WORLD CONFERENCE ON HIGHER EDUCATION

Higher Education in the Twenty-first Century
Vision and Action

UNESCO, Paris, 5-9 October 1998

VOLUME IV

Thematic Debate:

Higher Education and Research: Challenges and Opportunities

ED.99/HEP/WCHE/Vol. IV-7

Note of the UNESCO Secretariat

The present volume is part of the Proceedings of the World Conference on Higher Education (Paris 5-9 October 1998).

Volume I :	Final Report
Volume II :	Speeches and Lectures
Volume III :	Reports of the Commissions
Volume IV :	Thematic Debates
Volume V :	Plenary Speeches
Volume VI :	Listing of Titles of Individual Documents.

Documents are archived in the original language of delivery or in one of the language versions provided by the author. Copies can be obtained on request from the Division of Higher Education, UNESCO. Some documents are available in printed form only.

Note du Secrétariat de l'UNESCO

Le présent volume fait partie des Actes de la Conférence mondiale sur l'enseignement supérieur (Paris, 5-9 octobre 1998).

Volume I :	Rapport final
Volume II :	Discours et exposés spéciaux
Volume III :	Rapports des commissions
Volume IV :	Débats thématiques
Volume V :	Discours en séances plénières
Volume VI :	Liste des titres des documents individuels.

Les documents sont archivés dans la langue originale du discours ou de l'une des versions transmises par l'auteur. Les copies peuvent être obtenues sur demande adressée à la Division de l'enseignement supérieur, UNESCO. Certains documents ne sont disponibles que sur papier.

Nota de la Secretaría de la UNESCO

El presente volumen forma parte de las Actas de la Conferencia Mundial sobre la Educación Superior (París 5-9 de octubre de 1998).

Volumen I :	Informe Final
Volumen II :	Discursos y Ponencias Especiales
Volumen III :	Informes de las Comisiones
Volumen IV :	Debates Temáticos
Volumen V :	Discursos de la Plenaria
Volumen VI :	Lista de Títulos de los Documentos Individuales

Los documentos han sido archivados en el idioma original de la intervención o de una de las versiones entregadas por el autor. Para optener copias de los mismos mande su solicitud a la División de la Enseñanza Superior, UNESCO. Algunos documentos sólo están disponibles en papel impreso.

Introduction

In organizing the World Conference on Higher Education, UNESCO's goal was to create favourable conditions for a sweeping debate and to increase awareness of the principal issues in this important field.

The Thematic Debates were organized in parallel with the Commissions and the Plenary sessions and so constituted one of the selected frameworks for reflection and for deepening discussions.

Planning the Thematic Debates included the participation of some fifty representatives of NGOs and IGOs, as well as a number of resource persons and UNESCO staff members.

Each working document was prepared under the coordination of a leader with the contribution of partners chosen by the Secretariat from organizations already cooperating with UNESCO.

Working documents of the Thematic Debates were taken into account in preparing the Conference's principal working documents and in elaborating drafts of the Declaration Framework for Priority Action. This synergy marked the entire preparation phase.

The 12 Thematic Debates were regrouped into three large themes:

Higher Education and Development

- *The Requirements of the World of Work*
- *Higher Education and Sustainable Human Development*
- *Contributing to National and Regional Development*
- *Higher Education Staff Development: A Continuing Mission*

New Trends and Innovations in Higher Education

- *Higher Education for a New Society: A Student Vision*
- *From Traditional to Virtual: The New Information Technologies*
- *Higher Education and Research: Challenges and Opportunities*
- *The Contribution of Higher Education to the Education System as a Whole*

Higher Education, Culture and Society

- *Women and Higher Education: Issues and Perspectives*
- *Promoting a Culture of Peace*
- *Mobilizing the Power of Culture*
- *Autonomy, Social Responsibility and Academic Freedom*

The introduction to each Debate was given by the author of the working document. This was then completed by input from the panel members.

Each Debate produced a synthesis report representing the results of the discussions and the recommendations made.

The general coordination of the preparation and organization of the Debates was undertaken by the Division of Higher Education, UNESCO.

Volume IV of the Proceedings of the World Conference on Higher Education regroups for each of the 12 Debates:

- The Working Document;
- The Synthetic Report for each Debate;
- The interventions of the panel members.

With regard to the thematic debates on students and women, contributions which were addressed to the Organizing committee and judged relevant were also taken into account.

Thematic Debate

«Higher Education and Research: Challenges and Opportunities»

Leader: International Council of Scientific Unions (ICSU)

Working Document drafted by: Professor Daniel Akyeampong
Academy of Arts and Sciences
Accra, Ghana

and

the UNESCO SECRETARIAT

Contents

Summary

While early scholars saw the function of higher education as pursuit of knowledge for its own sake, today's researchers see it as going beyond that to include applying such knowledge in order to enhance, directly or indirectly, the material well-being, happiness and comfort of mankind. The utilitarian perception of the mission of higher education, the need for strengthening higher education and research capabilities of the developing world, how to bridge the gap between the natural and social scientists, and the freedom and responsibility in the conduct of research are some of the issues highlighted in this paper and opportunities for addressing them are discussed. Also discussed are the opportunities afforded by the new information technology and telecommunication system.

As we enter the 21st century, the main challenge to mankind seems to us to be how to sustain the immense contributions of research to the well-being of mankind without jeopardising the future of man.

PANEL

Chair: Prof. Daniel Akyeampong, International Council for Science (ICSU), Ghana

Rapporteur: Prof. Albert Fischli, Executive Director, Hoffman-La-Roche Ltd, Switzerland

Panelists:

Prof. Guy Ourisson
France

Prof. M.H.A. Hassan
Executive Director
The Third World Academy of Sciences (TWAS)
Italy

Prof. Oumar Sock
Directeur
Ecole Polytechnique de Dakar
Sénégal

Prof. M.G.K.Menon
India

Dr Heather Eggins
Director
Society for Research into Higher Education (SRHE)
United Kingdom

Prof. Maxwell McCombs
Department of Journalism
Univ. of Texas at Austin
USA

Resource Persons:

M. André Gouaze
Président
Conférence internationale des Doyens de Facultés de Médecine
France

M. Hervé de Tricornot
Directeur
pour l'investissement dans la recherche et le développement (AIRE)
France

M. Bernard Eding
Directeur,
Société Nationale de Raffinage (SONARA)
Cameroun

Mrs Maureen Brennan
ICSU
France

Advisory/Steering Committee:

Mr Sarukhan Kermez
Universidad Nacional Autónoma de México (UNAM)
México

Synthetic Report

Higher Education and research are intimately related. Good scientific research is needed to sustain a good cultural, scholarly and social environment, which is necessary for good teaching.

What is the web of relationship that defines the University research agenda:

- relationship between teaching and research and scholarship;
- relationship to the outside world of industry and to the developing world;
- the link between new technology and research;
- the link to elementary and secondary education;
- the link with public opinion and the tension between basic and applied research;
- and, finally, the fit with culture.

The dogma is that “no teaching can be good unless the teacher is a good researcher”. Research fits in the entire education purpose, beginning with elementary and secondary education. This is the setting in which the potential of female must be emphasized. In fact this has strong limitations, for instance in the professions in poorer countries or regions.. One should not confuse research and scholarship.

Innovation is mainly driven by the four stakeholders: universities, industry, society and governments. While universities have, among other things, the mandate to create new knowledge, it is industry’s task to translate it into new products and services. Today, forceful economic constraints are quickly enhancing co-operation between universities and industry. Successful outcomes can be expected if governments provide enough resources for basic research.

Networks of Centres of excellence in education and research in developing countries can jointly play a significant role in uplifting the status of higher education in developing countries, especially in the LDCs.

Regional Foundations for Higher Education: Joint international action co-sponsored by governments and major development aid organizations, including the World Bank, the regional Banks and UNDP, to establish regional institutions to provide funds to improve the quality of higher education in the developing world.

Information and communication technologies offer, on the one hand, the potential move towards a more egalitarian society and, on the other hand, the potential of new social divisions between the “information rich” and “information poor”. “On line learning is the future” - course delivery, research, networks and research alliances, all can be enhanced by making use of the technologies now available to us.

Governments should implement educational policies at all levels to give females free access to scientific education and should encourage international organizations and institutions to promote women in scientific research.

News media influences both the focus of attention and how issues are framed among the general public, government officials and researchers. Because this influence emphasizes applied research, the training of researchers should stress using all research opportunities to build basic theory.

Science and technology are a manifestation of human creativity at the highest level, with profound implications for society. But as a search for truth, for an understanding of Nature and in creating the enormous edifice of knowledge that we have today, it is undoubtedly an intrinsic part of culture, perhaps a different face of culture on account of its philosophy and method from that of the arts.

Science in its internal functioning is universal but it must derive its strength from the multi-cultural nature of our global society; it is the latter, which makes human society so productive and so interesting, and this is why it is so important that the forthcoming UNESCO/ICSU's World Conference on Science in 1999 will send a new message to the world community.

Working Document

Introduction

Inspired by Cicero's statement that "only man possesses the capacity to seek and pursue truth,"[1] the 19th century scholar, Cardinal John Henry Newman defined the function of the ideal university as the pursuit of knowledge for its own sake:

> "*Knowledge is not merely a means to something beyond it[self], or the preliminary of certain arts into which it naturally resolves, but an end sufficient to rest in and to pursue for its own sake*."[2]

Today the university sees its functions as going beyond that of Newman's vision to include the use of acquired knowledge in order to enhance--directly or indirectly--the material well-being, happiness and comfort of mankind. Higher education is now regarded as an institution not only for developing knowledge and training young minds, but for disseminating and applying such knowledge as well.

The 20th century will be remembered for its intellectual discoveries of relativity and quantum mechanics, and for the interpretation of the structure of DNA--discoveries that have enabled researchers to unravel some of nature's secrets and the fundamental behaviour of some of its life forms. The university's utilitarian perception of its mission, now regarded with greater emphasis and urgency, has come about largely as a result of these breakthroughs of knowledge in the natural sciences. Among the consequences of these discoveries could be listed the fantastic development of information technology and high-tech industries, the increase in life-expectancy[3] (chiefly because of advances in medical research and nutritional science), and increased food security (derived from genetic engineering research). In all these, the university has provided much of the leadership; with the partnership of government and its agents, industry and international agencies either as research collaborators or as funding bodies.

It is such achievements, such triumphs of science, that have led to a revision of Newman's dictum that higher educational institutions should pursue knowledge only for its own sake. Of course there will continue to be programmes of liberal education devoted entirely to scholarly study of the major works of other scholars to help clarify and possibly modify one's previously held convictions. Pure scholarship will remain with us because of the persistence of the cherished value of freedom of thought and enquiry, that intellectual value upon which the life of the university as a place of research and teaching depends. But in recent times, the immense contributions that university research has made to the national economy ironically places in jeopardy the future funding of such work. The university itself appears to be moving away from its ancient tradition of pursuing pure inquiry for its own sake precisely because of the pressures felt from underfunding.

As we enter the 21st century, it is appropriate that we discuss how this economic tension and other related problems arising from the utilitarian mandate should be tackled, so that the university will continue to serve the interest of mankind in all its manifestations.

University / Government and Industry Relations

The current triumphs of research are due in large measure to the provision of adequate financial support from government, from the private sector (through its industries) and from international agencies. The successes of the newly emerging economies in South East Asia--the present economic crises notwithstanding--provide sufficient evidence that in a science and technology-driven economy, it is the university that must be the powerhouse of the "knowledge economy."[4] Now governments everywhere are expecting the university to fulfil its role as a major agent of economic growth. However, there is a price to

pay for this. The injection of public funds into the university for research requires accountability that may be directed by an outside body and not by reliance upon the university's own evaluative procedures. This may impact negatively on a tenet the university holds so dear: respect for academic freedom and autonomy of choice in conducting one's own research.

In the same way, industry in the private sector is accountable to its shareholders who are typically more interested in their profits than in the pursuit of knowledge for its own sake. Shareholders are likely to favour programmes and projects that yield immediately applicable results. The effect is that basic research will be the loser. Will the university have the moral tenacity and related resources to balance its cherished values of free inquiry and intellectual honesty? Going after government and industry-supported research could lead to long-term consequences that are not easy to predict. The challenge now is to work out ways of catering for the interests of both parties in the research partnership.

There is also the problem of research conducted outside the university. The total government expenditure for research is often shared between the university and other specialised national research institutes or centres, while multinational industries have their own laboratories for research. The conduct of advanced research is no longer solely the preserve of the university. Research results obtained in national research institutes as well as in industry may be classified and so may remain unknown to the research public, sometimes until two or more decades have passed. No longer is all knowledge readily disseminated to all those capable of benefiting from it. This situation clearly undermines the important normative principle of the universality of knowledge, a principle that is treasured by the university and by ICSU. The freedom to pursue research and to publish one's results, the freedom to communicate among researchers and to disseminate such research information--these cherished rights--are thereby compromised with predictably morbid consequences for the educational training of the next generation of researchers. How to contend with this constraint is surely a challenge that must be addressed.

Basic Versus Applied Research

These considerations indicate that inadequate funding, leading to the need to generate additional income from other sources, is one reason for the university and its researchers to move toward applied research at the expense of basic research. The need for funding has yielded the marginalization of research motivated by a sense of curiosity generating from the intuition and the sheer intellectual power of individual minds. Yet, fostering such work remains one of the basic missions of any higher educational institution, perhaps all the more so during times of socio-economic crisis.

Prior to the demise of one of the superpowers, national agencies used to support basic research principally for its potential applications in the military and in commerce. But now they have less reason to invest in it. Yet everyone recognizes the economic and social benefits of basic research: it produces background knowledge, it develops research skills, new techniques, instruments and methods that in turn yield economic benefits over a much broader range of production sectors.[5] Also there is a symbiotic relation between basic research and technology, with each moving ahead increasingly faster because of the impact that one has upon the other.

Thus inadequate funding for basic research has an immediate deteriorating effect not only on higher educational institutions themselves but on national economies. We need to continue to create the necessary infrastructure for basic research "to fulfill its mandate as a creative manifestation of the human spirit."[6]

The Role of Information Technology

Information technology has proven to be a powerful aid to the researcher; but its potential has yet to be fully exploited. Its recent forays into the higher education industry, through the establishment of the 'Virtual University', has led some to forecast the demise of the traditional university structure as it is presently

constituted. This is because of the several advantages the 'virtual university' has over the traditional one: it encourages collaboration between universities and staff in distant locations; it affords the ready availability of first class libraries to students in varied institutions; and it is an excellent tool for cutting down costs.

Is the university as a spatially clustered community of researchers and scholars consequently an endangered species? The answer clearly depends on how narrowly one insists upon defining 'a community of scholars'. All that the Internet is encouraging is the possibility of providing at lower cost the capacity to unite spatially disparate people. In this way, it enlarges the research community to include those outside one's physical neighbourhood, so that people with shared interests can interact while working in different places on the globe. These are exciting possibilities of which even Cardinal Newman would have approved. We need to explore these advantages further.

Social Responsibility of the Researcher

Newman stated that "if a practical end must be assigned to a university course, then, it is training good members of society."[7] The applications of some research in science and technology have proven extremely hazardous to humanity. This utilitarian criterion--the mandate to apply knowledge, to pursue dominion over the earth--is plagued with danger and measures should be put in place to protect mankind and our environs. Currently, questions are being raised concerning the desirability and even the purpose of some of the research carried out in higher educational institutions. For although these institutions provide the technical tools of civilisation, they do not at present provide any guidance for their use. They are neither interested in ultimate ends nor can they predict ultimate consequences. The English mathematician G.H. Hardy once wrote:

"I have never done anything 'useful'. No discovery of mine has made or is likely to make, directly or indirectly, for good or ill, the least difference to the amenity of the world.[8]"

One may wonder whether Einstein felt the same way with his equation: $E = mc^2$. It is certainly no exaggeration to claim that it was the applications of relativity and quantum mechanics that reshaped the world both for better and for worse. No pure or basic researcher can predict what others will do with his results.

Typically, researchers are now faced with questions concerning the consequences of their work: what will be the consequences of biochemical weapons research for future generations, or of nuclear waste disposal, or of human cloning and other genetic experiments? How can our planet be saved from the current as well as for the future generations? Here we are dealing not just with technological and ecological questions but with moral dilemmas as well. The university cannot remain wholly indifferent to all values other than its cherished prizes of the search for truth and for funds, important though these quests may be.

The "good members of society", duly trained by the university, should "go into life conscious of the deeper issues at stake and of the values involved in them."[7] Truth and its applications must be pursued with responsibility, and it is for this reason that ICSU has created a Committee on Responsibility and Ethics in Science, charged with the duty of helping to find solutions to problems concerning ethics and responsibility in the conduct of science. ICSU aims to ensure that the contributions science makes to humanity will be for our common well-being and for humane social progress.

For, without such ethical vigilance, the distrust that some of the public currently has about science will most likely intensify at great cost to the progress of science. It is the challenge of the researcher to ensure that the two values of freedom and responsibility in the conduct of research are kept in their proper perspective, if the researcher is not to encourage the rejection of progress or modernity as an item of reactionary dogma.

The International Dimension of Higher Education and Research

In his ***Metaphysics***, Aristotle claimed that all men by nature desire to know, and in most cases they also desire to apply their knowledge. It is because of man's insatiable desire to know and to apply his knowledge that institutions of higher education exist at all. The economic progress that industrialised nations have enjoyed was hastened because of the existence of the relevant indigenous capability in a social environment that nurtured scholarship. The gap between the developed and the developing worlds, which is widening at an increasing pace, will be narrowed only if the necessary infrastructure and local supports for high education and research exist within the developing world. While most governments of the developing countries are facing serious economic crises, in the long run it will be to their advantage if a reasonable percentage of their GNP provides the resource necessary for the promotion of quality higher education and capacity-building in research.

The advanced countries can also contribute in the effort to create an indigenous base for research by helping to equip researchers of the developing world for full participation in knowledge-based socio-economic development. Working as a researcher in a less than sound environment, with few exceptions, means working in complete isolation. Having himself experienced such loneliness while working in his own country, Abdus Salam, of blessed memory, inspired by John Donne's remark that everyman's death diminishes me, because I am part of mankind', worked hard to try and break the scientific isolation of researchers especially in the Third World. Using his influence and prestige he was able to set up the International Centre for Theoretical Physics (now named after him) in Trieste, Italy. There scientists of the Third World get the chance to interact with their colleagues from the industrialised world while at the same time they continue to contribute to the capacity-building of scientists in their own countries. This world will be a better place for all if such institutional experiments could be replicated in other research areas. For as Salam once wrote,

> *"[Science and Technology] are the shared heritage of mankind. East and West, South and North have all participated in their creation in the past as, we hope, they will in the future."*[9]

The challenge, then, is for the world's community of higher educational institutions and researchers to make Salam's hope a reality, by finding ways to build bridges between the worlds of North and South, First and Third, men and women. The challenge is to ensure that all scientists, irrespective of where they might find themselves, will be suitably positioned to contribute their best toward solving the world's complex problems, thereby giving substance to the international nature and universality of knowledge.

Nurturing the Two Cultures

The curricula of some of the most well-known universities encourage too early a specialisation for the student. A science student specialises in the study of nature but not of man; student of the humanities concentrates upon man, to the complete neglect of nature. The result is the existence of what the British novelist C.P. Snow called "the two cultures." Some policy makers are students of the humanities with little or no interest in how the technological gadgets that they regularly use came about. Similarly, some scientists are hardly conversant with the appreciation of poetry or art or music. The public will better appreciate the work of the researcher if he has been prepared with an understanding of that public in all its dimensions.

Indeed, our educational system should be guided by the scientific worldview that has emerged in this century, that is the Copenhagen interpretation of quantum mechanics that states that there exist several mutually exclusive but complementary approaches to reality, since nature and society are too subtle to be described from any single viewpoint. The education of the scientist should include training in the social sciences, and that of the social scientist should include training in the natural sciences, so that it is possible for them both to apply their fullest potentials to national life and development. One of our challenges as we

enter the next millennium is to establish meaningful and extensive dialogue across and between disciplines to deal more effectively with some of the outstanding questions in the arts and the sciences.

Agenda For The 21st Century

We are about to enter the 21st century unable to reconcile two of the major discoveries of the 20th century, quantum theory and the theory of gravitation. In this respect, we are reminded of the dilemma faced by the 19th century researchers between Newtonian mechanics and electromagnetism. Its resolution in the early part of this century set the stage for some of the advances in knowledge already referred to. Are we to witness in the next century a synthesis of quantum mechanics and Einstein's gravitation theory? And what impact will such a feat have on mankind should research succeed in the endeavour? Will history repeat itself? We look forward with interest to the answers.

Without doubt, the major problem 20th century research has created is how to sustain development so as to "meet the needs of the present generation without compromising the needs of the future generation."[10] As is well-known development is closely linked to environmental change. Two major causative factors have been identified as responsible for the degradation of the environment, with serious implications for the future of planet Earth. These are the increased consumption patterns and life-styles of the affluent industrialised countries, and high population growth rates in the developing countries. Sustaining these life-styles and catering for the minimum needs of the global community have led to a considerable pressure on our natural resources. For example, energy sources are among the vital ingredients for economic activities as well as for people's daily lives. Fossil fuels which are the principal source of energy are responsible for heavy damage to the environment, contributing to the increase in carbon dioxide, the chief greenhouse gas. They are also a non-renewable source of energy. And yet energy consumption in the world is expected to increase. And so, in order not to compromise the needs of future generations, the challenge to the researcher whether at a higher educational institution or in industry, is to either identify alternative sources of energy which are renewable and are environmentally-friendly, or if we are to live with non-renewable sources, to find ways of decreasing the carbon dioxide emitted by fossil fuels.

How to achieve population stabilization has to be considered not only from a purely economic point of view but from human and cultural aspects as well. Happiness in some cultures means having many children while in others it is having one or none at all. ***All researchers***, social and natural, basic and applied, have a role to play in our attempt to encourage a globally applicable plan for sustainable development.

Research on the management of the environment, is global and interdisciplinary. Fortunately, meaningful cooperation and collaboration is now possible because of information technology. We need to take advantage of this very useful technology.

No doubt, the 21st century will raise even more problems but in the midst of difficulties lie challenges and opportunities. In all our deliberation, we need to ask ourselves what sort of human society we want to build in the next century; it must surely be one dominated by science and technology, but which engages the participation of all researchers. In all our endeavours we should let the following admonishing words of Einstein be our guiding principle for the next millennium.Concern for man himself and his fate must always form the chief interest of all technical endeavours; concern for the great unsolved problems of the organisation of labour and the distribution of goods in order that the creations of our minds shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations.[11]

Strategies for Future Action

- Governments should continue to fund basic research to levels which will enable the University fulfil better its role as a major agent of economic growth,

- a) Governments of developing countries must create the necessary social environment that nurtures scholarship; they should also provide a reasonable percentage of their GNP to promote quality higher education and capacity-building in research,

  b) International organisations and researchers in the developed countries must help break the isolation often experienced by researchers working in developing countries, through such methods as creation of centres of excellence twinning and sandwich post-graduate programmes,

- Governments especially from the developing countries are invited to study the opportunities afforded by the new information technology towards establishing "virtual universities",

- Higher educational institutions and research institutes outside the higher educational set-up need to collaborate to promote the principle of universality of knowledge,

- Higher educational institutions should ensure that the education of the researcher includes training in both the natural and social sciences, nature and society being too subtle to be described from one single viewpoint only,

- International organisations including International Council for Science (ICSU) and the International Social Science Council (ISSC), must prepare guidelines for their members concerning the ethics and responsibility in the conduct of their research,

- ICSU, ISSC, and other international organisations including those n the engineering sciences and industry should collaborate more fully to address the effects of overpopulation and of man-made environmental changes on our planet.

Notes

1. *De officiis*, line 4
2. As quoted by Jaroslav Pelikan, *The Idea of the University: A Re-examination*, 1992, Yale University Press, p.32.
3. See, for example, *World Development Report* 1993, Investing in Health, Oxford University Press, p. 23.
4. "The Knowledge Factory" *The Economist* October 4, 1997 p.5.
5. K. Pavitt, *World Science Report* 1993 p.134.
6. M.G.K. Menon, *World Science Report*, 1993 p.5.
7. Quoted by R.W. Livingstone, *The Rainbow Bridge and Other Essays on Education*, London, Pall Mall, 1939 p.16.
8. G.H. Hardy, *A Mathematician's Apology*, Cambridge University Press p.90
9. *Muhammed Abdus Salam, Science, Technology and Science Education in the Development of the South*, Third World Academy of Sciences, 1991, p.28.
10. Brundtland Report on the *World Commission on Environment and Development*.
11. As quoted by Neil Lane, Director of the National Science Foundation, USA in ICSU *Annual Report* 1996, p.104.

University - Industry Co-operation in Science and Technology

Address by: Professeur Albert E. Fischli
F. Hoffmann-La Roche Ltd
Pharmaceutical Research, Switzerland
ICSU Executive Board Member

Industrialists looking towards academia are confronted with a plurality of universities differing substantially in their organizational framework. Contacting them, it is advantageous to choose an individual approach. *Vice versa,* industry is offering a very varied picture as well. Whereas, in US metals and mining industry 2 % of sales have been invested in R & D in 1998 the respective figure for US pharmaceutical industry is 19 %.

In spite of the fact that the top 10 global pharmaceutical companies have been investing between 1 and 2 billions US$ into their R & D function in 1996 the output in the same year was only 0.66 new molecular entities (NMEs) first launched world wide per company. A figure, insufficient to allow these companies to hold their market share by internal growth. An independent study published by Anderson Consulting showed that 3 - 4 significant NMEs have to be launched on the world market in order to guarantee an annual growth of 10 % for one of the top 10 pharmaceutical companies. Taking into account that the global pharmaceutical market is expanding by about 6 % p.a., this would be just a little bit above maintenance level.

In order to close this gap, R & D funding within these top 10 companies will focus even more on the specific task of industry; i.e. translating new knowledge into products and services. Pharmaceutical industry is drawn towards increasing and improving interactions with universities and smaller companies engaged in the first steps of the afore-mentioned translatory process.

It goes without saying, that in this context heavy funding of non-product oriented fundamental research at universities can not be the task of pharmaceutical industry. This has to be an integral segment of governmental activities.

Fundamental or basic research is characterized by the fact that it is driven by the passion to understand and that it has to remain flexible and open for serendipity. It is creating new knowledge, the indispensible prerequisite for novel products; or placed differently, without new knowledge there can be no novel products or services.

For top pharmaceutical industries it is compulsory to amplify multifirm alliances and to substantially increase collaborations with academic centres.

For both partners universities and industry there are individual interests to start such collaborations. Whereas, the drivers for universities could be formulated as:

- market awareness of own research projects;
- initiating, sustaining or enhancing research programmes;
- accessing private funding, on top of public financing;
- accessing complementary skills and facilities in industry; and
- sourcing employment opportunities for research graduates.

the drivers for companies could be listed as:

- outsourcing R & D portfolio, especially at the discovery end;
- accessing complementary skills and facilities;

- gatekeeping on emerging fields of science;
- developing global approaches to own R & D;
- recruitment of research and technical staff.

Basis of collaborations have to be agreements, they are a must. The terms of the contracts have to be consistent with local competition laws. One of their main functions should be to safeguard intellectual propriety rights of inventors.

Finally, collaborations between the creators of new knowledge in academia and the translators of it into products and/or services in industry can be made successful by well practised management and ongoing communication, valuing the diversity of input and promising mutual benefits.

Address by: Prof. Dr Mohamed H.A. Hassan
Executive Director
The Third World Academy of Sciences (TWAS)
Italy

A. The Challenges

1. Experience has shown that no country can achieve sustainable economic and social development without the support of a minimum core of indigenous, highly skilled and innovative scientists, technologists and other professionals, who can undertake basic and applied research essential to national development.

This view is currently shared by a number of leading economists in the world (see article published last month in The Economist by Prof. Sacks of Harvard University on Global Capitalism).

2. In the majority of developing countries, especially the Least Developed Countries (LDCs), there is an acute shortage of world-class professionals. This is largely due to the failure of the institutions of higher education to attract, properly train and retain these professionals. The reasons are well-known. They are mainly attributed to the deteriorating infrastructure in universities and the acute shortage of leadership due to declining budgets and the brain drain. In addition, there has been a substantial increase in the student body, resulting in the over-production of poorly qualified graduates.

3. Basic sciences are the worst hit by this crisis. TWAS and ISP are currently conducting a survey on the status of basic sciences (physics, chemistry, mathematics and biology) in Eastern and Southern Africa to be presented at a conference on basic sciences in the region to be held in Arusha, Tanzania, in March 1999. From what we have seen so far, it seems that the majority of countries in the region have an average of 5-8 PhD holders in any of the four fields of basic sciences.

4. The challenge, therefore, is how to reverse this situation and create opportunities to attract and train young talents and sustain them to conduct problem-solving research.

In many developing countries there is a strong political will to change and invest more in education and research but they are crippled by debt and globalisation problems.

B. Regional and International Cooperation Strategies

1. Networks of Centres of Excellence in the South

Centres of excellence in education and research in developing countries can jointly play a significant role in uplifting the status of higher education in developing countries, especially in the LDCs.

First, we need to identify these centres (TWNSO/TWAS/South Centre project).

Second, we need to form thematic networks of these centres working in similar fields and provide them with modern communication technologies to facilitate their interaction.

Third, we need to establish comprehensive graduate and postgraduate training programmes at these centres and offer attractive fellowships to talented students to pursue their studies at these centres. The demand for such programmes is very high (example: TWOWS postgraduate training programme)
Fourth, we need to link these networks of centres of excellence in the South with their counterparts in the North and facilitate joint research programmes and exchanges of professionals.

2. Regional Foundations for Higher Education

Joint international action co-sponsored by governments and major development aid organizations, including the World Bank, the regional Banks and UNDP, to establish regional foundations to provide funds to improve the quality of higher education in the developing world.

A foundation for the African region is most needed. It should have a capital fund of about 1 billion US dollars, the income of which could be utilized to improve the infrastructure for research and training in institutions of higher education provide competitive fellowships to talented students to pursue postgraduate research and training at centres of excellence in the South; counteract the brain drain by providing attractive conditions and incentives to leading indigenous scientists and other professionals; facilitate the flow of world-class scientists and other professionals from the North to the South to assist in building local capacities in higher education.

Coopération Nord-Sud - Sud-Sud dans l'enseignement supérieur

Intervention de : Professeur Oumar Sock
Directeur de l'Ecole Supérieur Polytechnique
Université Cheikh Anta Diop
Dakar (Sénégal)

1. La coopération internationale entre établissements d'enseignement supérieur doit permettre l'amélioration des performances de ces établissements dans leurs missions fondamentales de formation et de recherche au service de la communauté.

Pour être efficace, cette coopération doit nécessairement sauvegarder la dimension culturelle, composante essentielle du développement durable. Cet aspect doit être plus particulièrement pris en compte dans les actions de coopération entre les établissements d'enseignement supérieur des pays du Nord et ceux du Sud, car les diversités culturelles, ethniques et linguistiques constituent une des principales richesses de l'humanité.

2. L'atteinte de ces objectifs suppose que la coopération Nord-Sud - Sud-Sud relève d'un véritable partenariat où chacun des acteurs apporte sa contribution, dans le respect mutuel, la loyauté et la solidarité. Ce partenariat constitue un moyen privilégié pour mobiliser toutes les ressources devant permettre aux établissements d'enseignement supérieur de répondre de manière pertinente aux besoins du développement humain durable; il doit concerner aussi bien le secteur public que le secteur privé.

3. La mondialisation et l'extraordinaire progrès des connaissances rendent encore plus nécessaire le renforcement des actions et des moyens de la coopération Nord-Sud - Sud-Sud, avec une attention particulière pour les institutions des pays du Sud, pour leur permettre de participer réellement au développement socio-économique de leurs peuples, par la production, l'acquisition, la maîtrise et l'utilisation des savoirs. C'est là la seule voie susceptible de préserver un monde de paix et de stabilité.

4. Pour vaincre les défis et saisir toutes les opportunités qu'offre la coopération Nord-Sud - Sud-Sud, il est indispensable de faciliter et stimuler les actions suivantes:

- l'accroissement des moyens, financiers notamment, consacrés à cette coopération;
- le développement d'une formation et d'une recherche de qualité dans les pays du Sud;
- la facilitation de la mobilité académique;
- le renforcement de la coopération inter universitaire Sud-Sud, en partenariat avec les institutions du Nord;
- le renforcement des réseaux de chercheurs et de structures existantes et la création de nouveaux réseaux, afin de favoriser le partage et les transferts de savoirs et d'expériences;
- l'introduction des nouvelles technologies de l'information et de la communication dans les institutions du Sud. Ces dernières doivent disposer des infrastructures, des équipements et des compétences pour ***l'utilisation judicieuse*** de ces NTIC, la maintenance et le renouvellement des équipements, la participation effective à la création des contenus et au contrôle de la gestion de ces NTIC; en effet, l'absence de ces NTIC dans les pays du Sud aggraverait très rapidement le déséquilibre entre les pays du Nord et ceux du Sud et accentuerait très nettement la marginalisation de ces derniers; à cet égard, je voudrait vous faire partager une question que je me pose: plusieurs siècles après l'invention de l'imprimerie, il existe encore sur notre planète des centaines de millions d'hommes et de femmes ne sachant ni lire, ni écrire. Comment relever le défi pour que l'usage des NTIC ne soit pas au 21e siècle, au service et sous le contrôle d'une minorité ?

5. Sur tous les éléments de stratégie que je viens de citer pour vaincre les défis et saisir les opportunités qu'offre la coopération Nord-Sud - Sud-Sud, d'importants et louables efforts sont déployés par de nombreux pays et organisations à travers le monde. Ces efforts doivent être poursuivis et renforcés, en essayant autant que possible de corriger les insuffisances décelées.

Je voudrais tout d'abord saluer l'action de l'UNESCO dans ces domaines. L'organisation de cette première Conférence Mondiale sur l'Enseignement Supérieur constitue une éclatante illustration des efforts de L'UNESCO pour l'intensification des échanges entre établissements d'enseignements supérieurs.

6. Qu'il me soit permis, en ma qualité d'universitaire d'un pays d'Afrique Francophone d'une part, mais aussi de membre du Conseil Scientifique de l'Agence Universitaire de la Francophonie, d'autre part, de saluer les actions de l'AUPELF-UREF (Association des Universités Partiellement ou Entièrement de Langue Française - Université des Réseaux d'Expression Française) qui, à travers ses nombreux programmes, mobilise la communauté scientifique francophone sur des objectifs d'excellence et de solidarité. Les Recteurs et Présidents des Universités Francophones d'Afrique Subsaharienne et de l'Océan Indien ont du reste félicité l'AUPELF-UREF pour la qualité de ses programmes et le rôle qu'elle joue dans la régionalisation et l'ouverture à l'international de nos universités, lors de leur réunion de Mars 1998 à Paris.

7. Je voudrais pour terminer, signaler, parmi de nombreuses initiatives de coopération Sud-Sud qui méritent d'être soutenues, celle de la Société Ouest Africaine de Chimie (S.O.A.CHIM.), créée en 1995 à Abidjan et qui regroupe les enseignants et chercheurs en Chimie, Biochimie et Biotechnologie du Bénin, du Burkina Faso, de la Côte-d'Ivoire, de la Guinée (Conakry), du Mali, du Niger, du Sénégal et du Togo. Cette Association organise régulièrement ses Journées annuelles (Abidjan en 1995, Dakar en 1996, Lomé en 1997, Cotonou en 1998, les 5es Journées sont prévues à Niamey en 1999).

Les Journées Annuelles de la SOACHIM connaissent un succès grandissant (123 participants en 1998, provenant de 12 pays, dont la France, le Canada, l'Afrique du Sud, l'Ouganda et la Mauritanie). Le financement de ces journées est principalement assuré par les Etats africains, les universités africaines et les enseignants-chercheurs eux-mêmes. La SOACHIM édite la revue "Journal de la Société Ouest Africaine de Chimie" (4 numéros parus).

Integration of Research Development in Human Culture

Address by : Prof. M.G.K. Menon
India

As we move into the future to relate to the multicultural diversity, we must make fullest use of distance education, continuing education, interdisciplinary education, using the powerful new tools being provided by science and technology, and not necessarily keeping to the institutional frameworks we have created and nurtured so far.

An important aspect would be to increase public understanding of science, particularly to make it intelligible, exciting and show its relevance.

Science and technology are a manifestation of human creativity at the highest level, with profound implications for society. But, as a search for truth, for an understanding of nature and in creating the enormous edifice of knowledge that we have today, it is undoubtedly an intrinsic part of Culture, perhaps a different face of culture on account of its philosophy and method, from that of the art science in its internal functioning is universal but it must derive from the multicultural culture of our global society; it is the latter, which makes human society so productive and so interesting.

Universal Networking: Opportunities and Challenges for Higher Education in the Information Age

Address by: Mrs Heather Eggins
Director
Society for Research into Higher Education
United Kingdom

Mr Chairman,
Colleagues and Fellow Delegates,

In exploring this theme of universal networking, I would like to touch on first, the context in which we all now find ourselves, with some comments on where we are now, and examine the opportunities we are afforded, and the challenges that we in higher education and in government will have to meet.

I. The Context: the Nature of Information and Communication Technologies

There are two particular aspects of the context that 1 would like to mention, within which higher education functions. One view of our society is that a new wave of economic and social activity, associated with profound technological change, is replacing the industrial age. In this paradigm, information and ***communication*** technologies (ICTs) are "the key to bringing in new flexible working practices, ridding, bureaucracy of its numerous dysfunctions, and allowing economies of scope, rather than economies of scale to be achieved". A number of researchers have analysed the impact that the new technologies have had on society. They find on the one hand, the potential for moving towards a more egalitarian society, in which there are hugely expanded opportunities for accessing and exchanging information. But they also find, on the other hand, evidence for the emergence of new social divisions between those who hold much information and those who hold little, the 'information rich and the 'information poor'. They also find some evidence for the use of these technologies as a means of introducing subtle forms of social control.

Yet however one views the effects of the changes in technology there is no doubt that they have impinged on the nature of information and communication in our institutions of government and of higher education. The coming of the personal computer to our institutions has enabled far-reaching changes in working practices to be developed. The combination of computers and telecommunications has brought about new and differing ways of organizing work.

The electronic interchange of data allows faster, more accurate and more efficient flows of data between our institutions, and, within higher education, between academics and students, researchers and funding bodies, university administrators and academic staff.

Two particular characteristics of information and communication technologies are worth mentioning. The first is the ability to produce information which enables the organisation into which it has been introduced to reflect on that information and, as a result, introduce changes.A good example is a university library where the computerised circulation and control systems supply the professional librarians with detailed information on their customers' preferences, use patterns of the books, and requirements. Thus the data generated by the processes of issuing, returning and reserving books can be used to reshape the way libraries handle the books so that they become more efficient in the use of their stock.

The second characteristic is that of communicating and networking information. The networking of information can be used for a range of activities, some of which lead inevitably to control by others. Christine Bellamy and John Taylor in their book on *Governing the Information Age* give four main capabilities of these networks, each of value to the researcher.

1. “Electronic networks can permit the integration of data which are held in different computer files, in different information systems, in different places and, even, in different organizations or jurisdictions” (Hence this is of enormous use to the researcher)

2. “Electronic networks allow for the cross-matching of data, enabling new kinds of information to emerge, information which can significantly extend the "intelligence" possessed by those who have access to such processes." (This is also invaluable to the researcher)

3. “Networking can bestow much more flexibility and precision in the targeting, tailoring and differentiation of information flowing to and from specific groups of businesses, customers or citizens.”

and, finally,

4. " The flexibility and connectivity associated with electronic networks can permit organizations and individuals, alike, to acquire much more autonomy and selectivity in the ways in which they retrieve, disseminate and communicate information."

Each characteristic offers positive benefits to higher education, either in its administrative practice, or its research. The technology though, is essentially 'ambiguous' as a number of authors have dubbed it, in that it simultaneously has the capacity to improve and enrich our environment and also to hold within it tendencies towards the Orwellian control of individuals.

Let me move now to look at

II. Where we are now and what higher education networks we have?

A. Course Delivery

Many of our universities see themselves as global institutions. And the demand to learn is expanding exponentially throughout the world. Equality of opportunity in seeking access to higher education is still far from achieved. Whereas participation at tertiary levels in OECD countries is between 30 and 50 per cent, in non-OECD countries, East Asia and the Pacific Islands it is below 15% and in South Asia around 5%. Sub-Saharan Africa has even lower participation rates.

The World Bank has indicated that by 2025 as many as 150 million individuals will be seeking higher education. Most of the new demand, however, will come from the countries with low incomes where the infrastructure needed to meet that demand will be the least developed. New ways of making education available to these communities need to be found.

Already a number of developments have been established which make use of a learner centred, flexible, technology-driven system of education available throughout the globe. These can be single institutions or partnerships, mergers and consortia. One example of an established body which offers distance learning is Open Learning Australia which acts as a broker to make courses from Australian Universities available to far-flung students in remote locations. It does not itself, though, have their right to grant its own awards.

However, a number of other players are appearing, particularly in the United States of America. Dozens of existing universities are teaching students in distant locations. The University of Maryland's University College teaches 55,000 students world wide and holds degree ceremonies in Maryland, Heidelberg, Tokyo, Okinawa, Seoul, Schwabisch Gmund, Irkutsk and Vladivostok.

The UK's Open University established in 1971 has registered some 2.5 million students, with 168,000 current students. It offers courses in Europe, including Eastern Europe, the Far East and has partnerships with a number of universities including, in the US, Florida State, Colorado State University Campuses and Western Governors'University.

One of the most interesting new developments is the opening this year of the Western Governors' University whose founders include seventeen governors and fourteen business partners'. Among these are IBM, Sun, AT&T, KPMG, Cisco, 3COM, Microsoft and International Thomson. Its aim is to act as broker within the higher education market, working on the principles of 'partnership' and competition'. It won't itself employ teachers, or develop courses: instead its academic content will be drawn from a range of national and international providers. Its courses will come from universities, corporations and publishers. Everything will be delivered on-line, and it plans to have 95000 students within ten years.

The phenomenon of virtual universities is appearing fast on the scene: California Virtual University, Penn State, the University of Nebraska, New York University and Boston University and Duke University all have plans afoot. The US Department of Education noted in 1995 that over half of all higher education institutions offered or planned to offer distance education courses.

A new development is the growth of degree providers who are in the private, 'for-profit' sector. Most are based in the US and include the University of Phoenix which has 48000 degree-credit students at 57 learning centres in 12 states: it offers an on-line campus and

specialises in particular areas at the BA completion and master's decree levels, especially in business, IT and teacher education. The DeVry Institute of Technology in Chicago enrols 48000 students in business and technical programmes on 15 campuses in the US and Canada.Many other businesses proliferate such as Sylvan Learning Systems and, with MCI, the Caliber Learning Network. This offers professional education nationwide, which consists of high quality courses (degrees and courses from universities such as John Hopkins, Berkeley, and MIT).

The Internet offers indexing services for enquirers. CASO's Internet University holds information on 2440 courses, the Global Network Academy lists 10,000 on-line courses. Both the Universities of North Carolina and Houston carry extensive lists on their websites.

A new industry is developing to meet the needs of those who wish to deliver courses using new technology. World Space, of Washington DC is creating a global satellite-digital radio network, which will be an invaluable resource for Third World students. IBM Global Campus offers for sale a range of products including Lotus Notes and Learning Space which are tailored to the needs of distance learning. Convene International, of San Francisco, and Microsoft have developed an Exchange Server-based distance learning system for universities. Several new industry ventures in the States are likely to develop into virtual universities - an example is Knowledge Universe which has involvement from Oracle and TCI, a cable company, and is poised to offer on-line courses.

The explosion of distance learning programmes is very marked within industry, some of which threaten university provision. Kaiser Permanente, in the U.S. health field, offers on 300 distance learning sites, bachelor's and master's degrees for nurses and continuing education for doctors.

One vision for the future propounded by Ted Marchese, vice president of the American Association for Higher Education is that the inherently global nature of distance education will lead to the establishment of major international combines. He asks "What would the postsecondary marketplace look like if (say) Microsoft Deutsche Telekom, International Thomson and the University of California combined to offer UC courses and degrees world wide. In time, its only competitor could be a combine of like standing and deep pockets: an IBM-Elsevier-NEC-Oxford combine, for example."

B. Research

International networks for mutual cooperation and benefit in relation to university projects have been lone, established. Hans van Ginkel noted that there are four types of inter-university networks:

1. The Associations and Learned Societies - These include formal consortia of universities such as the Council of European Rectors, and the many international learned societies such as my own, The Society for Research into Higher Education. Information is disseminated through professional groups who are able to reflect on and evaluate new developments which affect the universities. Research based networks can also provide a forum for initiating further collaborative projects.

2. Inter university Cooperation Projects, Joint European Projects - Small international research networks frequently develop, often stimulated by European Union financing. These carry out research on a particular topic over a certain period of time. They often continue to function after the research grant is finished, and are run by the researchers themselves. Major European Union programmes such as Erasmus and Tempus also fit into this grouping. Usually they are organised as discipline -orientated networks and are most likely to continue after the project has ended if their members can continue to meet under the aegis of a discipline based learned society.

3. Partnership with others Bodies -An example of such partnerships was the European Union Comett Programme which involved universities and business enterprises through a regional framework. Although that programme has ended, similar examples of international industry/university networks can be found.

4. Institutional Networks - These have developed notably over the last decade with universities in one country seeking links with others, sometimes with a view to establishing student mobility arrangements, joint research initiatives, and academic staff exchange. The networks frequently deal with mobility, information, exchange, lobbying and putting in tenders. Examples are the Coimbra Group, the Santander Group and the Utrecht Network.

Establishing links with other universities offers several advantages: not least the ability to focus a university's attention on the areas in which it excels and to find companion universities to provide strength in other fields.

The organisation of networks can vary considerably. Networks, after all, are essentially complex systems which function within their own political and social environment. Some can be informed groups, with loosely attached participants, open to all who wish to join. Others can be formal, closed organisations with legal status such as joint ventures and strategic alliances.

The concept of strategic alliances has much to recommend it. Hans van Ginkel argued that he had found at Utrecht, where he then worked, that the strategic alliance created a stronger commitment among all parties. He gave an example of Utrecht University's alliance with two international pharmaceutical companies, Glaxo-Wellcome and Solvay-Duphar. Together they had agreed on long term objectives, commitment, mutual investments. quality of processes and on how to make an exit. The combination of the companies' international ambitions in the biomedical sciences and the research capacity of the university had made several research institutes within the university's biomedical cluster among the best in the world.

III. The Opportunities and Challenges Offered by International Networking

Already there is sufficient evidence that international networking in higher education has much to recommend it. The established ways of working can be strengthened, and made more efficient and effective by making use of the information and communication technologies available.

Research

Research groups have historically crossed national boundaries and will continue to do so. The world is very clearly, in 1998, an interdependent global village. Partnerships, collaborative research projects and strategic alliances can be viewed as a means of maximising the investment in human talent and equipment that each university can provide.

The challenge is to universities and to corporations to recognise the opportunities and seek to develop them, to think, if you like, globally.

The challenge is to governments, to encourage their higher education institutions to set up such international alliances, and to find a formula, whereby a national government can support international shared research initiatives. The European Union has shown how research monies can spawn international networks very successfully. The problem of the national basis of research funding needs to be tackled.

UNESCO itself and the UN University might consider how best they might engender such networks.

a) Focussed Networks

The opportunity to establish world wide common interest networks lies within our immediate grasp. These could be established by UNESCO setting up a data bank of disciplinary professional groups and encouraging them to work together in providing support for those groups in Third World countries who might wish to draw on their expertise.

Networks on specific aspects of higher education - eg. access, funding, quality, postgraduate education- such as those offered by SRHE, could be supported by UNESCO or run jointly with the UN University. The research base of those could be a valuable means of bringing new knowledge into an international networked community which could evaluate it, discuss it using electronic means, and disseminate it to interested parties.

b) Course Delivery

The delivery of courses globally offers great opportunities for those in the under-developed countries who yearn for higher education. The opportunity is already beginning to be grasped. The School of African and Oriental Studies, University of London, has collaborative agreements for its postgraduate programmes in Economics with institutions in

Mozambique, Namibia, Vietnam, Zambia, Singapore, South Africa and Hone Kong. Students are funded in different ways. In developing countries, aid donors such as the Swedish International Development Agency, the Ford Foundation and the World Bank have been the principal source of financial support, with some commercial sponsorship. This provides a model which can be further developed, as appropriate.

The challenges are several. A major one, primarily to the delivering body, is that of quality of course and the related question of the maintenance of standards and delivery. While national governments can and do have their higher education courses, there is a challenge to consortia to accredit their courses and to UNESCO to consider how best accreditation of degree courses, which are and will certainly become worldwide can be organised. The spectre of low standard degrees sold for profit over the web must be avoided at all costs. Neither the governments of the provider countries, the governments of the students' countries, the future employers of those students nor the students themselves will be well served by poor quality courseware and low standards of degree equivalence being offered.

The most important challenge, though, for this UNESCO conference is the widening gap between the haves and have-nots. Internet connections are globally increasing, with 128 million users to date. Yet over a third of the world's population live in countries that are still not connected to the Net, and where email is available only in a restricted service. The telephone is the primary source for basic improvement but even that is not easily accessed everywhere.

The demand for higher education in the under developed countries will continue to grow. The challenge to higher education in the developed countries is to meet that demand by preparing good quality on line courses and distance learning courses tailored to the means at the disposal of the low income country in question, using radio, cassettes, telephone, and providing proper student support. Students in the Middle East and Asia, and particularly women who can be culturally uneasy about the Western classroom, appreciate the opportunities offered by immediate access to on line courses and the virtual class discussion with other students and teachers that can be offered. Many, indeed, find this more interactive and in-depth than the level achieved in a physical classroom.

c) A New Mind Set

The challenge for governments and for higher education is to develop a new mind set.

To recognise, in the words of Sa'ad Medhat, Director of Dubai Polytechnic, United Arab Emirates, that "Online learning is the future of academia". There is a huge opportunity waiting to be grasped. If the universities cannot rise to it, the new corporations of telecommunications industries, publishers, software companies, and powerful brand name universities are poised to move in. But however the problem is approached, the necessity is to meet the educational needs of the millions who are capable of and wish to pursue a higher education.

The role of UNESCO is to pursue that goal, gather information, act as support and help to push hard at a door which is already opening

References

Christine Bellamy and John A Taylor Governing in the InformationAge Open University Press, Buckingham, 1998
D Bell The coming of post-industrial society: A venture in social forecasting Basic Books, New York 1973
S Nora and A Minc The computerization of society. A report to the President of France MIT Press, Cambridge MA, 1980
A.Toffler The Third Wave William Morrow, New York, 1980
A.Toffler Power Shift Bantam Books, New York, 1990
D.Lyon The Information Society: Issues and Illusions Polity Press, Cambridge. 1988
I Miles The Information Society: Competing Perspectives on the Social and Economic Implications of ICTs' in W H Dutton (ed) Information and Communication Technologies: Visions and Realities Oxford University Press, Oxford, 1988
S Zuboff In the Age of the Smart Machine. The Future of Work and Power Heinemann, Oxford, 1988
M Castells The Rise of the Network Society. Economy. Society and Culture Blackwell, Oxford, 1996
Anon *Higher Education: The Lessons of Experience*, The World Bank, Washington DC, 1994
Gajaraj *D*hanarajan, a speech given at the British Council/IDP Education Australia Colloquium on Universities in the Twenty First Century, Singapore, 1996
Ted Marchese'Not-so-distant Competitors. *How New Providers* are remaking the Postsecondary Marketplace' AAHE Bulletin, May 1998, Volume 50, Number 9, pp3-7 Washington DC
Hans van Ginkel, Karel van Rosmalen, and Jeroen Torenbeek, 'On *Networking and Strategic Alliances*: *Dynamic Patterns of Organisation and Cooperation', keynote* address to CRE's Bi-annual conference, Olomouc, October 1996
Sa'ad Medhat, 'Educating in a digital future', The Times Higher Educational Supplement, September 11, 1998

The author wishes to thank the many colleagues with whom she has had discussions in relation to this talk including Ted Marchese, Philip Altbach, Elaine El Khawas, Leslie Mapp, Sarah Turpin, Alison Johnson, Steven Gilbert and Stephen Ehrmann, Dick McCray, Bruce Henderson, Terence Karran, and Robin Middlehurst.

Influence of the News Media on Research

Address by: Prof. Maxwell McCombs
University of Texas at Austin
USA

The rush and excitement of the daily news might at first seem far removed from the more measured pace and long-term commitments of scholarly research in the libraries and laboratories of the university. But any conclusion that the news media have little or no influence on scholarly research would be incorrect.

Newspapers and television can have very powerful and direct effects on the research agenda of the academy. Daily decisions by news organizations about which topics to emphasize, which topics to mention only in passing, and which topics to ignore result in significant influence among three important groups:

- First, government officials, both those elected representatives and career public officials whose priorities and budget decisions determine the level of funding from public money for various types of research.

- Second, the general public, or at least the active, informed portion of the public, whose support or lack of support, is the essential backdrop in democratic societies for public funding of various kinds of research.

- Third, researchers themselves, the foot soldiers who actually do the research and who make most of the strategic and tactical decisions about where and how to proceed with any line of scholarly and scientific inquiry.

Even modest media influence among these three groups can result in significant influence on the research agenda. And sometimes the influence of the news media is considerably more than modest.

In the United States, the New York Times "discovered" the drug problem in 1985 and assigned a reporter to cover drugs full time. Late that fall, the Times published its initial front-page story on crack, a new form of inexpensive cocaine just beginning to flood the country. That front-page story and its follow-up pieces in early 1986 catapulted drugs to the top of the news agenda. There were stories in major newspapers across the United States, a cover story in Newsweek, and TV specials about drugs on two of the national networks. Public opinion polls reflected heightened public concern about drugs, and Congress responded quickly. In just a matter of weeks, Congress wrote and passed anti-drug legislation backed by $1.7 billion in funding. That is major influence by the news media on public funding.

How we are influenced by the News Media?

The news media exert great influence on the focus of attention in a society. Not only do government officials, researchers and the public learn factual information about the world around them from the news media, people also learn how much importance to attach to a topic from the emphasis placed on it in news coverage. In other words, the news media can set the agenda of attention and lay the groundwork for public and elite opinion.

The principal outlines of this influence were sketched many years ago by Walter Lippmann, who began his seminal book, Public Opinion, with a chapter titled, "The World Outside and the Pictures in Our Heads." His eloquently argued thesis is that the news media are a primary source of the pictures in our heads about that vast external world that is "out of reach, out of sight, out of mind."

Lippmann's intellectual offspring, the concept of agenda setting, is a detailed program of social science research about the contribution of contemporary mass communication to those pictures in our heads. The core idea is that elements prominent in the media pictures of the world become prominent in the audience's pictures of the world. The salience of items in the news influences the salience of these items among the audience. In the words of the agenda setting metaphor, this is a causal assertion that the priorities of elements on the media agenda influence the priorities of the audience agenda. Over time, elements emphasized on the media agenda come to be regarded as important on the audience agenda.

Theoretically, these agendas could be composed of any set of elements. In practice, the vast majority of the empirical investigations to date have examined an agenda composed of public issues. In these studies the central finding is that the degree of emphasis placed on topics by the news media influences the priority accorded those topics by the audience. This influence of the news agenda on the audience agenda has been supported in more than 300 empirical investigations worldwide.

When we consider the key term of this social science metaphor, the agenda, in totally abstract terms, the potential for expanding beyond an agenda limited to topics in the news becomes clear. In most of the evidence to date on the agenda setting influence of the news media, the items on each agenda are objects, specifically public issues in the news. However, public issues are not the only objects that can be examined from the agenda setting perspective. The interests of scholars and researchers include many different kinds of objects.

Beyond the agenda of objects there also is another aspect to consider. Each of these objects has numerous attributes, those characteristics and properties that fill out the picture of each object. Just as objects vary in salience, in prominence, so do the attributes of these objects. Both the selection of objects for attention and the selection of attributes for describing these objects are powerful agenda setting roles. An important part of the news agenda and its set of objects are the perspectives and frames that journalists and, subsequently, members of the audience employ to think about and talk about each object. These perspectives and frames draw attention to certain attributes and away from others.

These two levels of the agenda setting influence of the news media, especially this ability to frame topics in certain ways, was at the center of a recent controversy in the United States about the priorities for public funding in health research. Aggressive tactics of those concerned about AIDS had created substantial news coverage about what were essentially political events. Some critics, both among researchers and public officials, contended that this had resulted in the funding of AIDS research at a disproportionately high level when compared with heart disease or cancer, which affect far greater numbers of people.

There is no question that the news media did put AIDS on the public agenda in the United States and high on the health research agenda of those government officials who determine research policy and funding priorities. The controversy concerned only the correctness of their behavior, not whether their agenda had been influenced. It had been!

How news frames for particular topics impact the audience agenda is the second level of agenda setting influence. The first level is, of course, the transmission of object salience. The second level is the transmission of attribute salience. Distinguishing the idea of agenda setting from previous ideas about the effects of mass communication on attitudes and opinions, social scientists have noted that while the mass media may not tell us what to think, the media are stunningly successful in telling us what to think about. Explicit attention to attribute agenda setting further suggests that the media sometimes do tell us how to think about some topics.

Basic and Applied Research

Both the first and second levels of the agenda-setting influence of the news media are more likely to suggest applied rather than basic research priorities. The topics in the news - - and the way that they are framed - - emphasize specific problems and needs facing a society. Even among those with little explicit concern about the influence of mass communication, there are now regular warnings that too much time is being devoted to practical problems, all to the detriment of expanding our basic understanding of the world. In the traditional view of university research, the priority belongs to basic research. It is basic research that creates the foundations of knowledge on which practical applications later come to be built. The examples supporting this traditional view are, of course, legion.

But research can be a two-way street. Applied work of almost any sort can lead to the expansion and elaboration of existing theories or even to new theories, if - - and this is a very important if - - these practical situations are approached from a theoretical perspective. By a theoretical perspective, I mean an intellectual desire to see beyond the immediate practical situation at hand and a desire to map the general principles that underlie this practical question of the moment. The key in the training and socialization of researchers is to stress the importance of a theoretical perspective in approaching even the most mundane practical problem.

The education of researchers necessarily must ground them in the theories that represent our best contemporary knowledge during their time spent in the university to earn a degree. But, more importantly, their education must instill an appreciation of theory as the ultimate goal of research because that is the spirit that will last an entire career. Most of the specific theories learned in graduate school will fade away in the course of a professional lifetime. But the desire to build theory can successfully drive an entire research career.

Building this intellectual component into the training of researchers is especially important because of the immense and building pressures on universities everywhere to expand their contacts with the world of commerce and government. Much of this pressure is financial. To quote our chairman:

> *" inadequate funding, together with the need to generate additional income from other sources, has led the university and its researchers to move towards applied research.. This has been at the expense of basic research -- research motivated by man's innate -- curiosity -- which has always been a primary mission of any higher education institution".*

In short, it is increasingly the case that universities cannot eschew applied research. But, to repeat my previous point, the fundamental mission of the university, the creation of new basic knowledge, can continue to advance if this applied research is approached from a theoretical perspective. Here are two historical examples from my field, communication. There are, of course, dozens of such examples in other university disciplines.

Example 1: The Diffusion of Innovation. Studies of the role of communication, both the patterns of mass communication and personal communication, that are involved in the spread of new ideas and new technologies began in a highly practical setting, farming. Much of the success of U.S. agriculture is a result of biological success in the development of new types of seeds, and chemical success in the development of new types of fertilizers. But scientific successes must be put into play by thousands of individual farmers in order to change a nation's level of productivity. Understanding and describing the communication strategies that resulted in the adoption of these scientific developments by individual farmers was the origin of diffusion theory. Now decades later, the principles of this theory have again been put to practical use, to enhance the growth and expansion of the computer industry in California's Silicon Valley and in Austin, Texas.

Example 2: Carl Hovland's Scientific Rhetoric. Carl Hovland was a Yale University experimental psychologist who found himself during World War II serving in the U.S. Army. Although armies with large numbers of conscripts often are accused of attempting to put round pegs into square holes, this was not the case with

Hovland. He was assigned a task for which he was well qualified, the evaluation of a series of Army films, "Why We Fight," that were designed to inform and motivate the troops regarding the goals of the war. This was an imminently practical assignment.

To take one example from these films, it was the official estimate of the United States War Department that once the fighting ended in Europe, it would be necessary to transfer most, if not all of these armies to the Pacific Theater in order to successfully conclude the war there. In contrast, it was a widely held view among American soldiers in Europe that once victory was achieved there, they would go home and return to civilian life. Now there is a highly practical problem to deal with! Hovland could, of course, have approached his task with exactly that practical question in mind. Did the film on this topic offer convincing arguments about the duration of the war in the Pacific and the necessity to transfer large numbers of troops to that theater? And he could have approached other films in the "Why We Fight?" series from a similar practical perspective. But he did not limit his research for the Army to the practical questions immediately at hand. Rather, Hovland saw this as an opportunity to build a scientific theory about persuasive communication. His studies were designed to test the effectiveness of various rhetorical devices, such as one-sided arguments versus two-sided arguments, in changing people's attitudes. The practical messages of the films and the practical questions to which the Army wanted answers became, in the language of social science, the operational definitions of theoretical concepts.

The Army received the practical information that it needed. But, more importantly, this program of research and its continuation at Yale University after the war produced an influential series of books that are the foundations of the theory of scientific rhetoric, an area of scholarly research whose empirical studies now number in the thousands.

Varied Origins of Research

Good basic research can have many origins, and many of these origins are far removed from the formal stereotypes of how scientists and scholars work. What is essential for good research is a strong sense of curiosity and the tenacity to pursue a theoretical line of inquiry.

When I was a graduate student at Stanford University in Palo Alto, California many years ago, a member of the physics faculty won the Nobel Prize for his research on the nature of matter. Asked about the origins of his program research, the professor attributed it to a combination of the weather and curiosity. One warm spring afternoon in Palo Alto he stepped out on his deck and opened a cold bottle of beer. And what he observed was what all of us have observed hundreds of times. “When you open a bottle of beer, dozens of bubbles rise to the top of the bottle and create a head of foam”. Nothing remarkable in the replication of that observation on a spring afternoon in California. But add scientific curiosity about why bubbles do rise to the top, some knowledge of theory and research about the nature of matter, and you have the beginnings of a major research program.

Let me add a personal example. The area of research with which my name is most frequently associated around the world is the agenda-setting role of the mass media. Indeed, that is my topic here today. While my writings on this subject cite Walter Lippmann's classic book on public opinion and even Plato's allegory of the cave, those intellectual origins of the theory of agenda setting are only part of the story. The immediate impetus for this line of inquiry was a sense of curiosity about the play of three news stories one day in the Los Angeles Times. Any one of the three could have been the lead story in the newspaper that day, the subject of a large headline, if it had been the only story available to the editors. But there were three! What I wondered happened to the impact of the two stories that ended up at the bottom of the front page with very small one-column headlines? Could it be that the emphasis a topic receives in the news influences the public's perceptions of what is important and what is unimportant. That was the beginning of the research on the agenda-setting role of the news media.

In short, the immediate origins of programs of research in the university are quite varied and often highly personal. Increasingly, as our chairman has observed:

"While early scholars saw the function of higher education as pursuit of knowledge for its own sake, today's researchers see it as going beyond that to include applying such knowledge in order to enhance, directly or indirectly, the material well-being, happiness and comfort of mankind."

Topics in the news can be a key source of ideas for research, especially news about the problems and needs of society that suggests particular applications of each individual researcher's area of interest and expertise. Thoughtful, careful work on these topics can contribute both to basic research and to the improvement of mankind.