung Hainan di Port Kelang. | 4,773.00 |

Jabatan Sejarah

| | | |
|---|---|---|
| 1. Encik Mohammad Abu Bakar | Politik dan problem pembangunan Trengganu. | 1,818.40 |
| 2. Encik Abdul Aziz b. Mat Ton | Sejarah perjuangan dan kemasyarakatan PKMM 1945-1948. | 631.00 |
| 3. Encik Abdullah Zakaria b. Gazali | Satu aspek sejarah Trengganu. | 1,654.52 |
| 4. Prof. Madya Chin Yoon Fong | Penghijrahan kaum wanita Canton dan Hainan ke Malaya dan Singapura serta kegiatan-kegiatan mereka di rantau ini pada abad ke 20. | 751.90 |
| 5. Dr. Omar Farouk Shaeik Ahmad | Suatu kajian awalan masaalah pelarian minority Muslim Burma, Thai dan ke Kampuchea di Malaysia. | 1,195.72 |

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|---|---|---|---|
| 6. | Encik Abdullah Azmji b. Abd. Khalid | Perkembangan perdagangan di Malaysia dan kesannya ke atas struktur ekonomi. | 2,067.00 |
| 7. | Puan Ramlah Adam | Dato Onn 1895 - 1962 Peranannya di dalam politik Tanah Melayu. | 5,569.50 |

Fakulti Undang-Undang

| | | | |
|---|---|---|---|
| 1. | Encik Abdullah b. Abu Bakar | Ke Arah Model Baru dalam perbicaraan Mahkamah-Mahkamah Syariah. | 4,207.67 |
| 2. | Encik Teo Keang Sood | Analisa pelaksanaan Akta Galakan Pelaburan 1968 dan perbandingan dengan Akta Galakan Perkembangan Ekonomi (Pelepasan dari Cukai Pendapatan (Bab 135) Singapura. | 1,000.00 |

Pusat Bahasa

| | | | |
|---|---|---|---|
| 1. | Encik Wan Omar b. Wan Ahmad Rasdi | Rancangan UMSEP - Perintis (Pilotting) | 8,840.00 |

Appendix B: Current Projects or Research in Selected Government Organisation (After SIRIM 1978)

| No. | Name of Organisation | Current Projects/Research |
|---|---|---|
| 1. | Bank Negara Malaysia | a) Computerisation of Bank's operations<br>b) Macro Econometric model for the Malaysian Economy<br>c) Agricultural Financing<br>d) Flow of Fund Analysis |
| 2. | Defence Research Centre Min. of Defence, K.L. | a) Materials R&D on defence equipment, components and stores<br>b) Quality Assurance Work on Military supplies<br>c) Preparation & Development of Defence std. and specifications<br>d) Operational Research |
| 3. | Federal Dept. of Agriculture | a) Soil and analytical services<br>b) Crop production services<br>c) Crop protection services<br>d) Farm mechanisation services<br>e) Agricultural extension services<br>f) Agricultural education services<br>g) Coconut smallholders development scheme |
| 4. | Forest research Institute Kepong Selangor | a) Regeneration of hill forest<br>b) Control of competing and other weed plants<br>c) Ecological studies of Malayan forest plantation<br>d) Forest measurements etc. |
| 5. | Geological Survey of Malaysia, K.L. (HQ) Jln. Gurney | a) Systemic geological mapping on a country-wide basis<br>b) Mineral prospecting operations and occurences<br>c) Explore for new metalliferous & non metalliferous, and mineral fuels & related resources.<br>d) Search for sources of groundwater where surface water supplies inadequate.<br>e) Investigations related to engineering and to assess available reserves of construction materials. etc. |
| 6. | Institute for medical Research, Jalan Pahang, K.L. | a) Various research projects in medicine eg. acaralogy, biochemistry, bacteriology, cytology, Filariasis, Haematology, Animal resources, malaria, medical ecology medical entomology, nutrition, parasitology, pathology, rural health, serology & immunology, stomatology, USA medical research unit, virus |
| 7. | MARDI (Malaysian Agricultural Research Dev. Inst.) | a) Research programmes in padi, oil-palm, horticulture, cocoa and coconut, field crops, soils water and engineering, crop protection, livestock improvement, economics statistics and project development. |
| 8. | Mines Research Institute | a) Alluvial tin prospecting<br>b) Study of the stability of mine faces and tailings dumps<br>c) Mineral processes selection<br>d) Fundamental research projects |

Appendix C: Current Projects or Research in selected Private Organisations (After SIRIM, 1978)

| No. | Name of Organisation | Current Projects/Research |
|---|---|---|
| 1. | Agricultural Chemicals (M) Sdn. Bhd, P.O. Box 78, Butterworth, Penang | a) Field testing of pesticides in major crops in Malaysia<br>b) Formulation studies & development for formulae of Agricultural chemical products<br>c) Pollution control and waste water treatment<br>d) Study on storage stability of formulated compounds<br>e) Synthesis studies of technical materials |
| 2. | Agricultural Research & Advisory Bureau 3½ miles, Kajang Selangor | a) Soil survey on Endau-Rompin project (rice)<br>b) Soil survey on the Kelantan state government project<br>c) Soil survey on a grass project in Pengel Kecil Johor |
| 3. | The Analytical Laboratories, 24B, Jalan 52/4, New Town Centre, P.J. | a) Investigation and study of effluents from Palm Oil Industries |
| 4. | Binnie dan Rakan P.O. Box 2610, K.L. | a) Kuantan/Kemaman - Salinity studies on the Kelantan & Kemaman Rivers. Also sedimentation studies on the Kuantan river.<br>b) K.L.- Construction of a 200 ft. high earthfill dam of capacity 7500 mil. gallons in U. Langat<br>c) Johor Tenggara - Construction of a 30 ft. high earthfill dam of capacity 880 mil. gallons at the Sungai Lebam<br>d) Penang - Feasibility study of a pumped storage scheme to augment low flow in the Sungai Muda |
| 5. | Datuk Kramat Smelting 73, Datuk Kramat Road, Penang | a) Modification of process to handle arsenical by-products<br>b) Preliminary removal of impurities in low grade ore<br>c) Arsenic and lead assays in biological samples viz hair, nails, urine, blood etc. |
| 6. | Harrisons & Crossfield (M) Sdn Bhd, 70 Jalan Ampang, K.L. | a) Breeding, selection and evaluation of new cultivates<br>b) Major commercial suppliers of improved rubber, oil-palm and cocoa planting materials to estates and small holdings in Malaysia |
| 7. | Malaya Acid Works Bhd Petaling Jaya, Selangor | a) Air pollution unit control operation and analysis on $SO_2$ and $SO_3$. Experiment and observation of new products. |
| 8. | Kumpulan Guthrie Sdn Bhd Chemara Research Station Seremban | Projects/Research: Oil palms, general agronomy, crop protection, pollution palm oil latex, Analysis. |