UNITED NATIONS

ECONOMIC and SOCIAL COUNCIL

Distr.
GENERAL

E/CN.14/543
14 December 1971

Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA

SCIENCE AND MASS MEDIA I

Report of the Kampala Seminar on Science and Mass Media
Kampala, 23-27 November, 1970

M71-2657

C O N T E N T S

PART I - REPORT OF SEMINAR

PART II - PAPERS DISCUSSED DURING SEMINAR

Part I. REPORT OF THE SEMINAR

INTRODUCTION

The seminar on Science and Mass Media was held at the Institute of Public Administration in Kampala from 23 - 27 November, 1970. It was sponsored by the Ministry of Information, Broadcasting and Tourism of the Republic of Uganda, in conjunction with the German Foundation for Developing Countries and the United Nations Economic Commission for Africa.

This seminar is a follow-up of a similar one held in Berlin in 1968. That seminar which was attended by representatives from English-speaking African countries considered, among other things, the promotion of the application of science and technology for development in Africa, and it was considered that one of the priority areas in this field was the creation of an informed public on science and technology and on their application to development.

The Kampala seminar had an additional objective namely to bring together scientists, technologists and mass media operators to consider in what ways these groups might co-operate to promote the popularization of science and technology.

Participants came from Uganda, Kenya and Tanzania. Their names together with those of the organizers are given in the annexes to this report.

OPENING CEREMONY

The opening ceremony started at 2.30 p.m. on Monday 23 November, 1970 with a short address of welcome by Mr. J. Kihika, Chairman of the Seminar Committee. The Honourable Alex Ojera, Minister of Information, Broadcasting and Tourism then delivered the opening speech. He stressed among other things the need for co-operative effort by mass media operators, scientists, technologists and other groups in bringing the fruits of science and technology in development to the common man.

His speech was followed by addresses delivered by Mr. R. Kraetsch, of the German Foundation for Developing Countries and Dr. A. Banjo, of the United Nations Economic Commission for Africa.

AGENDA AND ORGANIZATION

The agenda adopted for the meeting is contained in Annex I. The seminar was organized in the form of sessions at which lecturers presented papers on a number of topics on the agenda. Each presentation was then followed by questions and discussions. The third day of the seminar was devoted entirely to outside visits. The detailed programme is given in Annex II.

SUMMARY OF DISCUSSIONS

The role of science and technology in development

In considering this topic, there was a lot of discussion on the need to relate science and technology to the development needs and programmes of the African countries. It was noted that the role of science and technology in development could be considered under two aspects.

The first aspect was that of enabling Governments to select the desired future when they are formulating their development plans. Knowledge of the possibilities of the technology available would enable decision-makers to know the various kinds of social and material changes that were possible. Furthermore, through this knowledge, they would be able to know in advance the probable social and economic consequences which might arise in their countries as a result of the changes they have chosen to bring about.

The second aspect of the role of science and technology in development was that of implementation. Once the programmes to be included in a development plan had been selected, technology was required for the implementation of the projects making up the programmes. It was therefore necessary for development plans to include provision for obtaining and using the technological inputs necessary for their implementation. The available technology will, in all cases, constitute a constraint on the implementation of the projects in the plan.

It was noted that African countries would, for some time to come, have to import technology and in doing this they required to be constantly aware that most of this technology was originally designed to suit situations in temperate countries. Furthermore the adoption of this imported technology might work against the existing traditions and cultures. In this respect it was inevitable that certain cultural changes are bound to take place as an inevitable consequence arising out of the adoption of imported technology.

Scientific journalism

The discussions which had gone on earlier had stressed the importance of science and technology in the formulation and implementation of development plans which were aimed at changing the material and social circumstances of African countries. Arising out of this role of science and technology, it was emphasized that information on science and technology was no longer a matter for the experts alone, but also for the people in general. In this regard, scientific journalism had an important role to play in deploying mass media to bring information on science and technology to the general populace.

The objectives of scientific journalism directed to the ordinary people are summarized as follows:

(i) To provide general education and information about the methods of science;

(ii) To provide general information about scientific phenomena and to answer to the need of people generally to know "how things work";

(iii) To tell the public about advances in technology and to keep the interest of the public alive in its progress by interpreting the significance of new developments;

(iv) To promote discussion about the ways in which science and technology are used and to draw attention to any welfare or ethical implications of such uses;

(v) To explain to the ordinary people the science and technology which are going to be utilized in implementing national development plans.

The seminar then considered the various problems which would attend the development of scientific journalism.

With regard to communication between scientists and journalists, it was emphasized that it is necessary for the science journalist to understand fully some of the general attitudes of specialists in the scientific field so as to enable him to adopt an appropriate approach while seeking information from them.

The question of the interest of the owners of the press was raised as it was pointed out that science news and features were not likely to appeal to readers and sell newspapers in the same way as news and features on political or social events. Newspaper publishers will need to be convinced that science journalism would also be profitable. It was however pointed out that science news and features, if well presented could make attractive reading. It was the duty of a good science journalist to present his articles in such a manner that they caught the eye of the reader and were simple enough to be understood by the ordinary person.

On the question of training journalists, it was agreed that existing training programmes did not give sufficient emphasis to scientific journalism. Governments should be requested to support the training of scientific journalists within the context of the new courses and institutions which are planned for the training of journalists.

The question of sources of science news required particular attention in Africa. Besides obtaining news and information directly from the scientists and technologists, there were many public bodies, scientific organizations, and technical firms in developed countries which produce, regularly, information of scientific interest which could be source materials for the scientific writer. In addition there were a number of journals which

RESOLUTIONS

Resolution 1

The Kampala Seminar on Science and Mass Media, recognizing that knowledge of modern technologies is one of the basic requirements for the implementation of development plans in all developing countries,

Recommends,

(i) that all development plans take into account the technological implications of implementing them;

(ii) that African Governments provide publicity campaigns to inform the people about the social effects of these new technologies;

(iii) that the teaching of science and technology in schools at primary and secondary levels be encouraged by African Governments so that African children may be prepared to meet the ever-increasing demands of technological society.

Resolution 2

The Kampala Seminar on Science and Mass Media,

Recognizing the importance of creating an informed public on the use of science and technology as instruments for the implementation of planned change;

Aware of the need to build a basis of technology for our evolving cultures,

Aware of the great potential of scientific journalism in promoting these objectives,

Recommends,

(i) that African journalists give increased attention to science writing directed to bring information to the people about the use of science and technology in changing the human environment, in increasing production and in making life less arduous and more pleasant;

(ii) that mass media operators (i.e., newspaper publishers and editors, sound radio and TV directors and programmers) should allocate resources within their organizations towards the establishment of regular columns and programmes for science news and features so as to:

(a) provide general education and information about the methods of science;

(b) provide general information about scientific developments that will affect the daily life of the ordinary citizen;

(c) to interpret the progress of technology and its applications;

(d) to explain the scientific or technological bases of the country's development programmes;

(iii) that, in order to facilitate the development of manpower that will be required for the technological evolution of the nation, mass media should undertake programmes directed to promote and maintain interest amongst school children and young people, so that they will be motivated to pursue careers in science and technology;

(iv) that the science and engineering community should work in closer co-operation with the mass media community in order to assist journalists in their work of bringing science and technology to the people;

(v) that African Governments give scientists, engineers and other technologists working in government establishments and parastatal bodies greater freedom to speak to the press on the progress of their work;

(vi) that more formal training and adequately organized and equipped institutions are required to provide part-time and refresher courses for existing journalists who wish to prepare themselves to participate effectively in this new field, and to produce the future generation of journalists who will be able to cope with the increased demand for scientific information;

(vii) that establishments such as universities, Government Ministries, research institutions and libraries should strengthen their facilities for providing literature and materials on scientific and technological developments as a source for mass media programmes in science and technology;

(viii) that journalists should make themselves familiar with the activities of the scientific and technological establishments in their countries by regular visits to these establishments and by holding meetings with their professional colleagues in these establishments;

(ix) that the three East African Governments should introduce or strengthen the teaching of journalism at university level.

PART II. PAPERS DISCUSSED DURING SEMINAR

1. THE ROLE OF SCIENCE AND TECHNOLOGY IN DEVELOPMENT

Introduction

The widespread adoption of development planning is based on the belief that it is possible to foresee and estimate the magnitude of the future needs of a society and, through appropriate and timely planning, to provide for those needs through the implementation of measures and projects. There are many assumptions tacitly implied in this belief, but perhaps the most far-reaching assumption is that when we have determined the needs and been able to define the measures and the projects necessary to satisy them, we shall know how to implement them. "How to?" is perhaps the most fundamental question facing all developing countries.

Unfortunately, the question "how to?" is one that is usually left unanswered ani often not even posed in the statement of objectives, targets and programmes usually contained in African development plans. One of the unrecognized but often unwarranted assumptions made by the development planners in our countries is that "how to implement" the measures and the projects which are envisaged in the various 5 to 6 year development plans which they assemble can be taken for granted.

The record of all the unachieved projects in the development programmes, of many African countries can be liberally annotated with the unanswered question "how to?" written against most of the failures.

What is in a development plan?

The essential objectives of a development plan relate to required changes in the behaviour of people, in the organization of social and economic life, changes in the features of the physical environment relevant to the pursuit of human patterns of living and changes in the production and distribution of goods and services.

The problems which arise in the contrivance of changes in the behaviour of people are problems such as motivating people to want the changes considered desirable, dealing with the obstacles usually cultural but in some cases also structural which impede changes in behaviour patterns. There is also the problem of predicting the final patterns of behaviour in relation not only to those aspects in which change is required but also to aspects of behaviour in which changes are not required within the community.

A great many failures in the achievement of development objectives can be traced to the fact that the people who are to be benefitted do not take readily to the changes planned for them and often cannot see the connection between the changes requested in their behaviour patterns and other desirable objectives that they may support.

While changes in the behaviour of people are often not explicitly defined within most development plans, the changes required in the organization of social and economic life are usually more clearly set out and in greater detail. Such changes often relate to subjects such as where people will live and where they will work, the length of working periods in relation to leisure periods, the uses of leisure, relations to Government particularly in the contribution through taxation and other fiscal measures to the running of Government, the kinds of services which should be provided collectively by Government or by individuals; the levels of consumption and saving and such fundamental matters as the provision of education, the provision of housing and of health services to individuals in the community. Changes in the organization of the social and economic life touch everybody very closely. Some of them only require changes in the thinking and ideals of individuals, others require the creation of legislation to define new relationships and yet other changes require the provision of new physical facilities and new economic resources to the individual. How to bring about such changes can often make or wreck a development plan.

By far the changes which most people are aware of and are able to appreciate in advance are the changes to features of the environment which are relevant to human patterns of living. Such changes may be in the provision of means of transportation such as roads, railways, air transportation and shipping. In addition to providing the networks for these modes of transportation which usually involve large-scale projects of physical alternations and construction, there is also the need to provide the transportation means appropriate for these different networks. Examples of these are the motive power and rolling stock required for railways, cars and other types of road vehicles, different kinds of passenger and freight aircraft and different types of shipping for both inland waterways and sea transport.

We often assume that all the problems of providing the necessary networks and the various means of transportation have been solved in the advanced countries and are available just by direct purchase. Very often because the physical characteristics of the environment in a developing country are unique in one way or the other, or may present problems not already encountered elsewhere, the procedures for bringing about the changes which are required to provide the networks of transportation and sometimes the transportation material cannot be simply transferred from an advanced country to a developing one without modification. The same situation can arise in the provision of the many different modes and means of telecommunications which are required to promote or underpin development.

The most varied area of provision of objectives and plans for development is in respect of the production of goods and services. In agriculture, we may want to increase the quantities of production of agricultural foods and other materials; in many plans for agricultural development projects are envisaged for improvement of the quality of existing crops and livestock and almost as frequently for the introduction of new species of crops and livestock to fill any gaps in existing traditional patterns of production.

In industry, the plans usually provide for the local production of a considerable number of goods that are imported from foreign countries and in particular provide for such production to be based on the utilization of local natural resources. This implies that projects must be carried out for the discovery and exploitation of natural resources occurring in the country. A programme for industries based on local natural resources usually involves, in addition to the processing of agricultural products, the prospecting for, the mining and the extraction of many minerals and metals which form the raw materials for industrial production. Most mineral resources occur in conditions that are almost unique and vary from country to country or, even within the same country, from one area to another. Sometimes the minerals occur in combinations that may vary in composition from those existing elsewhere. Consequently the very problems of locating and extracting them constitute new problems that have to be solved before any plans for their utilization can be implemented.

Even though techniques exist already elsewhere for the production of particular goods and services, the availability of capital for investment, the need to provide employment and to satisfy other economic and social requirements in the organization of production may require that production itself be carried out in a different way from what might be the practice elsewhere. These are some of the typical problems arising from the objectives and the types of programmes that go up to make a development plan.

"How to" is technology

In general, how to do something is the technology of that activity. In order to avoid the extension of a definition as wide as this to categories that are not intended, it is necessary to delimit the scope of the definition. One important characteristic of technology is that it is oriented to a purpose. It must be man-directed. Phenomena or changes that occur naturally as part of the properties or functions of living or inert matter cannot be included: but when man learns how to induce such phenomena or changes in order to achieve desired purposes or ends, that is technology.

As such, technology will include techniques, procedures and methods for manipulating or treating inert and living matter so as to achieve desired objectives. When a maize plant grows, that is a natural phenomenon. When we find out how and why it grows, this is science. However, when we use this knowledge to grow maize when and where we want, or to change its manner of growing, or its form, that is technology. Much of technology is of this origin. We first have to discover the properties and behaviour of the type of matter we are interested in, that is, the science of that domain. On the basis of the science we can now derive methods for consciously interferring with the properties and behaviour so as to produce desired states and transformations. What I am trying to explain here is the experience that much of technology is based on science.

Nevertheless, there is a large body of technology which is empirical. That is to say that the techniques and manipulations which we need to alter matter or to reproduce desired phenomena have been derived from trial and error, and as a result of long experience of "trying ideas out" by people who have been working in specific domains. This is not to say that there are no scientific principles behind such technology but that for the moment we know what to do, but not why it works! Most technology originated in this empirical way, but later on the scientific principles underlining them were discovered and demonstrated. In modern times the expansion of scientific knowledge has been specially rapid and technology based on science is now our usual experience.

Utilizing technology for development

Coming back to the subject of development, we can easily cite examples of the ways by which technology enables us to prosecute our objectives and plans. All development plans usually provide for increases in production. Such increases may be in the production of foodstuffs, or fibres of plant origin. To achieve the increases in crop production necessary to attain this objective requires the acquistion and utilization of suitable agricultural technology. In crop production, such technology will deal with the introduction of improved, and in some cases, mechanized methods of cultivation, improved varieties of seed, and the use of fertilizers and irrigation where necessary. Production will also be increased by suitable crop production measures to prevent the depredations of pests and plant diseases. When the crop is full grown, appropriate methods of harvesting and storage will have to be introduced to reduce spoilage during harvesting and further losses through deterioration between harvesting and the final point of sale. Technology is also required for the transformation of agricultural foodstuffs into the usual consumable forms, or for the processing of plant fibres into textiles and other final articles of economic value to consumers.

Some plans provide for the exploitation of mineral resources so as to increase national income. To implement any plans for exploiting mineral resources, we have first to find out what minerals exist in the country, how and where to find them. Many technologies have to be utilized for this activity which is commonly referred to as mineral prospecting. After the minerals are discovered and evaluated, other types of technologies are necessary to win them from the earth. At the final stages of mineral processing we also require the necessary technology to extract the raw materials required for industry from the original minerals.

Because of the importance of technology for implementation of our development plans and the absence of autonomous bodies within the African economies that might provide the technologies required for any projects as and when required, it is necessary to provide a plan for making available, or for acquiring the technologies required in step with the timetable for implementing development programmes. Different strategies will be required to achieve this result depending on the actual situation with regards to the type of technology required and its availability. In the case of tech-

nology which is already generally available and which can be utilized by direct transfer, the principal methods of acquiring such technologies is by training of local manpower. Planning in this respect will be necessary to provide the education and training facilities or access to the appropriate kinds of courses abroad for school-leavers qualified to receive them. In other cases, the time it will take to train manpower to the level of competence required to provide the services necessary may be much longer than the implementation time at our disposal. In this case, even though plans should be made for training of manpower, it will still be necessary to purchase the expertise and experience required by engaging consultants who can immediately deliver such services. Of course, if there is a pool of trained manpower already available, whether locally or from external sources, the quickest approach would be to employ them.

There are other cases where the technologies required are not immediately available and may need to be adapted from existing ones or developed entirely from the start. In such cases, plans should provide for the creation of the necessary institutional facilities for research and development well in advance of the period in time when such technology will be required by our programme of development projects.

The role of science and technology in development

The role of science and technology in development can therefore be considered as having two aspects. On the one hand, science and technology enables us to forecast the different futures that are achieveable through knowledge available to mankind on the uses of material resources and on changes that might be made to the human environment. At the same time, science and technology enable us to select in advance from the various alternatives which are technologically achieveable, when preparing targets and programmes for increasing production in different economic sectors, for improving the environment of our cities and villages and countryside through the provision of means of communication and of transportation, and of housing, public health and medical services. The second role of science and technology is in implementation. We require to possess the necessary technologies and the capacity to apply them in order to actually implement most of the projects that are contained in our different development programmes, even though the objectives specified for those programmes are in terms of social ends and benefits.

Finally, for our countries to be able to fully benefit from the use of science and technology for development, it is necessary not only that there should be explicit planning for the utilization of science and technology, but also that our people in general be aware of the possibilities of science and technology and that they be informed about the importance and the many facets of their applications.

2. THE IMPORTANCE OF SCIENTIFIC JOURNALISM IN THE APPLICATION OF SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Introduction

Science and technology is applied through people and by people. There are two aspects to this question. The people through whom we apply science and technology are the scientists, engineers and other kinds of technologists. In the past, in many African countries, it was the general belief that science and technology were the concern of these categories of people only. Consequently, within the last five years many African countries have placed considerable emphasis on the education and training of scientists and technologists in order to have the manpower to work on programmes involving the use of science and technology.

However, this alone is not sufficient. Advances in science and technology and the uses to which they are put can have great impact on national life and on national progress. Hence the utilization of science and technology is a subject in which all of us are interested whether we are ordinary citizens, community leaders or national leaders. The experts (the scientists and technologists) are important for the utilization of science and technology, but the purposes and the programmes for which such utilization takes place are the concern of the whole community.

Hence, whilst science and technology will be applied through the experts, the applications will really be made by all the people. This is so on the one hand because the development objectives which the national plans are intended to achieve derive from the people, on the other hand because the nation as a whole will itself be involved in the implementation of many of the programmes involving the utilization of science and technology.

Once we begin to utilize science and technology to change the circumstances of life and the course of progress of the nation, it is obvious that information on science and technology is no longer a matter to be restricted to experts alone. Scientific and technical journalism has an important role to play at such a stage by deploying mass media so as to bring science and technology to the general populace. In doing this, scientific and technical journalism has to be guided by a set of clearly defined objectives and by the need to tailor the message according to the kind of audience.

Creating an awareness

One audience is all of us, particularly the ordinary citizen who most likely is a non-expert in the field of science and technology. For such an audience, the important objectives of science journalism should include the following:

(i) To provide general education and information about the methods of science as an approach to nature and as a tool for understanding it;

(ii) To provide general information about scientific phenomena of relevance to the ordinary citizen's daily life and interests, particularly to enable him to understand the natural and man-made environment in which he lives;

(iii) To inform about and to interpret the progress of technology and its applications;

(iv) To promote discussion about the ways in which science and technology are used and any effects such uses may have which raise welfare or ethical issues;

(v) To explain the scientific and/or technological bases of any development programmes which will alter the environment or the standards of life of the community, particularly those programmes which require active support of the people as a whole in order to ensure success.

Career guidance

A second audience for scientific and technical journalism is constituted by young people still at school. Scientific journalism can help to create and maintain interest amongst school children so as to obtain more school leavers who will go on to pursue careers in science and engineering. Many countries in Africa have been concerned about the problem of obtaining more recruits to studies in science and technology. Mass media can be used to promote campaigns to interest young people in scientific and engineering careers.

Many ways have been devised to bring to the attention of school children and students the wonders of the world of science and the potential benefits for mankind from scientific discoveries. One of the ways in which this can be done is throughdifferent kinds of publications and radio/television programmes for school children. Many of these are designed to entertain, but they also contain information about science or technology so that the young are gradually led to understand how their environment is explained by science and how it can be modified and made more amenable to human habitation and enjoyment through technology. In this way by starting at an early age, it is possible to create an awareness and a sensitivity to science and technology in school children and thereby to motivate more of them to learn further about these two fields and eventually to select careers in engineering or science.

Educating leaders and policymakers

Leaders and policymakers formulate objectives on behalf of the people and usually decide on the priorities and programmes for development. Such people need to be better informed than the general populace. They need to be informed in greater detail about the opportunities existing for fruitful applications of science and technology, about the strategies for using science and technology in various sectors of the national economy and about the prerequisites for effectively using science and technology in terms of manpower development and institutional infrastructure.

At the present day, the majority of leaders and policymakers in African countries do not possess an educational background in science. Nonetheless, in their role as the chosen leaders of the people, they have to decide the directions in which government support and action should be oriented in order to promote and utilize science and technology effectively for the benefit of their countries. It is important that people at this level find means of obtaining up-to-date information on the possibilities available for improving the material and social circumstances of their country through using science and technology.

This need can be met by science journalism which can bring up-to-date information on current developments in science and technology and provide informed and authoritative opinions on the significance that these developments could have for economic growth. Feature articles in national newspapers, lectures and discussions on radio or television can assist community leaders and policymakers to be reliably informed about what is going on in the world of science, about the impact which trends or developments in science and technology could have on public policy and public affairs, and about the potential of existing technology and current research for solving problems encountered in development.

In the field of public affairs and public policy, in particular, a special role exists for scientific journalism. In the course of formulating policy and plans for using science within the nation, many questions of public interest will need to be debated. Scientific journalism can promote the discussion of such public interest issues so as to assist in creating a national consensus to guide policymakers. It should also assist in explaining to the people what effects the decisions taken by leaders in connection with plans for using science and technology will have on their lives.

3. SOURCES OF INFORMATION ON SCIENCE AND TECHNOLOGY FOR THE USE OF MASS MEDIA
by Horst M. Scheffold

We are living in the age of science. Science is everywhere around us. Jets, cars, drugs, plant breeding, fertilizers, tse-tse flies - their effects and what to do against them - synthetic fibres, vaccinations. Where - in this age of science - science writing stands is the question of this session and how to handle science as a journalist.

Starting with an analysis of the situation of science writing today - not of yesterday - we realize that newspapers, magazines - along with radio and television - have enabled scientists to tell their stories through simplified but accurate language that can be understood and is readable and interesting for people who are not scientists. People - this is readers, listeners, viewers - are at the same time more educated and more willing to learn. They soon grasp the meaning of scientific and technical terms if diligently presented and it does not even appear necessary to"write down" to today's consumers of media.

But certainly the science writer has to help the readers and listeners in one way or the other to recognize and to familiarize with scientific and technical words and facts. However, before discussing how to present a story just a glance into the sources of the science journalist or sience writer as I shall call him in the future:

Speaking to science writers about their main sources many confess that they get most of their "tips" by reading daily papers. The opening of a new factory, the arrival of a new expert in Uganda or elsewhere, news about a new product in the international press, (science is universal and must not always happen at one's own doorsteps), a look into the economic page offers indicators of what is happening in the world of science and technology. Usually a phone call or a letter to the factory or an expert is enough to receive "glossies", drawings, charts, graphs - and sometimes an invitation for a visit - if not to travel somewhere. An interview - about which we shall talk later - is easily granted as a rule. Let me give you a few examples of what can be obtained by approaching firms or institutions like Siemens, ICI, USIS, Grummans, NASA. (Examples are shown and analysed).

Now there may be some of you saying that running around, finding out whether a tip is promising or not, is rather troublesome - well, there is an easier way - however some trouble, some imputs are always necessary if you run for success - which for us is a good science story. This easier way is to look into the science pages or science corners of the international dailies such as the New York Times or the London Times. In the 30th September issue of a prominent German daily of similar standard in science reporting, I found the following news and features on science topics:

(1) A note that "Nature", one of the great international science magazines will come out three times a week in the coming year. The reason: to have more space for actual science reporting, more commentaries and more on science policy issues. This proves evidently that science information is in strong demand;

(2) A report on the National Convention of the German Medical Doctors' Association. Main topic: Infant nursing and a lot of information around it;

(3) A short piece of news on a new cancer therapy by help of Conconvalin A, a globuline extracted from the fruits of the baobab;

(4) Another medical story telling a new therapy of gall stones;

(5) More out of the medical world is revealed in a feature story on lately discovered anti- corpuscles protecting transplanted organs;

(6) One more article deals with virus infections in the womb. This is highly practical and useful information;

(7) There is a report on how a computer is used in a mental hospital to control brain functions of the patients;

(8) Medicine is not all. Readers with palaeontolgoical interests are informed of the finding of a giant saurian in the arctic;

(9) Space technology is not forgotten: A competent and voluminous story describes a new electronic engine for satelites and there is also;

(10) A note on a Russian geological prospecting probe to be sent to the planet Mars rather soon;

(11) Finally there is something about zoology, particularly animal behaviour in stress situations. Crabs are reported from a zoological research institution to leave their claws in the body of the enemy - to escape while the latter remains surprised. To save themselves crabs commit self-mutilation.

So far on a science page. You can easily find in different daily papers five science pages every week multiplying your intake of science information considerably. The stories on these pages rarely coincide, with the exception of a few newsy events, because each paper has different sources and lines of interest. In addition most of the science events can wait for publication a rather long time - sometimes even for years.

The more sophisticated science writer is not satisfied with what I have proposed as a source until now. He will insist on reading regularly one or several science or technical magazines or journals, such as for instance New Scientist, Scientific American, Popular Mechanics, Nature, Space Technology, Science Journal, The Bulletin of Atomic Scientists and/or some fifty or hundred more including learned journals (examples are shown).

All these printed sources are easy to get, that is to say to buy for not very much money. They are at the same time displayed in libraries or reading halls or can even be received free of charge from the information services of the foreign diplomatic representations. Big international companies publish their own science journals of similar standard in many languages and are very easy to recive (examples are shown).

If, however, this is not enough yet or if you want to be in - to be an ingroup with the international community of science writers - you can become a subscriber to the Science Service at a nominal fee, which since the beginning of this century is a main source for the science writer. The Science Service has become a sort of "Liaison agency between science circles and the world". Among its many activities for the benefit of the individual science writer are of particular interest:

(1) The Enterprise Science Service from which I have brought along a few copies;

(2) A science news reprot distributed by mail;

(3) A tri-weekly health column;

(4) A column on the oddities of nature and;

(5) The Science News (letter), a weekly summary of current science for the scientist and non-scientist.

At this point you may have the feeling that sources alone do not make a science writer, regular reading of science journals does not automatically increase the understanding of science - as medicine, agriculture, chemistry, bionics, mathematics, astronomy, geology, space technology, etc. How can all that be mastered by the science writer, where to begin, how to select as a freshman in science writing.

Usually anyone who wants to become a science writer has at least some basic notions of science. It has to be improved by gathering more facts, by means of library research or generally by doing a lot of reading.

The science writer need not be a scientist but some specialization is of advantage. Unfortunately the science writer cannot always specialize according to his taste, interest and motivation because of this funny being called The Reader, the Listener, the Viewer. Hist interests and motiva-

tions are equally essential and force the science writer to answer the following questions before doing his specialization:

(1) Will the chosen subject of specialization be of interest to periodical consumers of media six months or a year from now?

(2) Will the chosen subject be interesting enough for me - the writer - to write about it?

(3) Will I be able to understand the subject?

(4) Is the subject adaptable to interpretation?

(5) Is there enough material available on the subject?

(6) Are interviews possible?

(7) Are there enough illustrations to get?

These questions have always to be answered, whether science writing is intended as a full-time career or an interesting journalistic side-line. It is further of importance that there is some evidence of the potential science writer to be at least able not to forget the invitation to write with precise accuracy and to indicate the significance of scientific discovery or invention in readable terminolology to the readers. (examples are shown).

Having arrived at this point, I should refer to and talk about the second main group of sources for the science writer aside from the printed or in a similar way disseminated sources: Interviews. However, this is the domain of my colleague Mr. von Randow. He will deal especially with the problem of interviewing the scientist. Though not dealing with interviewing, I nevertheless wish to make a few general remarks on the psycholgical situation which stimulates the co-operation between journalists and scientists, or makes it impossible or at least difficult.

Many scientists are men of considerable literacy qualities or have become self-trained writers. Other scientists and technologists, on the other hand, find it difficult to write interestingly. Why is that so?

The scientist's training as a rule has made him objective (at least concerning his own subject). He is constantly reminded in his professional environment to use an accurate, exact language and terms which are more meaningful than those used in every-day language. On the other hand, since science is everywhere around us - as we have concluded in the beginning - it is quite obvious that scientists are people who have something important to say. Why are they not always listened to? It is no insult to state that many of the scientists fail to communicate with the general public

because they sometimes do not know how to say it. I know most scientists are realizing this themselves and they deplore that they have lost the subjectivity of the successful journalist.

It is not necessary to tell the modern scientist that his profession has become a public concern. Already a hundred years ago they were reminded of this by the French mathematician Gergonne who said that they would have done their job fully only if they could explain science to the "man in the street".

It is advantageous for the scientist, the public, and the journalist to become publicly concerned with science. Here is the chance for scientists and journalists to come together.

For the journalist it offers a lot of professional chances, but only if he observes a few rules and if he, as a science writer, practises the criteria of good journalism. In addition the good science writer has to observe the following:

(1) The science writer must be somebody who loves the hunt, minute work and strict verifying;

(2) He should have the skill to extract news out of the clouds of technical phraseology in his library research or in his interviewing;

(3) There must be the talent to translate scientific terminology into the language of the reader;

(4) He must have a clear understanding of the steps of processes by which the researchers arrive at their conclusions or obtained their results;

(5) Facility of expression is necessary so that the readers, too, may understand him; and

(6) The honesty of the purpose to discuss future effects of science without exaggeration and sensationalism;

(7) The science writer must understand the point of view of the scientists and be able to co-operate with scientists;

(8) Finally the science writer should write pleasantly readable but precisely accurate, acceptable to the scientist, the editor and the reader.

4. HOW TO DEAL WITH THE EXPERT
by Thomas von Randow

In this seminar much has been said about the importance of familiarizing the general public with the goals, the ideas and solutions of scientific research and technological enterprises. Much had been said about the role of the science writer as an interpreter of what the expert in science or in technology has to say. So I shall not repeat these things.

I rather should like to dwell on the relationship between the expert and the journalist. In this regard, I believe, I may be of some informative value to the seminar since I have been both a scientist and a science writer. As a scientist I did research in the fields of information theory, computer sciences and especially in artificial intelligence at a rather famous university, the Massachusetts Institute of Technology in Cambridge, Massachusetts, in the United States. As a journalist I have been working since almost ten years as the science editor of DIEAZEIT, a German weekly with a circulation of 300,000 plus two foreign editions of 12,000 each printed in the U.S. and in South America.

Science writing first entered my life when I still was with MIT (the university mentioned above). A young man came to my office one day to interview me on a paper I just had published in the quarterly report of our institute. I still distinctly remember how I felt when the guy started questioning me. I didn't like the idea at all. I asked myself: How come this young fellow who obviously is not an expert in my field should write about my work? After all, it's my work, my thoughts, my inspirations (if there were any), it's been my precious time I had put into this work - and now this young lad asks a few questions and then he will go away and write some sort of story about it, probably loaded with misunderstanding, with mistakes, and downright nonsense.

Well, it turned out to be just like that. The young man took lots of notes, and I tried to emphasize what I thought was the most important aspect of the whole thing. Yet the story I afterwards read emphasized exactly the wrong things. I felt that this reporter had made a fool of me, and I was so mad that I called the fellow and told him off at the telephone.

This happened thirteen years ago. Recently I came about this story again and read it. To my great surprise I now find it well done, an excellent piece of science writing. Now having become a science writer myself, I look at the story differently.

This experience may serve as an example for what I shall call the communication gap between the scientist and the journalist.

Let me briefly tell you the whole story of this particular research and what the journalist made out of it.

First the experiment: Grey Walter from Bristol University invented a device that he called CORA. CORA looks like a turtle and is as big as a medium size turtle too. The turtle rolls on three wheels, one, the drive and steering wheel is in front and two wheels are in the rear. The front wheel is driven by an engine and it can also be turned so that CORA can make turns very much like a three wheeled delivery car. On its "forehead" CORA has ears, microphones that is, CORA also has a feeling, because CORA is surrounded by bumpers like bumpers on a car, but CORA's bumpers go all around the little vehicle and they are connected to a device that sends electric pulses to CORA's electronic brain when the machine hits something on its way.

The brain is an electronic apparatus that can perform the gimmicks which I am going to explain.

When a light is lit, CORA senses it and its motor starts running, driving CORA towards the light. But when CORA bumps into an object on its way, CORA backs up a little, and then chooses a different way in order to continue its run towards the light. When it hits another obstacle, again CORA backs up and detours in order to go around the object.

As I said, CORA also has ears, microphones to be exact. Well, you may whistle, yet it does not impress CORA at all, it does not react to the noise. However CORA's electronic brain is built so that the machine can learn from experience.

This is, how it's done: Before the light is switched on, we whistle, and we do so every time the light is being switched on. After a while CORA has learned that the sound means "light on", and, as you remember, "light on" triggers CORA's mechanism to make it run towards the light. Now you only have to whistle - and off she goes, CORA starts running straight forward and does the other trick too, that is, trying to go around obstacles. CORA has learned to associate the sound with the sensation the light causes in its brain.

Now we erase CORA's memory. That is done by some sort of electric shock. CORA is stupid again, it does not react to sound anymore. But now we train the little beast differently. We always whistle just before it hits an object in its way. Now CORA has learned that whistling means obstacle, so we whistle and without having hit an object, CORA understands the warning, it retreats and takes a detour in order to avoid bumping into something.

We can play real dirty tricks on CORA: We can whistle every time the light is going to be lit and also every time the creature is about to run into an obstacle. Now, after CORA has done its learning what is it going to do when we simply whistle? Is it going to run forward because sound means light or is it going back up, because it "thinks" whistling means obstacle? Well, the machine doesn't know. It starts jittering,

going back and forth rapidly, erratically indeed, and finally the poor thing breaks down. It has suffered from a decision neurosis. This actually was the purpose of Dr. Walter's work. He is a neuro-physiologist, and he wanted to stimulate the decision neurosis mechanically.

I had modified the design of CORA and I had the MIT shop build five CORAs of the new type. It suffices to tell you about one modification: I had a light bulb inserted on CORA's forehead, a bulb that could be lit. I also had a pen built, a two times two meter pen like a child's playing pen. There I placed my CORAs and I lit their lights. Of course they started immediately running into each other, backing up and trying to detour etc. Somehow the five creatures arranged themselves by finding a modus to live together without bumping into each other too often. Their learning apparatus helped them because while one CORA approached the other followed, his machine noise intensified - that was the analogon of whistling in Grey Walter's basic experiment. So the machines learned to listen to each other and to associate the noise with bumping into the neighbour.

The purpose of my experiment was a mathematical one. I had developed a special prediction theory which allowed me to predict the behaviour of such a group of individuals, and I had to try it out. That is: taking into account various conditions like the starting position of the machines and other variables, I could calculate statistically what would happen, and I checked my theory by comparing the theoretical prediction with the observed behaviour.

One thing I observed was: most of the time one machine ran freely about while the other four carefully avoided running into this "dictator" while they did run into one another quite frequently and got in all kinds of trouble. Only very rarely was there a situation in which all five CORAs run around with equal rights not giving only one the privilege of moving freely. Actually this status of "democracy" not only occurred very rarely, it also didn't last very long. My little society snapped back to dictatorship all too easily.

I had explained the experiment just about the way I did now here, and I had made it very clear that of course connotations like dictatorship and democracy for the two states of affair are not to be taken seriously. Actually I warned the journalist better not to dwell on this perfectly unjustified analogy at all. Yet guess what I read the next day in the Boston Globe? I quote "German Professor at MIT proved Instability of Democracy", that was the headline. Then followed the story which began: "Five mechanical devices in a pen trying to live with each other rather choose dictatorship for their political system than democracy. This has been demonstrated by Dr. Thomas von Randow, a German mathematician who is presently joining the staff of MIT's Research Laboratory of Electronics. The 35 year old German scientist had built five turtle shaped robot devices that learn by experience not to bump into each other but to avoid collision while running around a six times six feet pen ..."

I could have killed the man, since I never had spoken seriously of democracy and dictatorship in regard to my experiment. What would my colleagues now think of me when they read it? I felt cheated, taken in, ridiculed. Nobody, so I feared, would take me as a serious scientist anymore. I felt simply horrible.

But why? Shouldn't I have been grateful for that story. Alright, it dramatized the outcome of the experiment, but it was not really so wrong. Besides it made good reading and it did convey the gist of the experiment after all, because later in his story the journalist mentioned the more important aspects of the experiment, the empirical check of the prediction theory and all that. So I should have been happy.

I was not, because I felt my work was mispresented. It read like a profane and rather silly little gimmick that I had performed and not at all like scientific work.

However, had the journalist presented it the way I would have liked it, nobody would ever have found the thing interesting. What can we learn from this experience of mine?

1. The journalist should never forget that in reporting on a particular finding of a scientist he, the reporter, is in fact taking something away from the expert. After all, it's his work; he is proud of it; he would rather tell the people about it himself. But since he usually has no journalistic experience, he at least would like to see his work presented the way he likes it. This man is a touchy individual who needs special care.

2. This care includes one thing, the journalist in my case had failed to come up with: the science writer should have an idea how he is going to present his story while he is still with the scientist. And the journalist should tell the scientist, what his idea of presenting the story is. But here the journalist can defend his point, can explain to the scientist why he is using his particular strategy in telling the story to the public. May be you as a science writer will have to revise your plan a little bit on account of this conversation - well if this is so, the scientist must have a rather strong point.

3. The scientist may learn from our story too. The science writer's business is to popularize science, and popularizing means a number of things.

It means especially simplifying and dramatizing the scientific finding. This may result in telling something, the scientist feels is wrong, and in shifting the emphasis by putting accents on aspects of the scientist's work which in his opinion are not the main points.

Dear Mister scientist, before you get mad at the journalist, just try to identify yourself with the layman, with what you have been before you become a scientist, and ask yourself; "How would I as a layman have reacted to the story? May be you find out the science writer is not so wrong after all.

Let me give you a few more examples of the natural friction between the scientist and the journalist.

Once I wrote a story about smoking and health. I had interviewed a researcher who had experimented with mice who smoked. As a result of this the animals developed cancer of the lung. I quoted the scientist by writing: "Dr. Werner told me that his mice smoked the equivalent of 20 cigarettes a day and they seemed to like it". Dr. Werner read this and became furious, because I apparently had misquoted him. What he had actually said was: "The mice inhale the cigarette smoke by means of a canule which had been inserted in a hole that was cut in the animal's air pipe in the throat. If you take body weight as a basis you may say, the mice inhaled the equivalent of 20 cigarettes consumed by human smokers. The mice appeared to like it because they seemed not to object to the procedure of being put on the cigarette holder." I had skipped the details of how the animals inhaled the cigarette smoke simply called it smoking, and I made less words in telling my readers about the equivalent amount of human cigarette consumption and that the mice apparently liked smoking. After all, it was only one paragraph in a long article. But the scientist complained bitterly because he feared the criticism of his colleagues. "I never said", he repeated, "that the mice smoke, I would never say such a thing, because smoking is a very complex behaviour..."

It still escapes me why he was so mad at me.

There is always the question as to whether the science writer should show the scientist what he had written before it goes to print. Of course chances are, he will take out the parts you were very proud of. For instance: I once had written about a cyclotron. Now, in this machine electrons, the tiny particles that convey electrical current and that are also building blocks of the atoms, are whirled around a circle, while they pick up more and more energy. This is done by certain devices that give those electrons a push every time they come flying by. In order to illustrate this a little bit, I wrote: "It is like running horses in a circus. At certain points of the circle are men standing with a whip who give the horses a little strike every time they run by, so they keep running faster and faster."

I gave my manuscript to the director of the cyclotron laboratory. He generally approved of it, but took out my circus scene. He thought that was not serious enough. Well, in a case like that, you couldn't possibly put such a comparison back in again, because once you ask the expert for editing, you have to accept his decisions. This certainly stands against showing the manuscript to the expert. However, I still would recommend to do it whenever it is possible.

Actually I found out that the scientist is not so terribly touchy after all. At least according to my experience, the situation looks like this: If you show your manuscript to the expert before it goes to print, he will approve of most of the things of which he most likely would disapprove, would he see the story no sooner than in the printed paper.

Actually I do not blame the scientist of being rather sceptical of the skills of a science writer. Take this for instance: Mr. Scheffold in his presentation mentioned briefly the discovery of a substance, an enzyme of plant origin, that has the property of stopping the uncontrolled proliferation, the uncontrolled multiplication of cancer cells. However, this substance has shown this particular property only in vitro, that is, in a tissue culture and not yet in living animals. Actually it is definitely impossible to apply this substance, say, to the cancerous tissues of human beings and therewith heal cancer, because the stuff becomes neutralized in the blood serum. Nevertheless, the finding of the substance is of tremendous importance, because the way it stops cancerous growth of tissue gives rise to a completely new explanation of how cancer comes about. I cannot go into details here. But for our purpose it is important to know, that the researchers in Israel and in the United States who have discovered the substance and the way it works, never even mentioned the possibility of developing a cancer drug out of this stuff. Although there may be a vague, and I emphasize vage hope to eventually derive such a medicine out of this finding. Yet one of our Newspapers in Germany and others of similar style in other countries tooted in big headlines: "PLANT EXTRACT CURES CANCER, Sensational Discovery Gives Hope to Millions of Dead Bound Sufferers". No wonder, scientists become sceptical of us.

There is one thing about headlines, however, that has to be said here. While the headline I just mentioned is definitely wrong and absolutely disgusting for it creates false hopes among deadly sick people, I maintain, that a headline should catch the eye and doesn't have to be so terribly accurate. Scientists do not believe in this philosophy, because they don't make newspapers, they don't know what it means to invent a headline that must have no more than twenty letters and still fulfill three purposes: describe the content of the article, catch the eye, and be grammatically not insulting. Here again we have to try to explain our situation to the complaining scientist or, even better, explain it before he gets mad.

Part of the reasons for the communication gap between the scientist and the journalist is the fact that the journalist often deceives the scientist about his knowledge of the matter. The journalist sometimes is afraid to reveal his ignorance to the expert. He says "yes" when the scientist asks him whether he had understood the matter, while the journalist should actually have answered "no". This happens so often that I should like to stress the point a little. Especially when there are more than one

journalists interviewing, the individual fears his colleague's criticism or sarcasm. Therefore he rather pretends he understood everything than admitting that he has not. The result is painfully noticeable in the journalist's report. It is all wrong all nonsense. You know, that is too bad. Things like that shouldn't happen. Journalists are basically nosy, and they should remain nosy also in front of the scientist. You are not supposed to know science. He is. So ask him, again and again. He's got to explain it until you understand the matter real well. Don't forget: The scientist is interested in having his work made public, so let him sweat for it a little. He'll come out finally with everything you need to know.

Pretence also hampers good journalism in another way. That's when you write your story. You've been impressed by the expert, now you want to show how well informed you are, you almost feel like a sciontist yourself. And when you write, there is a little man sitting on your shoulder whispering: "Show them how much of an expert you are; try to impress them; the scientists should even feel they can learn from you. Don't just use the profane vernacular". Do not listen to that little green fellow on your shoulder. Always be aware of the fact that the experts should read their stuff in their scientific journals. The person you are talking to is the simple citizen. Never mind what professor X thinks about your writing, think how your mother would like your story, she is important.

This subject, although belonging to the next presentation, has something to do with my theme also, because there is one thing, most science writers easily seem to forget: Your most important partner in your work, the scientist, should be impressed by your work, but what impresses him is the job he usually cannot do: presenting his work in a way, it can be understood by the ordinary reader. Their art of simplification without substantial loss of the original information is much admired by most experts. Never forget: He is a layman in other fields too, and he is grateful to read an easily comprehensible story about scientific work outside his own field just as much as everybody else. We should remind him at times of that.

5. TWELVE BASIC RULES FOR INTERVIEWING
by Horst M. Scheffold

1. Who is the interviewee? Find out as much about him as possible before the interview.

2. Have your major questions prepared in advance. (This means a considerable amount of study on your part of the subject at hand.) If possible, keep your questions in your pocket and refer to them only if it will not interrupt the interview.

3. Make your interview specific and direct - but do not antagonize your interviewee!

4. Do not argue with your source! If he makes statements contradictory to facts - not simply your opinion - which you have, point this out and ask for an explanation. But be polite about it and do not offend your source.

5. Do not hesitate to ask basic, simple questions. No one expects a reporter to be an expert at everything, but everyone expects a reporter to be accurate. Therefore, when in doubt, ask for an explanation.

6. Watch out for the unexpected. Many times the person you are interviewing will add a new dimension to an assignment which no one expected. Do not simply ignore it because your prepared questions did not include the new topic. Follow up on the new angle.

7. Take notes of everything. It is easier to throw some notes away if you have too many, but it is often impossible to get more information after the interview has been completed.

8. If it is possible to check back with your interviewee after you have written the story, do so if necessary. Do not put words in the mouth of the person you have interviewed.

9. Get plenty of direct quotes. Ask your source to repeat something if that is necessary to get the quote right.

10. Also take notes about the interviewee's appearance, his physical characteristics, his mannerisms, the place where the interview took place, etc. And use this information in your story to give the reader a complete picture.

11. Know when to quit. If a time limit has been set, keep it. If none has been set, quit once you have your information.

12. Keep yourself out of the written story. Only under the most unusual circumstances are such things as "this reporter asked" or "I was told" acceptable.

6. HOW TO PRESENT A SCIENCE STORY,
by Horst M. Scheffold

How a story is offered to the reader, listener or viewer is sometimes considered to be an art and out of the possibility of systematic description. If this were true we would not need this lecture. I think it possible to generalize on how a science writer particularly can come out with his subject.

Any story form can be used to explain science, however the news story and the feature are most commonly used. The news story is written to inform the reader. The feature article aims at more. It is meant to instruct, to guide, to entertain. The news story presents the bare facts while the feature article can give detailed information with supplements and dramatizing a little (which is not the same as sensationalizing) to appeal to the readers' imagination.

The science reporter writes on what he sees or on what reliable sources have taught him. News stories may or sometimes have to be hurriedly written. It is different with the feature writer. His writing does not relate only to the actual fact but also to the causes or background of the story. The feature seldom meets a deadline and can be written at greater leisure. This offers a great opportunity to writers to make use of moving narration and vivid description, clear exposition in order to dramatize his writing. In many respects, feature writing is reporting - at least it amplifies the work of the reporter.

Is the writing of a science feature more difficult than a science news story? Perhaps. Because for a feature you need more of psychology and more of projection of your own attitudes and your knowledge. By feature the writer communicates more personally and intensively with his reader. For a science feature it is essential to have the ability to be curious and interested in the things around and the desire to share that interest. This of course implies the capacity to recognize subjects that will interest the reader and may be developed into science features. A little bit of enthusiasm visible to the reader is always good, and to see human interest elements even in a story about a technical process will make all of us more successful science writers. The qualities of observation, thoroughness and accurateness are indispensable, skilled interviewing, to write clearly, accurately and with imaginative appeal is important to keep the readers' interest up to the end of the science feature article.

Well, we realize already it is not easy. But easy enough to be learned and practised. Let us find some practical advice. You remember that I told you that it is not always necessary to write down to the today's reader. Still the journalist, the science writer has to help his reader to make the best out of the given information. But first of all the reader or listener must be made curious. This is why in a popular science story the lead or first paragraph is the most important one, as it should be in every story by the way. The way you handle this lead can make or break your whole story.

The lead is a sort of writer's lure to readers. It should try to catch the reader's eye within the first few lines. If the reader escapes already there it will be difficult to get him back later on.

The first paragraph of a science article is rather foreward-not backward-looking. And the science writer uses utmost care to use the familiar in order to explain the unfamiliar. To give you an example: If a new variety of wheat in a wheat-growing area can better bridge the food gap between the seasons and if this food gap is recognized as a common and serious problem, it is not advisable to start the story by saying that thanks to the wonders of genetics and a couple of astute scientists there is a new wheat variety, but you will say that the times of lacking wheat supplies between the seasons have come to an end. And then only you go on by telling why.

Now writing the body of the science article does not vary very much from any other type of feature article. Except for one important thing, namely that science writing must humanize science or technology by showing how the discovery affects the reader's life or the conditions of living in his human environment. Everywhere people are interested in people, and first of all every person is intersted in himself.

I think it is a good attitude which the Minister of Information proposed in his opening speech for the science writer: To be the interpreter of science, to give science a new meaning in order to show people how science and discovery will help them directly or indirectly. Ordinary readers are not interested in isotopes but they may at least learn the word if they are told in an easy way what role isotopes play as tracers in medicine, biology, agriculture, animal breeding, etc. The appeal of the science article is its application to the home, children, family, health, hobby education, trade, professions and development. Non-scientists as readers are not interested if they learn how the discovery may make them wiser, happier or healthier.

An informal tone adds to the reader's interest when the writing is done in a way as if the writer and the reader were sitting together discussing the new scientific venture. Anecdotes, personal pronouns and familiar incidents increase the understanding. Everything, however, should be told in concise, unified paragraphs with concrete words. Do not let your story flow because it is difficult for the reader to notice when a new thought or a new process starts - he must be able to follow every step - and please do not try to be a poet using beautiful analogies.

Another question is whether the writer should quote scientific authorities frequently or not. Certainly, quoting an authority makes the reader feel to receive authentic information. On the other hand, there are not many good examples yet which give a reasonable description of the scientist

as a normal human being but with special qualities and merits. The scientist is too often shown as a diabolic figure, different from the rest of mankind and this is not a successful way to make people friendly and gayful believers in science.

The scientist does not need magic. He needs and wants and deserves to be recognized as a Mr. Everyman who learns, has his doubts, works hard with strong professional devotion, with the problems all of us have ourselves, but with an important knowledge and ability to solve many of mankind's most urgent problems.

To include the scientist in the story as a human being makes it more personal, more vivid and more complete.

If the writer himself should also appear in the story is more doubtful. It is not of real interest how the writer feels among test-tubes and whether he understands everything or not. The writer has to write for the reader - and not for himself. And remember, the writers - all of us journalists - are not the typical readers.

And as almost everybody else the writer has various likes and dislikes which could colour his writing. Only those facts that are significant have to be included in the story.

Precise accuracy is always necessary in a science story. By this the writer is gaining the confidence of scholars and readers alike.

It matters very often in science whether a number is 1.75 instead of 1.5 or 1. This is why science writers spend much of their time checking titles, names, initials, technical data to avoid overstatement or "talking down" to readers.

Quoting the source, if it is a technical journal or from a story of another writer, is a matter of basic good journalistic behaviour.

A responsible writer tries to get his story checked by an expert or by the interviewee. Sometimes this is not possible or not even necessary. But if the interviewed scientist offers his support in checking the copy - there is rarely a reason to refuse this offer. For the rest it improves relations between the science and the journalistic communities.

Accuracy is often less a problem than readability.

Educators especially have been attentive to it, but they have arrived at recommendations more suitable for the formal school situation. If a journalist would always live up to the rules of readability found by educators he would bore the reader. Nevertheless, these rules are valid and indispensable in teaching young people. Journalism is not only education - it has more functions.

There is nothing against a journalist writing what we call intelligent. Whether a sentence has 25 or 70 words may not be of importance as long as simple structure, carefully selected vocabulary and some psychology help making the reading easier. Remembering our pushing-cart example of Tuesday we realize how difficult it is to explain even the most common things simply and in an understandable way.

While the science writer should understand a lot of science, he should be as unscientific as possible in his writing. If he is too complicated he is not understood - if he is too simple he is boring. Find the middle-way.

Now how long should a story be? There is the widely accepted rule to keep the story brief. But there are exceptions. Readers have not the same habits everywhere. The length of a story has to be kept flexible matching the readers' habits. The term target group is of importance in this respect and to know more about it is a must if journalism and mass media are considered main development agents.

On Tuesday we were also talking about illustrating a story. On the average - also in the USA and Europe - some 40 per cent of the space is used for illustrations. Mr. von Randow mentioned his paper as an exception carrying only some 5 per cent of illustrations. Illustrations are no decoration. Pictures, transparencies, graphs are all effective investment to increase the understanding of the science story.

For developing countries the use of illustrations offers very special problems. Many subgroups which are not yet regular consumers of printed media meet great difficulties in interpreting pictures adequately. Sometimes visual perception does not allow the use of abstract drawings, or as Mr. Banjo pointed out magnified presentation of even familiar facts. This is, by the way, the same with film and television.

Let us sum up what has been expressed: How a science story is written makes its success. The science writer has to understand and explain the subject clearly. He must narrate interestingly and describe vividly, write with facility. The style of writing has to follow these rules:

1. Dry facts have to be enlivened with human interest incidents.

2. Figures and statistical material have to be broken down into figures the reader can comprehend.

3. Complicated facts can be simplified by analogies.

4. Explain the unfamiliar with the familiar. For example air-pollution in Kenya can be explained to a farmer by reminding him of the dust a car produces on an unpaved road or by the sticky smoke of fire in the house.

Observe in addition to these four recommendations:

Organize the story in paragraphs, vary length of sentences, be careful in the choice of words. And remember: Science writing is the best way of becoming a science writer.

Annex I. AGENDA

1. Opening ceremony.

2. Theme address on the role of science and technology in development.

3. Election of officers for the seminar.

4. The role of science and technology in development.

5. The importance of scientific journalism in the application of science and technology for development.

6. Sources of information on science and technology for the use of mass media.

7. Visits to the Ministry of Information, Broadcasting and Tourism and to science laboratories.

8. Co-operation between the mass media community and the science and engineering communities.

9. How to interview a scientist.

10. How to present a science story.

11. Preparation and adoption of the seminar record and recommendations.

12. Closing ceremony.

Annex II. PROGRAMME

Monday 23 November, 1970

9.00 a.m. - 10.30 a.m.	Registration
	Tea break
10.45 a.m. - 12.00 noon	Registration (cont'd)
2.30 p.m. - 3.15 p.m.	Formal Opening
	Speeches by:
	1. Mr. J. Kihika Chairman Local Organising Committee
	2. Hon. A.A. Ojera Minister of Information, Broadcasting and Tourism, Uganda
	3. Mr. R. Kraetsch, Head Africa Section, German Foundation for Developing Countries
	4. Dr. Ademola Banjo, Head Science and Technology Section, United Nations Economic Commission for Africa
	Tea break
3.40 p.m. - 5.00 p.m.	Theme address: "The Role of Science and Technology in Development" - Dr. A. Banjo
	Discussions on the theme address

Tuesday 24 November 1970

9.00 a.m. - 10.30 a.m.	First Seminar Session "The Importance of Scientific Journalism in the Application of Science and Technology for Development" - Dr. A. Banjo
	Tea break

Tuesday 24 November 1970 (cont'd)

10.45 a.m. - 12.00 noon	First Seminar Session (cont'd)
2.00 p.m. - 3.15 p.m	Second Seminar Session "Sources of Information on Science and Technology for the Use of Mass Media" - Mr. Horst Scheffold
	Tea break
3.40 p.m. - 5.00 p.m.	Second Seminar Session (cont'd)
6.00 p.m.	Film show

Wednesday 25 November 1970

9.00 a.m. - 12.00 noon	Visit to "Radio Uganda"
	Visit to the Press and Film Units of the Information Division, Ministry of Information, Broadcasting and Tourism
	Visit to Uganda Television
2.00 p.m. - 5.00 p.m.	Visit to the Engineering Laboratories, Uganda Technical College
	Visit to Science Laboratories, Makerere University

Thursday 26 November 1970

9.00 a.m. - 10.30 a.m.	Third Seminar Session "Co-operation between the Mass Media Community and the Science and Engineering Communities". - Dr. Thomas von Randow
	Tea break
10.45 a.m. - 12.00 noon	Third Seminar Session (cont'd)
2.00 p.m. - 3.15 p.m.	Fourth Seminar Session "How to interview a scientist" - Mr. Horst Scheffold
	Tea break
	Fifth Seminar Session "How to present a science story" - Mr. Horst Scheffold

Annex III. LIST OF PARTICIPANTS

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Annex V. SEMINAR DIRECTION AND SECRETARIAT

Seminar Direction

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Consultants

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1 Berlin 27

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German Foundation for Developing Countries
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Annex VI. SPEECH BY MR. JOHN KIHIKA, CHAIRMAN OF LOCAL ORGANIZING COMMITTEE FOR THE SEMINAR ON SCIENCE AND MASS MEDIA, IN KAMPALA ON 23RD NOVEMBER, 1970

Hon. Alex Ojera, M.P.,
Minister of Information, Broadcasting and Tourism

Your Excellency,
The Ambassador of the Federal Republic of Germany

Ladies and Gentlemen:

On behalf of the Committee which has been responsible for organizing this seminar on Science and Mass Media in Uganda, I welcome you all here this afternoon. I particularly welcome and thank you Mr. Minister, for honouring the seminar by agreeing to perform its opening ceremony, this afternoon. All of us, especially members of the organizing Committee are very pleased to see you in our amidst.

This seminar, was originally to be the second of a series of its kind to be held in East Africa, but it so happened that it is now the first, and the only one of its kind to be held in this part of the world, this year.

Originally, the first was to be held in Nairobi and the third in Dar-es-Salaam. Due to unforeseeable circumstances, however, the seminars in Kenya and Tanzania had to be cancelled. The same fate was to befall the Uganda seminar, but due to your wise decision, Mr. Minister, this particular one survived the guillotine. When I welcome you here, therefore, Mr. Minister, I do so with deep gratitude for this action you took to save the seminar, the results of which I am sure, will eventually be beneficial to the common man.

A request was later on received from the German Foundation to include five delegates from Kenya, and five from Tanzania. We quickly granted this request in the spirit of the Treaty of East African Co-operation. This was done in the knowledge that Kenya's or Tanzania's problems are Uganda's problems and vice versa.

We therefore have among us today, delegates from these two sister countries to whom we extend our hand of warm welcome. We also warmly welcome the experts whom you see here, who have come purposely from ECA and the German Foundation to assist at this seminar.

We are also indebted to the authorities of the Institute without whose help it would not have been possible to hold the seminar.

Annex VII. SPEECH BY HON. A.A. OJERA, M.P. MINISTER OF INFORMATION, BROADCASTING AND TOURISM ON THE OCCASION OF THE OPENING OF A SEMINAR ON SCIENCE AND MASS MEDIA ON 23RD NOVEMBER, 1970 AT THE INSTITUTE OF PUBLIC ADMINISTRATION

Mr. Chairman,
Your Excellency,

Ladies and Gentlemen,

There could be no better time for holding a seminar on Science and Mass Media on the soil of one of the developing countries - the Republic of Uganda. I find this to be the most interesting and challenging period for our peoples and those of Africa and it is for this reason that I am most grateful for having been given an opportunity to open an important seminar like this one.

In Uganda today, and perhaps in most developing countries in Africa, we are deeply involved in a revolution for economic, social and political justice. In the case of the Republic of Uganda, political independence as you all know, was achieved in 1962. The people of Uganda are fully aware that that was only a political independence and that it was wrong to think that that was the end of the road. The people of Uganda regard the attainment of political independence as the starting period from which the people of Uganda must move away from the ways and mental attitudes of the colonial past. Similarly it was the period when Uganda had to start thinking of moving away from the hold of tribal and other forms of factionalism, including vested interests and acceptance of poverty as a way of life; and embark on development and nation-building which can only be achieved by a united people.

I believe all peoples of Africa have had the challenging task of deciding whether to survive or remain under the mental and physical slavery for ever. They have had to decide whether they should live under fear, apprehension and without hope. In Uganda we have been formulating the goals that Uganda must achieve and try to consolidate them, hence at this particular junction Uganda offers an interesting period as a basis for further formulation of methods of communicating scientific knowledge to the masses of people and interpreting and relating them to these objectives that the country has set for itself.

The idea of your seminar was conceived in 1968 in Berlin. I had the privilege of being Minister responsible for Mass Media in the country at the time when the invitation to attend the seminar came and I did not hesitate to send delegates because no one could underrate the involvement of science in the affairs of a developing country. Your Chairman today, who is an official of my Ministry, together with one other journalist from one of our local newspapers represented Uganda.

I am gratified to note that the rest of participants in today's seminar include experienced people in various fields of science and technology. I also see that there are several qualified journalists and experienced persons in the operation of mass media facilities. Furthermore, the seminar is beautifully blended by experience from experts who have been provided by the German Foundation for Developing Countries and the Economic Commission for Africa. All these persons will, in my mind, produce very interesting and practical ideas on the methods of reporting scientific news.

Looking through the programme it can be seen that topics are wide and varied. They include subjects like "the importance of scientific journalism in the application of science and technology for development". There are many other subjects which I need not waste your time enumerating.

Whereas I could fully agree with the aims of this seminar so far described, I would like to take the opportunity of mentioning a few points which could provide food for thought during your deliberations for the next five days. I would like the seminar not to treat the problems facing developing countries superficially, particularly in the scientific involvement in this struggle. The role of science in our struggle for complete emancipation of our people from any forms of colonialism or neo-colonialism or any other-isms, cannot be minimized. A seminar like this one which has brought together people in the scientific world and people who communicate daily with the masses of the people should generate some new ideas that would give hope to our people. This vivid spirit calls upon the seminar to discuss matters of research on what to do.

All participants must not forget that in whatever we do we must not divide ourselves into scientists, journalists, politicians, housewives, etc. All of us need to pull our efforts together, each one effectively contributing the best he can. We must not forget that we are today taking decisions or laying down guidelines which will affect the future generations and therefore the fate of our people and the fate of Africa.

Your seminar will discuss various matters including research into new ideas of communicating scientific knowledge to the masses of our people and in doing this you will consider several other factors. In my view some of these may warrant further consideration:

1. That in any method of communication one first decides on what material is to be communicated, to whom it is to be communicated, and the best method of communicating it. Our journalists should therefore avoid merely repeating what has been reported in another country without considering whether or not the message is getting home. In short we have to be original as much as possible in our method of reporting.

2. In passing information of technological nature it is our view that people operating in the field of mass media should avoid doing it simply like an exposition of professionalism. They should remember their spectators and use a technique that will ensure that the information disseminated has achieved its value. In doing this one must always remember that we are writing or broadcasting for the masses and not for the city-dwellers only or a given class of persons. We have a commitment to totally involve our people in nation-building and since it is true that mass media communication gets to the greatest number of people, we must ensure that what we disseminate will help to arouse total awareness of our people and educate them in what part they have to play in nation-building.

Ladies and Gentlemen, in other words: If perhaps a doctor were invited to give a talk on radio or write an article in the local press aimed at educating the masses it might not be all that effective if that doctor wrote a professional article of a highly technical nature.

We are aiming at informing the masses of the people and let us accept the fact that the masses of our people would not today perhaps follow a highly technical and professional talk like the one that might have been written by the doctor for doctors or for his examiners. Instead a series of questions, if repeated a number of times at peak periods on Radio might carry the message better. Some of these short questions could be as follows:

(a) "Has your child been vaccinated against polio? Polio is a dangerous disease and make sure to go tomorrow to the vaccination station if your child has not yet been vaccinated".

(b) "Have you boiled your water? Remember unboiled water can make you sick".

Similarly, it is a woll known fact that scientific and technological reading is not very easy. If, therefore, men of mass media have to pass their information to the masses in a simple and understandable manner they would have to think of dramatizing the information so that the ordinary people can read about them or listen to them in a language and style they understand without losing interest in the subject.

I consider that one of the ways for doing this is for newspapers to open their columns to regular articles on science and technology. Radio and TV operators should not hesitate to carry programmes on their media which highlight various achievements in subjects of day to day concern to the masses like agriculture, animal industry, medicine, etc. I have seen, for instance, in some countries a few programmes aimed at teaching housewives how to repair a leaking tap. Similarly, in our conditions a five-minute programme could be presented on TV, showing for instance, the masses how to grow tomatoes, how to keep cattle healthy and how to keep a home clean. In order also to write articles covering subjects of highly specia-

lized nature in a simple language to be understood by ordinary people, journalists themselves must acquire special skills in scientific writing and reporting. The journalists themselves in simplifying the scientific speech must not distort it simply because they are not conversant with the scientific jargons. This is the very purpose of your seminar i.e., to bring together scientists and journalists and form the best way of communicating to the masses effectively.

Let me hope that during this seminar our journalists and mass media operators will be encouraged to establish and maintain a constant relationship between themselves on one hand and scientists on the other with a view to finding the best way of a two-way communication between the two groups. The people themselves should also be able to indicate what sort of information they need.

In this way the masses will be given an opportunity of reading and hearing more about the subjects in which many of them will develop an interest. The task which faces the mass media world in this field is not a small one. We cannot expect it to create an informed public on science and technology within a short time. There must be insistence, repetition and constant flow of information to the public especially among the young generation. I am informed, Ladies and Gentlemen, that in countries such as Israel where there is shortage of water, some of the main programmes on radio are repeated many times so as to give an impact on the consumers on the importance of conserving water. So every citizen from the time he learns to understand speech gets every day a programme telling him or her to be careful about the usage of water. Similarly, we could repeat programmes about vaccination daily and although the educated public might not like it the masses would benefit as the more we repeat programmes of this nature the better for them.

Like in any other field, our journalists and scientists have had their training probably in very highly industrialized countries. This meant that they have acquired knowledge and techniques about the environment of such countries. The problem that is likely to face them is that of re-orientation. There is no doubt that the highly industrialized countries have had to adapt methods best suited to them. If similar methods were applied to developing countries the people would immediately have a problem in understanding what you are trying to put across. The method we adopt in developing countries must therefore take into account the background of our people.

The yard stick of our achievements, therefore, in the field of scientific reporting can be judged on the spirit of patriotism shown by all. In Uganda, for instance, a local film was made in the district of Kigezi. The film was entitled "Wire Drawing" and the actors portrayed exactly how wire used to be drawn in the past. This film won a prize in the film exhibition held in Moscow about three years ago. I saw very

little of this in our press. This film could be of great interest not only to the local people because of their heritage, but to scientists who may do further research.

I think in a developing country, the role of the Press should be to build rather than indifference. Similarly, I would call upon our scientists to use the knowledge they have acquired to carry out some original research.

Ladies and Gentlemen, it is not proper for me to pretend that I can cover the whole field of the purpose of your seminar. I hope I have been able to touch on points which will generate useful discussions during the next five days. I would like to pay tribute to the Economic Commission for Africa and the German Foundation for Developing Countries, for initiating plans to hold this seminar in Uganda. I would also like to welcome and thank the experts who have come to give specialized lectures, and those who have prepared the ground to enable the seminar to take place in Uganda. I can assure you that your efforts have not been wasted. The seminar is being held at a time, amongst other things, when I had, under this same roof announced the formation of an institute of mass media communication. When that institute starts I would like to see scientific journalism being taught as a specific subject. It is my hope that you, as fore runners of this field, will be in a position to assist should we find it necessary to call upon your organizations for such assistance.

It is my honour and pleasure, Ladies and Gentlemen, to declare this seminar open.

Annex VIII. ADDRESS BY THE REPRESENTATIVE OF THE ECONOMIC COMMISSION FOR AFRICA

Hon. Minister,

Your Excellencies,

Ladies and Gentlemen,

I bring you the greetings of Mr. R.K.A. Gardiner, the Executive Secretary of ECA and the following message on his behalf:

The Economic Commission for Africa is very glad that we are holding this seminar on Science and Mass Media in Kampala. It is one stage further in the programme of promoting the interest of mass media and their operators in the very big task of bringing information about science to the ordinary people in Africa. This programme is a very important one because the march of the African peoples towards development and the creation of modern societies implies the gradual replacement of their existing cultures by new ones which will embody all the aspirations of our people for higher standards of living. These new cultures will, we hope, still be African but they will be based on a foundation of science and technology which will reflect their new-found dominance over the environment and their success in utilising the resources provided by nature for the betterment of human life.

The need to bring science to the people is not just the idea of a few individuals who feel that it is a good thing. It is a necessary part of the whole process which is envisaged by the different development plans that are being planned and implemented on the African continent. Hence the work of bringing science to the people needs to develop into a mass movement all over Africa. In this mass movement, mass media experts must work hand in hand with scientists, engineers and technologists of all types. The seminar which we are opening today is an additional step taken in the direction of getting the mass movement started.

A little over two years ago, a group of about 20 journalists, editors, radio and television programmers gathered together in Berlin to participate in what had been announced as a seminar on science and mass media. Many came prepared to be bored. Some thought the seminar would talk about electronic equipment for broadcasting; certainly, all came with some apprehension about whether they should have been there at all.

During the three weeks of that seminar the participants were talked at by journalists, by scientists and even by scientists who had turned journalists. There were also a number of trips through West Germany during which it was possible to obtain a full appreciation of what science and technology meant to the life of a modern successful country, and even more to see how the cultural life of the nation itself was permeated with the understanding of technology and with its successful use in serving the needs of daily life.

But the time the seminar came to a close at the end of these three weeks, all our journalists gathered at the seminar were quite convinced that they had come to the right meeting. More than that, many had also realised that the subject of science and technolology was one which they themselves were concerned with, and that this was not just an esoteric field for the devotees of science and technology. And so the seminar closed with many hopeful and ambitious resolutions for the future propagation of the ideas that had been discussed and argued for three weeks in Berlin, and also with a lot of good intentions about involving other journalists and mass media in the developing countries who could not be present in Berlin.

Since then there have been many developments all across the continent. In Nigeria, on the other side of the continent we already have a development in one of the largest and most powerful newspapers in West Africa, the "Daily Times" of Lagos, to create a new editorial division to deal with science journalism. This paper hopes, with effect from the middle of next year, to publish regularly each week a substantial science supplement that would be directed towards the mass objectives that have started the movement for bringing science to the people.

The seminar which we are opening today in Kampala is another kind of follow-up derived from the resolutions of the Berlin seminar two years ago. While the objectives of this seminar remain the same as the earlier seminar two years ago, we have one added objective here. This is to bring in the experts in the field of science and technology into the movement.

There are two reasons why the practitioners in the field of science and technology have to be associated with this task - one reason is that the job of bringing an awareness of science to the ordinary people and of creating new cultures based on the use of technology cannot be carried by mass media community as well as the scientific community. The second reason is that the people pay in many ways and through considerable sacrifices for the activities of the science community. Hence they also have a right to know in what ways the funds that they contribute towards the assistance of this privileged community are being used for the benefit of the whole nation. It is therefore one of the earnest hopes of the ECA that this seminar will also contribute towards local co-operation by the journalistic community and the scientific community, in the task of bringing science to the people.

During the next few days, we shall be going in detail into a number of topics. I will therefore not deal any further in this opening address with the substance of the seminar. I would like however, to express the appreciation of the Economic Commission for Africa on two matters: one is the considerable effort which has been put into the organizing of this seminar by our Chairman, Mr. Kihika, and the Local Organizing Committee in Kampala. We have always believed in the ECA that the function of all external technical assistance, whether from United Nations organizations

or bilateral agencies, should have primarily the objective of assisting the people in each country themselves to do things for themselves and thereby to take control and responsibility for their own destiny. In the preparation of this seminar, what has been furnished by the sponsoring agencies has been primarily some ideas and a little bit of support. The main task of arranging the details of our programme, arranging for the participants and for the facilities for holding the seminar have been carried out by the Local Organizing Committee. We are all witnesses today, to the efficiency with which the Local Organizing Committee in Kampala has carried out this task. I would therefore like to congratulate Mr. Kihika and his colleagues on the excellent organization of this seminar.

To our partners in the promotion of this seminar, here I refer to the German Foundation, I would like once again to express the appreciation of the ECA for their continuing support of this programme on science and mass media as well as for their support of other programmes which are making a very valuable contribution to development in Africa. I would like to say to Mr. Kraetsch, here who is representing the German Foundation, that the Foundation has come a long way with us in the ECA in the task of supporting ideas and action that are needed to promote progress in this continent. I hope that they will be able to work with us in the still long journey that we envisage lies ahead. I would therefore like to convey to the German Foundation the thanks of our Executive Secretary, Mr. Gardiner, for their continued co-operation with ECA and their support for African progress.

Finally, Mr. Chairman, I would like to say how much we are honoured today by the presence of the Hon. Minister (Mr. A.A. Ojera) who has found it possible to grace this occasion with his presence. The presence of the Hon. Minister is also a mark of the importance accorded in Uganda to this subject, because as well all know, there are many important political activities taking place in Uganda this week where perhaps his presence is mandatory. I would therefore like to thank the Hon. Minister, Mr. Ojera, for finding the time to open this seminar and also wish to convey through him to the Government of Uganda the appreciation of the ECA for their willingness to be host country to this seminar, and also for the considerable support which the organizers of the seminar have received from different offices and agencies of the Uganda Government.

We had hoped that it would have been possible to have two other country seminars in Nairobi and Dar-es-Salaam during this same period. However, owing to a number of factors which operated against the successful conclusion of arrangements on time, it was not possible to hold these seminars. Consequently, we have as international participants, invited from outside Uganda, a number of journalists and scientists from Kenya and Tanzania. We hope they will bring to the seminar an additional contribution based on the circumstances of their countries, and that they will return to

Annex IX. ADDRESS BY MR. E.H.L. KITAMIRIKE AT THE CLOSING OF THE SEMINAR ON SCIENCE AND MASS MEDIA AT THE INSTITUTE OF PUBLIC ADMINISTRATION - 27 NOVEMBER, 1970

Mr. Chairman,

Ladies and Gentlemen,

I feel most honoured to have been asked to close formally your week-old deliberations on the subject of Science and Mass Media.

The inter-dependence of both Science and the Mass Media cannot be over-stressed. On the one hand Scientific discovery is daily aiding the inter-course of peoples by establishing new and quicker media through which people can communicate. On the other hand scientific knowledge, in order to be understood and usefully employed by the people, requires the assistance of the mass media for its dissemination. I very much hope that during your discussions you have come out with concrete suggestions as to how this inter-dependence can be furthered to the benefit of mankind.

Seminars of this kind are useful in that they enable the interchange of knowledge by exports in their various fields. New ideas are formulated and new and improved ways of doing things are devised. Thereafter it becomes the duty of people and organizations closely connected with the subject at issue to see how best the new ideas can be adapted to meet changing needs and circumstances. It is my hope, therefore, that the conclusions reached at this seminar will provide food for thought for those engaged in the promotion of scientific knowledge and those concerned with disseminating information in one way or another.

It is not my intention to reiterate what my Minister has already said when opening this seminar. However, allow me to remind you of his expressed intention to set up an Institute of Mass Communications. He also pointed out his wish to see scientific journalism taught at that Institute, when it is eventually established. The institute will be a melting pot in which the technicians involved in the operation of mass media technical facilities, will meet with writers and producers who use those technical facilities. This proves that we in the Ministry are already taking seriously the subject which has been occupying your minds over the last one week. We are anxiously awaiting your report to see how we can be guided by your expert ideas in the establishment of this Institute.

I am sure you are well aware of the scarcity of trained manpower in the scientific and journalistic fields in developing countries like Uganda. It is exactly these people that we require to further the cause of our revolution of the Common Man. Your contribution to this revelution in the form of ideas which will advance the revolution is most timely and will be very greatly appreciated.

At this juncture I wish to associate myself fully with my Minister's appreciation for the initiative of the Economic Commission for Africa and the German Foundation for Developing Countries in organizing this seminar. I am also particularly grateful that they should have chosen Uganda as the venue for such important discussions. I wish also to thank those experts who have given lectures, and to express the hope the advice and knowledge they have contributed will be constant help in your future endeavours in tackling problems facing science and mass media. Lastly but not least I wish to thank the IPA for allowing us to hold the seminar here.

I would now like to formally close this seminar and to wish every participant a safe journey home.

Thank you.