

GENERAL REPORT ON PHOTOGRAMMETRIC AND REMOTE SENSING
EDUCATION AND ITS IMPROVEMENT IN THE WORLD

by

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Commission VI

Working Group 8 Report

ABSTRACT

The scopes and objectives of ISPRS WG-8 are presented. The world situation with regard to education in general and with regard to certain regions where facilities are particularly insufficient are elaborated. The paper reports on the organization of the working group and elaborates the work accomplished so far. Consensus in three specific areas, viz., (1) Curricula, (2) Manpower and facilities, and (3) Research are summarized. Cooperative development and self-determination on a regional basis are emphasized.

SOMMAIRE

Les buts et les objectifs du groupe de travail VI-8 de la SIPT sont présentés. La situation mondiale en général à l'égard de l'éducation et ainsi en particulier la situation à l'égard de certaines régions qui ont des facilités insuffisantes, sont élaborées. Cette étude présente l'organisation du groupe de travail et élabore les objectifs accomplis jusqu'ici. Les assentiments généraux dans trois aires spécifiques, à savoir, (1) les programmes d'études, (2) la main-d'oeuvre et les facilités, et (3) les recherches sont résumés sommairement. Des développements coopératifs et de l'auto-détermination sur les bases régionales sont accentués.

INTRODUCTION

In accordance with the bye-law 27 of the ISPRS statute, subsequent to the XIV Congress of the ISPRS held at Hamburg, FR Germany in 1980, the new President of Commission VI (Prof. Dr. Jürgen Hothmer) asked this author to form a Working Group and act as its chairman for the period 1981-84. The assigned task of this working group (ISPRS WG VI-8) is: "Promoting education and research on photogrammetry and remote sensing wheresoever feasible based on drawing conclusions from the earth-wide inventory of WG VI-I; listing monetary and personnel resources for benefitting educational institutes; exploring requirements for visiting professorships and developing solutions to meet these needs; exploring feasibilities for partnerships between educational institutes and developing solutions to meet respective needs; preventing overlapping with other Working Groups".

Realizing the complexities of education and research in the areas of photogrammetry and remote sensing in the world, and considering that a world consensus in this regard would very much be desirable, a committee (working group) of 15 colleagues from as many nations was formed. This group is significantly representative in terms of the ISPRS member nations they belong to, in terms of their institutions and in terms of their

expertise. While working towards the formation of the group, its chairman solicited ideas and opinions from group members and numerous other distinguished colleagues as well. The final list of the members is given below after their respective countries listed in alphabetical order:

Australia	:	Dr. Alfred Adamec
Brazil	:	Dr. J.B. de Andrade
Canada	:	Dr. Sanjib K. Ghosh (Chairman of the WG)
France	:	Dr. M. Carbonnell
Greece	:	Dr. Demetrius Rokos
India	:	Prof Prabhakar Misra
Italy	:	Dr. G. Inghilleri
Japan	:	Dr. Taichi Oshima
Kenya	:	Prof. David Nyika Kiromo
Netherlands	:	Prof. J. Visser
Nigeria	:	Dr. Olubodun O. Ayeni
Philippines	:	Prof. Cristy R. Hernandez
Poland	:	Dr. Zbigniew Sitek
Thailand	:	Dr. Wicha Jiwalai
U.S.A.	:	Dr. Roop Malhotra

The group, however, sustained a great loss in the untimely death of Dr. Inghilleri. Furthermore, there was an initial confusion at the ISPRS Council with respect to the Working Groups in Commission VI. This confusion having been removed by President Doyle, only in December 1981 the group started functioning.

ACTIVITIES

The group, with primary assistance from their individual agencies took up the task of assisting in updating the inventory of ISPRS WG-VI/1 (Chairman, Dr. A.J. Brandenberger). Having a correct and updated inventory is the beginning. To derive benefits from this is the final goal. That, however, requires close cooperations aimed finally at technology transfer, and mutual assistance (also in the form of inter-institutional research).

While not all modern technology is appropriate in all the countries, many areas can probably bypass many of the early steps in technological development. However, the very introduction of the technology often causes socio-political perturbations that do not necessarily parallel the steps of industrialization in the Western countries. A visible trend exists in the ensuing confusion in these regions. Before the confusion goes out of hand it is necessary that we take a look from the point of view of the world areas that are usually on the receiving end of "technology transfer".

The technology that has been working wonders in expensive-labour, cheap-capital economy cannot necessarily export it with happy results. The problem of "technology transfer" remains yet one of the knottiest facing the development officials and the academicians who are dragged into the problem arena. Sensing and relieving the burden is better done at the level of education wherefrom the society obtains usually its guidance and orientation.

Self determination and mutual cooperation are deemed better than mere foreign aid. It is in this context that some regional conferences were contemplated. They were deemed absolutely necessary. Regional, in view of differences in their requirements based on geographical and socio-economic conditions as well as to keep the groups smaller in view of

closer and in-depth cooperation. Conference, because conferences have been found to be the most effective initial contacts amongst several individuals intended to work in a team for mutual benefits.

On a closer study of the status of Education in photogrammetry and remote sensing, one can see three areas in the World that are in immediate need in this regard, viz.,

- 1) The African countries (in general);
- 2) The South-East Asian countries; and
- 3) The South and Central American countries.

The emphasis being on Education, at this stage, it was intended that individuals directly concerned with the academic problems in these fields would join such conferences. In view of developmental research, one can visualize, however, that non academic agencies may be included in such conferences should the need be felt. One would note, however, that there are other forums available to the production oriented governmental and business agencies. Thus initially it was proposed to keep such conferences restricted to only academic institutions, which, in some countries, would include governmental "in-house" training facilities/schools.

It was envisaged that these conferences would consider the following amongst other relevant topics:

- (i) Development of 'core' curricula for all accepted levels of technical education, i.e., those of (a) University level professionals; (b) Technologists; and (c) Auxiliary personnel.
- (ii) Inter Institutional cooperation in terms of (a) Exchange of teachers; (b) Collaborative research; (c) Cooperation in sharing educational materials like hard- and softwares; and (d) Cooperative publications.
- (iii) Development of regional professional papers and periodical publications aimed at exchanging technical information in regional languages, where feasible.

In view of above, three regional conferences were planned. However, due to various reasons only the following two materialized:

Conference I: For African countries.

Dates: August 15-17, 1982 Place: Ile-Ife, Nigeria

Conference Director: Dr. S.O. Ihemadu, Director
Regional Center for Training
in Aerial Surveys
P.M. Box 5545, Ile-Ife, Nigeria

Conference Co-Director: Dr. S.K. Ghosh, Chairman, ISPRS WG VI-8.

Conference II: For South-East Asian Region

Dates: May 16-19, 1983 Place: Kuala Lumpur, Malaysia

Conference Director: Mr. Mohd. Ibrahim bin Seeni Mohd., Deputy Dean
Faculty of Surveying,
Universiti Teknologi Malaysia
Kuala Lumpur 15-01, Malaysia.

Conference Co-Director: Dr. S.K. Ghosh, Chairman, ISPRS WG VI-8.

Around 150 colleagues involved in education or/and research in our fields in the specific region were invited to participate in each conference.

All academic institutions known to be teaching photogrammetry and remote sensing in the regions were invited to participate. In the selection of the participants, assistance was obtained from the reporters of the ISPRS from these countries and the listing of the UN member nations was consulted in considering the countries. The Data Bank maintained at the Laval University Department of Photogrammetry (efforts of Prof. Brandenberger) has been of extreme help in these regards.

In the so-called "developing countries" of the world, there is, on the average, less than one institution per country that imparts education in photogrammetry. The number is practically zero when one thinks of remote sensing. Thus, the efforts of the working group were intended to finally ameliorate the situation. While international politics, big business and international intrigues are at work on all fronts, we were concerned with down-to-earth problems related to the education in our field, with the hope that the academics will eventually give the lead that is lacking.

To reiterate, there are several high priority problems that would require our attention: (1) A need for an international assessment of manpower in the fields of photogrammetry and remote sensing education. (2) A need for developing unified curricula in these areas. (3) A need for collaborative researches and cooperation in sharing educational materials (hard- and softwares) and teaching personnel.

MANPOWER

Considerable spade work in this regard is credited to Prof. Brandenberger (e.g., 1980, UN publication, World Cartography, vol. XVI). For reviewing the manpower in Surveying and Mapping as well as for reviewing the institutions of education on a broad basis, one can distinguish the various educational levels into three categories: U, T and A.

U: University level professionals

T: Technologist/Technician categories

A: Auxiliary personnel (administrative and technical personnel e.g., office personnel, draughtsmen, mechanics, drivers, labourers, etc.).

For education planning in any specific field, an annual intake of 1/20 of the active manpower in that field is realistic. In view of this, on the average, based on studies of Brandenberger (1980), the following annual intakes into post-secondary school levels would be appropriate (see also Ghosh, 1983) for the whole world:

U level: 5 060 (of which about 5% in the doctoral level) or about 1 professional per 500 000 inhabitants;

T level: 26 600 or about one technologist/technician per 100 000 inhabitants; and

A level: 21 000 or about one auxiliary personnel per 115 000 inhabitants.

Note: These figures are based on the world averages. One may consider values higher or lower depending on the country being developed or developing, respectively.

One must recognize that the strength of a profession is directly related to the strength of its educational system. The strength would be visible in the profession's organizational structure both out of the school as

well as in the school. We have noted developmental trend during the last two decades in various countries of the world. We ought to maintain the tempo in the right direction. Each region has its characteristic need for specific type of education level. If readily available, this level of instruction could relieve the burden of on-the-job training by the employers. This will also provide potential for aspiring capable young persons to pursue college level education programs and thus increase their employment potentials with an openness which is being advocated more and more in the regions.

CURRICULA

Surveying and mapping educational curricula in general and photogrammetry in particular have undergone drastic changes over the past three decades. On the other hand, Remote Sensing has just started making a headway.

Educators and practitioners in the mapping fields have been experimenting with curricula while the society at large was demanding more complex and yet more comprehensive and more extensive services. On the other hand, there has been tremendous developments in terms of equipment, procedures and general understanding in the basic subject areas of our fields (mapping sciences) and other associated areas like mathematics, physics, computer technology, etc.

Clearly the profession has responded well to these needs in view of the developments. These two forces continuously at work have helped the crystallizations of the disciplines. Thus the surveying and mapping profession is no longer content with having one or two courses of a civil engineering curriculum, or having geodesy and astronomy being taught in a geographical study program. A vastly upgraded university education in our fields is the logical result. This, however, is not yet evident in most countries.

A Conceptual model of the present day undergraduate education in our fields is given in Fig 1. The core discipline of Mapping--Photogrammetry & Remote

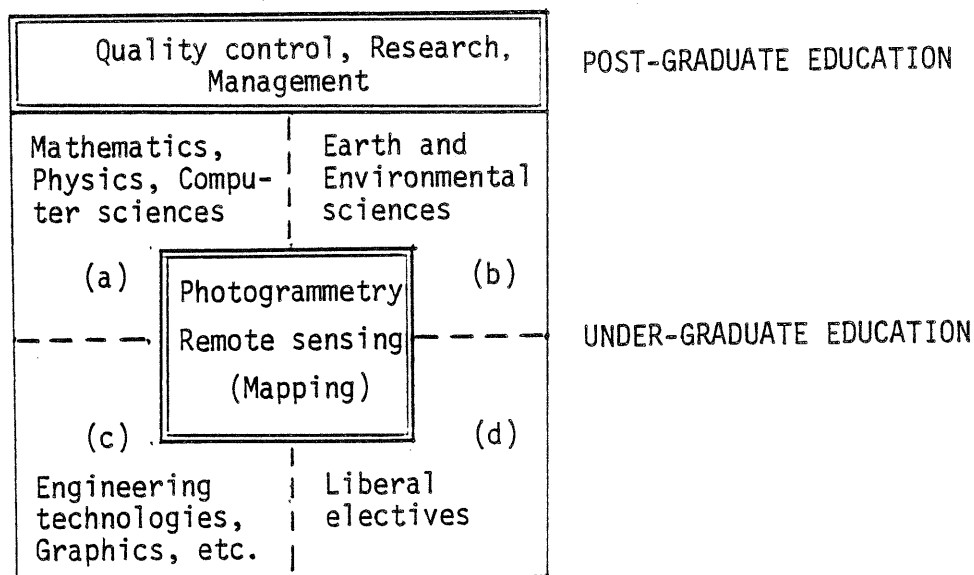


Fig 1: A conceptual model in Photogrammetry and Remote Sensing Education

Sensing cannot be complete without the four associated areas of:

- (a) Mathematics, physics and computer sciences;
- (b) Earth and environmental sciences (including Geodesy, Astronomy, etc.);
- (c) Engineering Technologies, Graphics, Electronics, etc; and
- (d) Liberal electives (economics, law, literature, etc.).

So far as post-graduate education is concerned, some preparations are necessary in the advanced levels of Quality control, Management and Research experience. But then, this must be built on top of the broad undergraduate program. The associate areas (a, b, c and d above) are generally well established in the institutions in all countries. The curricula and programmes development must, then, concentrate on the core area of our concern. This is where we need to cooperate. The idea is not to force a curriculum but to exchange views so that we all can benefit mutually in reaching our own viable programs.

RESEARCH

Research can be defined (see Ghosh, 1976) along three broad categories of Basic research, Applied research and Development. The term "Research and Development" (R&D) as generally used is assumed to embrace all three above.

For the purpose of convenience, at least in the academic world, we differentiate between Research and Instruction. However in a university, generally, the two are closely related. Furthermore, it is entirely appropriate and, indeed desirable, that the coupling of research and service in the context of teaching-learning mission of the university should be encouraged and continued.

In the world today, three factors combine to give new meaning and importance to the development of photogrammetry and remote sensing:

First, the age of direct, graphical mapping in the field -- in the classic sense of the term -- has largely been liquidated. Thus, non-'Advanced' countries (and their organizations) -- often themselves but recent 'graduates' from 'dominated' status -- are obtaining a degree of scientific independence and freedom of decision and maneuver which is, in a collective sense, unique in their recent histories.

Second, such developments are accompanied by a revolution of rising expectations. Great many people exposed to highly sophisticated concepts and systems are becoming actively dissatisfied with their traditional techniques and are demanding some measure of modernization. These demands coincide with the availability of skills and technologies necessary to support such modernizations. Gradually, the technological and power gap which has long separated the "Developed" from "non-Developed" is beginning to narrow.

Third, such developments are taking place when modern communications and competitions have made all men uneasy neighbors.

In view of these it is time that we start talking about cooperation in both Instruction and Research. In all the countries, with respect to the utilization and application of Remote Sensing and Photogrammetry in particular, real power has resided within formal organizations of governments. Therefore, in the international field, proper coordination can be effective only with the cooperation of the governments. In a scientific discipline, such coordination can be enhanced by the scientific societies,

associations or similar cooperative institutions, which generally can run only with government support (direct or indirect). On the other hand, direct government involvement would contain tremendous amounts of red tape and many noble efforts may be lost in the geopolitical arena. In this respect, we have in the ISPRS an international forum, which functions with the cooperation of practically all the governments concerned, without their direct involvement and authority. This would offer excellent opportunities.

There are, however, two factors of concern:

- (a) All countries do not have their national societies.
- (b) Alliance for research between any two countries may raise suspicion unless the matter is broadly open. In this respect multi-national forums seem more logical.

The two international regional conferences were held under the aforementioned guidelines with particular emphasis on the three specific areas of activities, viz: (a) Manpower and facilities, (b) Curricula, and (c) Research (and associated publications). Details of these conferences would be available in their respective reports. Numerous papers were presented, discussions were conducted, ideas were exchanged. The highlight and accomplishments would be apparent in the resolutions adopted at the end of each conference. These are given below for ready reference.

Resolutions at the 1982 Conference at Ile-Ife, Nigeria

- (1) Such Regional Conferences should be held as much as possible in various places.
- (2) In future, for more effectiveness and the achievement of greater benefits the participation at future Conferences should, in addition to the academic institutions, include public and private representation.
- (3) Participation at future Regional Conferences need not be limited to the African Region and the ISPRS but may also include representatives from other regions of the world, as well as from international organisations.
- (4) Future Conferences should include invited papers from experts within or outside the region in addition to presented papers.
- (5) Panel Discussion should be encouraged at future Conferences.
- (6) In view of the impact of such Conferences on the Educational Status in this particular field, moral as well as financial assistance from International or other organisations would be highly appreciated.
- (7) Non-Commercial and Commercial exhibits should be encouraged.
- (8) In future, particular attention should be given to curriculum development in the various academic institutions with due consideration to regional and professional requirements in Photogrammetry and Remote Sensing.
- (9) In view of observed gross inadequacies in the Region in training facilities (such as Manpower, Instrumentation and Library facilities), due attention should be given to this problem.
- (10) Special attention should be given to professional status and recognition of Specialists in Photogrammetry and Remote Sensing.
- (11) Due consideration should be given to developing advanced level education in Photogrammetry and Remote Sensing.

- (12) Special attention should be given to the lack of Funding for Research and Development in Educational Institutions.
- (13) Necessary attention should be given to the need to complete questionnaires whenever circulated.

Resolutions at the 1983 Conference at Kuala Lumpur, Malaysia

- (1) Recommends to develop a stereo-imagery set training-aid (similar to the set developed at the University of Illinois and by The Japan Society of Photogrammetry and Remote Sensing) with regional examples.
- (2) Recommends that all restrictions on aerial photography that are not sensitive to the national securities be lifted in all countries in the region as is done in most of the countries of the world.
- (3) Recommends that the ISPRS Information Retrieval System would be made available on a free-of-charge basis.
- (4) Recommends that the universities in the region be encouraged to develop programs leading into masters and doctoral degrees. Furthermore, extension (or refresher) courses in all levels be encouraged also. This should, however, be done after appropriate studies on the manpower requirements in each country is made.
- (5) Recommends that countries which have not yet established a professional society in photogrammetry and remote sensing should consider to do so and to cooperate closely.
- (6) Recommends that the matter concerning education in geodesy, surveying and mapping, photogrammetry and remote sensing on higher levels in the South East Asian region be carefully studied. This may lead into an invited paper for the Rio-de-Janeiro ISPRS Congress in 1984.
- (7) Recommends that in photogrammetry and remote sensing programmes in universities, efforts be made to obtain/provide appropriate funds to perform research in conjunction with graduate students. Various national and international sources be explored and exploited to that effect.
- (8) Recommends that a regional newsletter in photogrammetry and remote sensing be published as soon as practicable.

It would suffice to say at this point that our concerned colleagues have already started acting on these resolutions. But then, we have to go a long way before we can say that we have come even closer to our cherished goals on all fronts.

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