Post Graduate Institute of Medicine Oration 2007

POSTGRADUATE RESEARCH : RELEVANCE TO NATIONAL DEVELOPMENT

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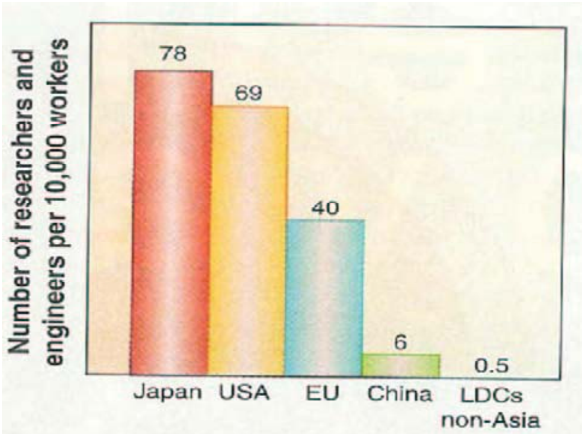
Universities are considered as repositories of knowledge. Creation of new knowledge and dissemination are therefore prime functions of a university. University based research by the academics also contributes to excellence in teaching. An active researcher is required to be updated with current developments in his/her field of research. This in turn contributes to his excellence in teaching both at undergraduate and postgraduate level. It will also result in intellectual stimulation of young students. Today the yardstick of rating universities is the quality of publication by its academics in international peer reviewed journals, in particular in Science Citation Index (SCI) cited journals. This ultimately result in international recognition of a university as a centre of academic excellence. In many advanced countries, the funding of universities by the government use this criterion as a standard. Research in the universities, also constitute the science and technological base for national development. There is no country that has achieved industrial development without a solid and advanced science and technology capacity. For example newly industrialized countries such as South Korea, Singapore, Taiwan invested heavily on scientific research, particularly in basic sciences which enabled them to achieve the present status of industrialization.

A postgraduate researcher initially gets trained in research methodology. This will include acquaintance with techniques relevant to his research, reading and analysis of literature linked to the research project, experience to express his/her findings at conferences and to peers in the field, writing up a PhD thesis and defend the findings at an oral examination by experts in the field and finally in the dissemination of his data as international publications. Thus a postgraduate researcher on successful completion of a PhD is trained to think critically, device appropriate methodologies to solve scientific problems, develop a hypothesis based on the current knowledge to further advancement of knowledge. This type of training undoubtedly provide the strength and capacity to undertake further research to either produce products of industrial value or improve the quality of an already existing product. As mentioned above the ultimate quality of research is measured by its acceptance for publication in peer reviewed journals. Such acceptance also is indicative of peer evaluation of ones research. Scientists all over the world wish to publish their findings in the most prestigious journals of the world. Among several indices or parameters used in the evaluation of the international prestige of a journal is ‘Impact Factor’ (IF) of the journal. The IF is calculated as given below :

$$IF = \frac{\text{Total No. of citation a journals papers receive}}{\text{No. of papers published by the journal}}$$

Some journals like Nature, Science and Cell have very high impact numbers. It is indeed a great achievement for a researcher to get published in such journals. Writing on the scientific impact of nations by David King the then Science Advisor to the former Prime Minister of Britain, has shown clear evidence between citation per unit GDP and the GDP per person in US$. This also demonstrates the need for investment on research if a country is to achieve industrial development and enter into global competitive markets. In an era where private sector is considered the engine of growth, it is either conveniently or through ignorance, forgotten to realize that those countries where private sector is the leading industrial producers achieved such productions only after a critical mass of highly trained scientists and technologists were produced within the country. Singapore, with no natural resources whatsoever, is today, a country with highly advanced industrial productivity and high tech industries. This was made possible because Singapore invested heavily on manpower development in cutting edge science and technologies such as Electronics, Biotechnology, Information Technology and Biomedical sciences. Ismail Serageldin, a former Vice President of the World Bank, writing on the world poverty and hunger in 2002, identifies the relationship between the number researchers and engineers per 10,000 population and industrial productivity. According to him Japan has 79 researchers and engineers per 10,000 persons, USA 69, China 5 and LDCs only 0.5 and Sri Lanka has approximately 0.7 per 10,000 population. No doubt after 60 years of independence we are still dependent on foreign aid (Figure 1).

An interesting and also further proof of relevance of postgraduate research in national development emerges when comparing Cuba with Sri Lanka. For some strange reason both countries had almost identical number of publications around 110 in SCI cited journals in 1991. In 2004, Cuba had gone up to almost 500 while Sri Lanka is still staggering around 200 (Figure 2). Today despite all kinds of sanctions, Cuba has an advanced science technology based industry including Biotechnology both in biomedical sciences and agriculture. In contrast to both countries, in 1991 Singapore had little over 500 publication and in 2006, Singapore produced nearly 6500 publications. What more evidence is needed to prove that postgraduate research is sine qua non for Industrialization.



Sri Lanka 0.7

Figure 1

Let me now show you the research productivity of our University of Colombo. The total number of SCI cited publications in the year 2005 has been only 37, though highest among all universities in Sri Lanka. The total number of science based PhDs produced for the period 1997 to 2006 (a ten year period) in the Faculty of Medicine has been approximately 37 with a total of approximately 23 PhD trained academic staff, while in the Faculty of Science for the same period, it has been approximately 33 PhDs with a total of approximately 55 PhD trained academic staff members (Figure 3). Certainly these are not encouraging figures if we want to achieve international recognition and also contribute to national development. There are many reasons for this type scientific productivity among the academics. The main reason is, of course, the insignificant funding of postgraduate research in general. The country has been investing in an infinitesimally small percentage of the GDP in science and technology research. In the year 2008 it is as little as 0.13 per cent !. While the countries closer to us and in the region this figure is closure to 1 per cent!. The National Research Council (NRC), the National Science Foundation (NSF) and the Council for Agricultural Research Policy (CARP) are main organizations funding research. These organizations depend on the Treasury for annual allocation of funds for research. When that allocation is only 0.13 per cent of GDP, only very few applications for research could be funded. It is therefore imperative that if Sri Lanka is to achieve science and technology capacity for development the investment on scientific research must necessarily be increased significantly.

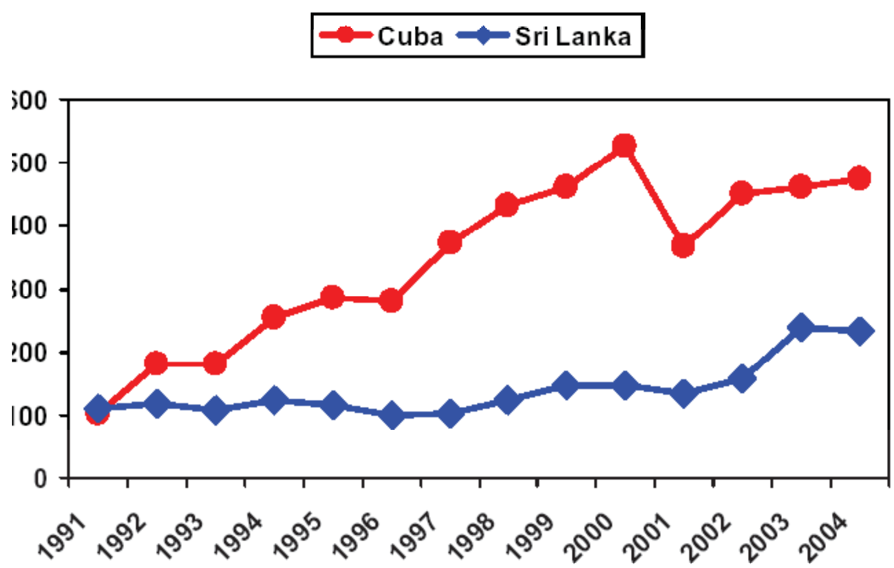


Figure 2

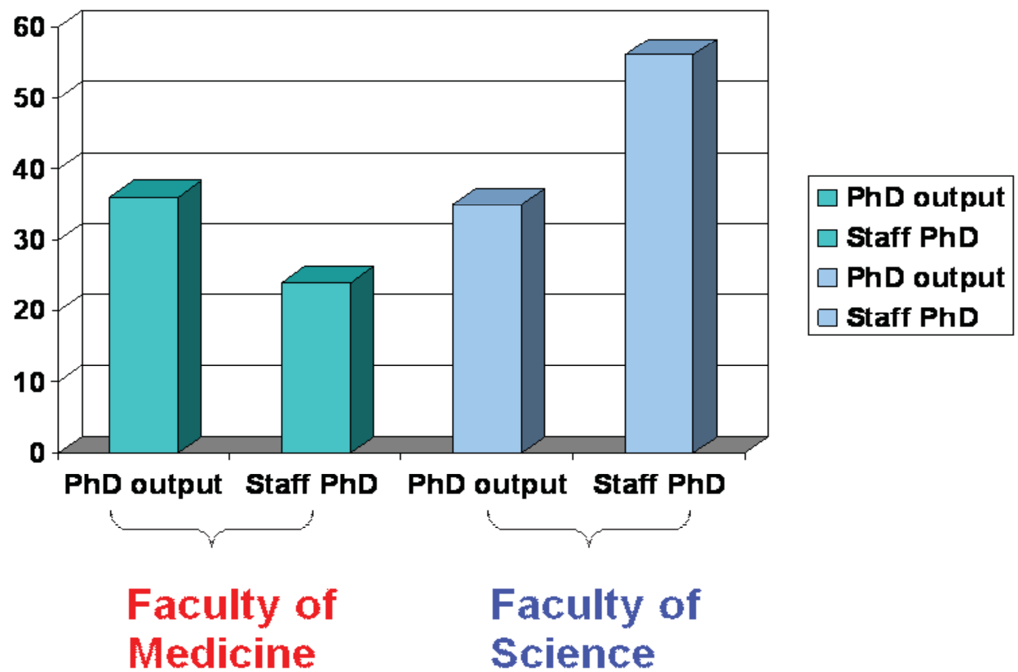


Figure 3

However, the academics cannot totally absolve themselves, for poor scientific research productivity mainly on the lack of funding. There are many international funding garding the uality of our graduates. It is not surprising that the academic standards and quality ofthe global community is facing many challenges in the 21 century. These include the impact of tools to attack these challenges in the 21 century are already in existence.he unprecedented advances in molecular techniques and information technology during the last 2-3 decades of the last century will play unimaginable roles in global p organizations providing funds for research in developing countries, particularly on tropical diseases, food and agriculture, environmental science, geology, pharmaceutical products from plants, marine sciences etc. These grants are very competitive and applications to such organizations have to be prepared meticulously. Also sometimes it becomes necessary to apply for several years until you achieve success. This in turns revolve around the recognition, incentives and rewards for academic research. It is indeed true, that except for merit promotions in the university systems, there are no other mechanisms for encouraging, recognition and promotion of postgraduate research in the university sector. In fact this has been a national weakness through out the university sector from its inception. While in many countries both developed and developing, the University Grants Commission or its equivalent, provide competitive research funds, in Sri Lanka, the UGC provide funding only for undergraduate teaching. This in turn is related to non-provision of funds for postgraduate research by the Treasury.

There have been many lamenting and critical articles in the recent past re graduates have fallen over the years when the intellectually stimulating research, and original thinking are minimal. These academic activities closely linked with active research programmes. In the absence of such intellectually stimulating environments, universities naturally become factories producing non-productive graduates.

Despite this status of science and technology capacity in the country st c climate changes on food production and stability, natural disaster of floods and drought,disease burden of both tropical parasitic diseases and non-communicable diseases, the energy crisis to mention a few. These challenges will have greater impact on developing countries of the world. The Bill Gates Foundation in making available US$ 500 million for scientific research, identified Seven Grand Challenges in the field global health. These included the production of improved childhood vaccines, creation of new vaccines, control of insects that transmit disease agents, improvement of nutrition, Improvements in the drug treatment of infectious diseases, cure of latent and chronic infections and the measurement of health status accurately and economically in developing nations. These challenges are closely related to the UN millennium developments goals which include the eradication of extreme poverty and hunger, achievement of universal primary education for boys and girls, promotion of gender equality and empowerment of women, reduction of child mortality rate before age 5 by two-thirds, improvement of maternal health and reduction of mortality rate by 75%, ensuring of sustainability and increasing access to safe drinking water and the development of global partnerships for development.

The scientific tools to attack these challenges in the 21st century are already in existence. The development. The unveiling of the Human Genome Sequence along with many othergenomes such as the rice genome, the genome of the major malarial mosquito and themalarial parasite, Plasmodium falciparum constitute gold mines for scientific advancement to improve the quality of life. The advances in the information science similarly provide hither to unknown rapid access to latest information on science and technology as well as socio-economic issues. Writing on the impact of unveiling of the Human Genome, Francis Collins, identified Genomics to Biology, Genomics to Health,and Genomics to Society as three wide fields of impact on human life in the 21st century In his vision he also identified, Resources, Technology Development, Computational Biology, Training, Education and Ethical, Legal and Social Implications (ELSI) as key sectors to develop in order to derive the maximum benefit of Human Genome sequence.

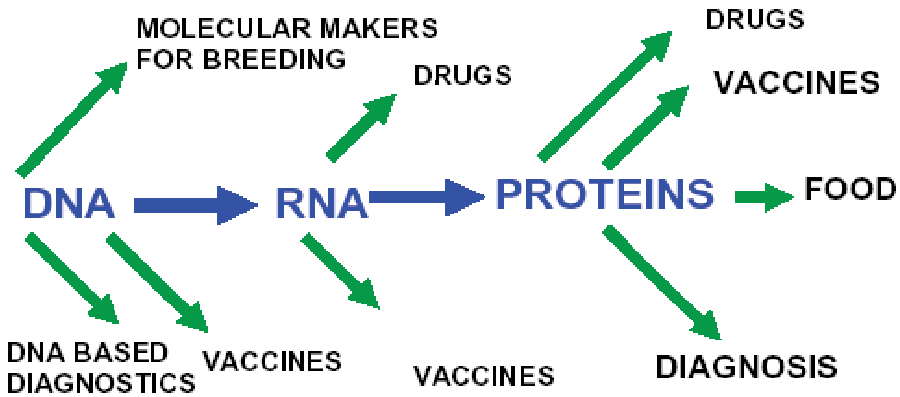


Figure 4

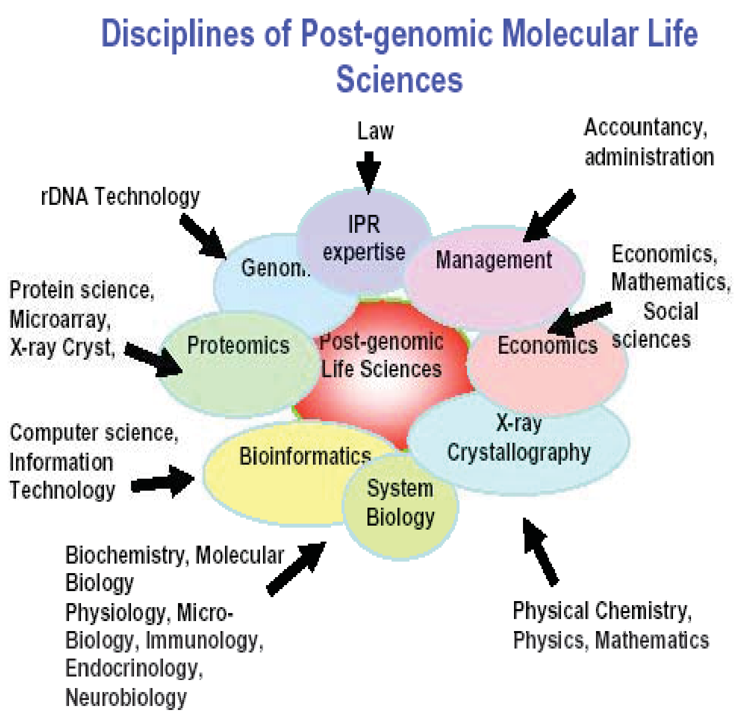


Figure 5

The potential developments based on the Human Genome Sequence are illustrated in figure 4, some of which are already in global markets. It should be immediately apparent at to achieve these benefits multidisciplinary approach is invariable required. These scientific disciplines some are basic sciences while others of applied in nature are illustrated in Figure 5.

Some of the priority areas for national development where molecular technologies are applicable are shown Figure 6 and 7. The University of Colombo has been able to set p a Centre of Excellence which can play a major role in national development if funds are made available. The Institute of Biochemistry, Molecular Biology and Biotechnology (IBMBB) established in 2004 with funding from Sweden is the ultimate achievement of more than 20 years of scientific collaboration between Swedish Universities and the University of Colombo funded by the Sida, SAREC and the International Programme in Chemical Sciences (IPICS) of the University of Uppsala. The IBMBB is a national asset and it is now up to the government to make it a viable Centre of Excellence in Molecular Life sciences.

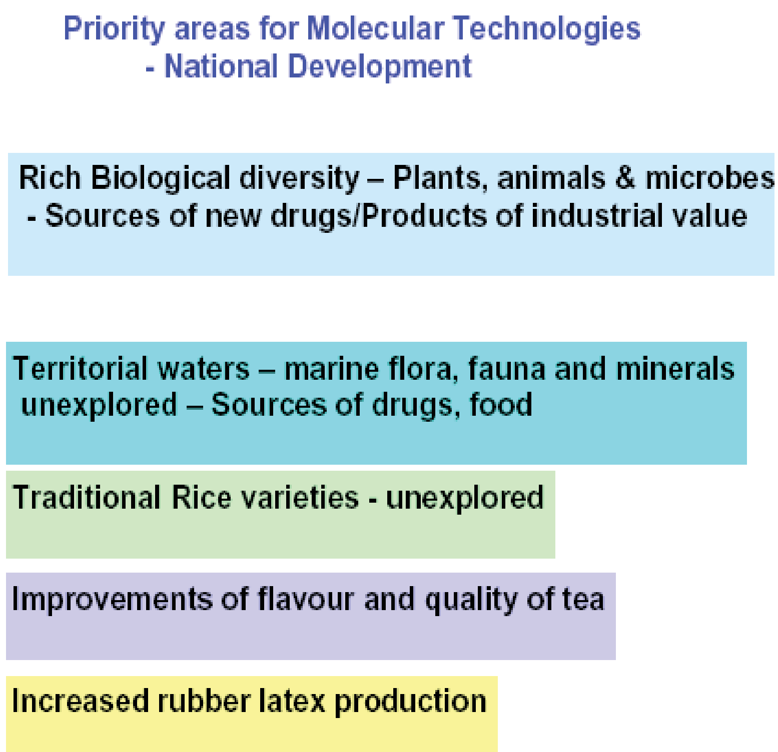


Figure 6

Figure 7

Genomic & Molecular Medicine

Application of Molecular techniques in forensic Science and Archaeology

Molecular studies in developmental biology

Detection of Post-harvest pathogens

Purification and recycling of waste water

Multidisciplinary Approach to Molecular Life Sciences