REMOTE SENSING — AT ERINDALE COLLEGE

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INTRODUCTION

The surveyor, as the measurer and delineator of the physical features of the earth (and of the legal features of parcel boundaries) has many tools of the trade. The ultimate purpose of surveying is to secure the optimal use of land and its resources to meet social and economic needs. One of the tools the surveyor can use is remote sensing.

> *Remote sensing from space is potentially one of the most important sources of information required for solving global resource-management problems.*
>
> *W. A. Radlinski, 1983*

He also states:

> *Unless surveyors take full advantage of these new technologies and expand the results of their work into new areas which can use their talents, the surveyor's role in the information age could be considerably diminished.*

Remote sensing is taught in Survey Science at the University of Toronto to provide future surveyors with a knowledge of these new technologies.

THE COURSE

THE COURSE title is "Remote Sensing and its Interpretation". It is intended as an introductory course, to give a broad understanding of remote sensing with particular emphasis on its application. Students from many disciplines take the course, e.g. biology, geology, geography, forestry, as well as surveying. This broadens the interest of the group and gives each student a feel for the other areas of resource management that are involved in using the same technique.

Both Forestry and Geography Departments on the St. George campus offer remote sensing courses. The course taught at Erindale is different from these in its strong emphasis on application of the technology, rather than the physical principles of the remote sensing systems. The course has two one-hour lectures per week in spring term. Problem sets, assignments and study guides are performed in the student's own time.

1. WHAT. Remote sensing is the science and art of acquiring information about objects from measurements made at a distance (Colwell, 1983). It is a cross between photogrammetry, airphoto interpretation and computer analysis. The beginning of the course introduces the basic concepts of remote sensing and satellite data acquisition. Because some airphoto interpretation is taught in the photogrammetry course, the remote sensing course concentrates on satellite systems and non-photographic airborne systems; although the often used remote sensing tool of infra-red photography is covered, particularly for agricultural purposes. The main satellite and space-borne systems, such as Landsat, the Heat Capacity Mapping Mission, France's SPOT, SEASAT, the Space Shuttle's SIR (Shuttle-Imaging Radar), the Coastal Zone Colour Scanner on Nimbus, and Canada's proposed Radarsat program are described. The typical airborne systems used in Canada, e.g. Side-Looking Airborne Radar (SLAR), reflected and thermal infra-red photography, the MEIS scanner from Canada Centre for Remote Sensing and laser systems, are also described. Video remote sensing is being researched by the Forestry Department and is taught there. Remote sensing for meteorological applications is touched upon but not described in depth.

2. WHERE. The bulk of the course is in the applications of remote sensing, mainly:

- land use, urban planning, change detection
- water resources, environmental monitoring
- geology, geomorphology, mineral exploration
- forestry, agriculture
- hydrography
- archaeology

Minor areas include wildlife habitats, planetology and astronomy. Although geophysics is a subject of remote sensing, this is a large area of specialization and is not covered in this course.

One quarter of the marks for the course are on a 15-20 page report. The student chooses an appropriate subject, usually in one particular application. Students in previous years have written reports on subjects ranging from pattern recognition to remote sensing and privacy, sea-ice monitoring to determining primary productivity in aquatic systems. Each student gives a 15-20 minute oral presentation of their report to which all interested staff and students are invited. Ten percent of the total course marks are assigned for this presentation. The other course marks are: interpretation assignments - 6%, problem sets - 6%, study guides - 3%, and exam 50%.

3. HOW. The students learn from their own interpretation and studies which remote sensing method is best used for each particular application.

For the first 8 weeks of the course, the student's homework consists of following eight study programs. Each program consists of a booklet containing information and questions, a documentary cassette tape and a set of slides showing images. These study guides lead the student through the interpretation of many different remote sensing techniques. The students also have two interpretation assignments that they select from a number of applications (e.g. geology, land use, comparative studies). The assignments involve looking at remotely sensed imagery, preparing a report and/or map and answering questions regarding the image and its interpretation.

This part of the course also introduces digital image processing. Because most remote sensing data is collected in digital form, it allows computer manipulation and classification to produce maps from the images. Topics, such as image processing and enhancement, image detection, extraction and representation, and pattern recognition, are covered briefly. This gives the student the introduction needed to later take a higher level course in image analysis. There is a course "Image Processing for Remote Sensing" offered at Erindale.

4. WHY. Remote sensing is used for energy, natural resource and environmental management in strategic planning by government and industry. Current techniques are linking remote sensing to the large land information systems that are being established by municipalities at all levels. Already the mapping industry uses satellite images to produce maps (1:250,000) and to update existing maps (1:100,000 and 1:50,000). Remote sensing techniques are invaluable for reconnaissance mapping, in areas that are hard to access, and where large regions have to be covered. Route planning for transmission lines and gas pipelines is made much easier using satellite and airborne images. The applications are endless.

CONCLUSION

The future in surveying, as with most other disciplines, is both a broadening of scope and a depth of specialization. There are so many things the professional must be aware of to provide the best service to the client. Without the most up-to-date knowledge surveyors will be failing in their professional task. The modern surveyor, therefore, has to have a general understanding of all of the areas that affect the surveying profession, and have enough knowledge to find the correct specialist as needed.

There is now too much in a surveying curriculum for any one student to specialize in all of the topics. In the past, a surveyor was also a geodesist. Today, the surveyor can also become a land information manager or perhaps a hydrologist. Each aspect of surveying attracts and amplifies the abilities of different types of people. Let us rejoice in that, escape the narrow confines of present practice and look to the future. ●

REFERENCES

Colwell, R. N. 1983. Manual of Remote Sensing. Edition 2, Volumes I and II.
Radlinski, W. G. 1983. "A Satellite View of Natural Resources". Opening address, The Royal Institution of Chartered Surveyors Annual Conference, Stratford-upon-Avon, July 1983.