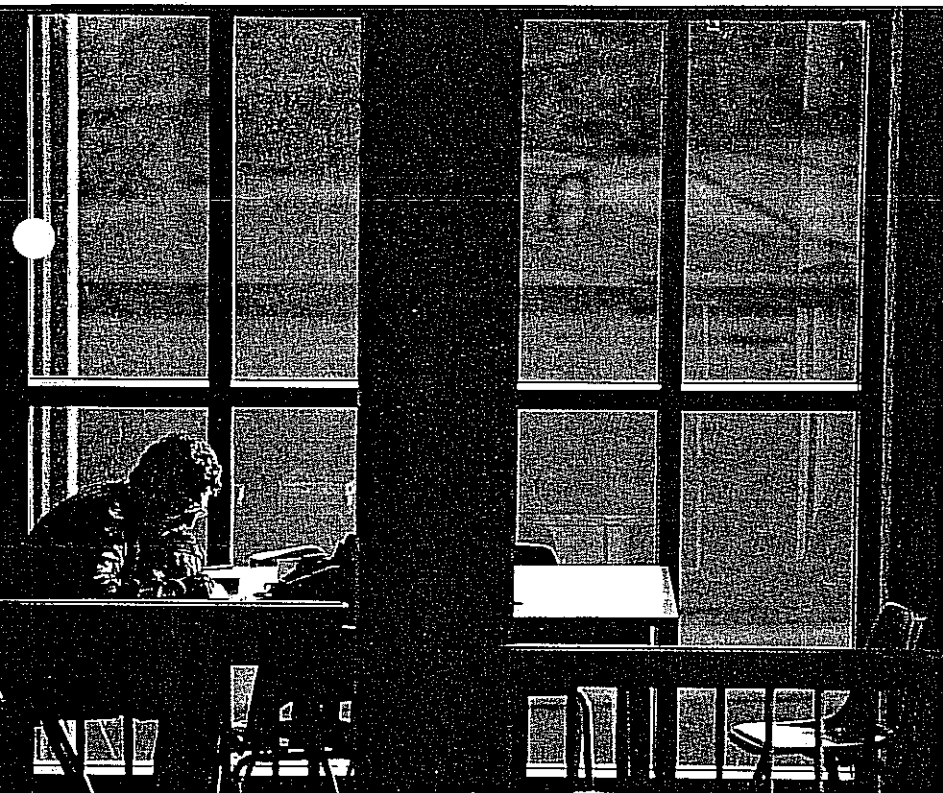


Making High-Quality GIS Education Accessible: A European Initiative

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At the Technical University of Vienna, a major European Community-funded initiative is creating a new approach to continuing education in geographic information systems (GIS) for professionals.

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Geographic information systems (GIS) education has clearly become a growth industry. For those establishing courses in GIS during the past few years, the concern has often been simply getting a GIS course approved and into the classroom. In many cases, the generic National Center for Geographic Information and Analysis (NCGIA) *Core Curriculum in GIS* provided a convenient starting point. Now that the initial frenzy of new course offerings has passed, however, it is time to examine more deliberately the various kinds of educational needs in the GIS workplace.

Knowledge about GIS is important in a broad range of jobs — from entry-level

technical jobs, in which hands-on skills are important, to management-level jobs, in which a general awareness of the technology and its applications is more appropriate. Between those two extremes are various occupations requiring assorted combinations of in-depth knowledge and skills. Each type of job presents a different challenge for educators.

Fortunately, traditional educational structures and institutions can meet many of those needs. Building on the experience of the few early leaders in the field and taking advantage of the growing number of textbooks and other teaching materials, universities around the world now offer an extensive selection of GIS courses. They range from introductory courses for general education to specialized geographic information science degrees. For educators working with students at the beginning of their educational journey, elsewhere in this issue Palladino and Goodchild discuss NCGIA's current efforts, which are directed at encouraging the introduction of GIS into secondary education.

But what about individuals who completed their formal education years ago? In many fields, experienced professionals find that they, too, need the kind of formal education in GIS that only the most recent university graduates have had easy access to. How do professionals, managers, and scientists obtain entry into the GIS world? For most of those people, returning to full-time university life is out of the question.

Current educational options for GIS professionals are a bewildering array of software seminars, conference tutorials, workshops, and short courses. Locating the appropriate course that fits a particular set of needs is often frustrating and time consuming. Once such a course is found, many busy professionals find that they learn too little of what they expected to cover, or that they are thrown too deeply into an area in which they lack basic knowledge. The frustration of wasted time does not lead to a satisfying educational experience.

What is needed is a coordinated, well-planned program of studies that can be acquired within the constraints of a regular work schedule. This article describes an initiative of the European Community (EC), under the Community Action Program in Education and Training for Technology (COMETT) program and coordi-

nated by the Technical University of Vienna, to examine the needs of GIS professionals and develop a comprehensive, international, postgraduate course in GIS.

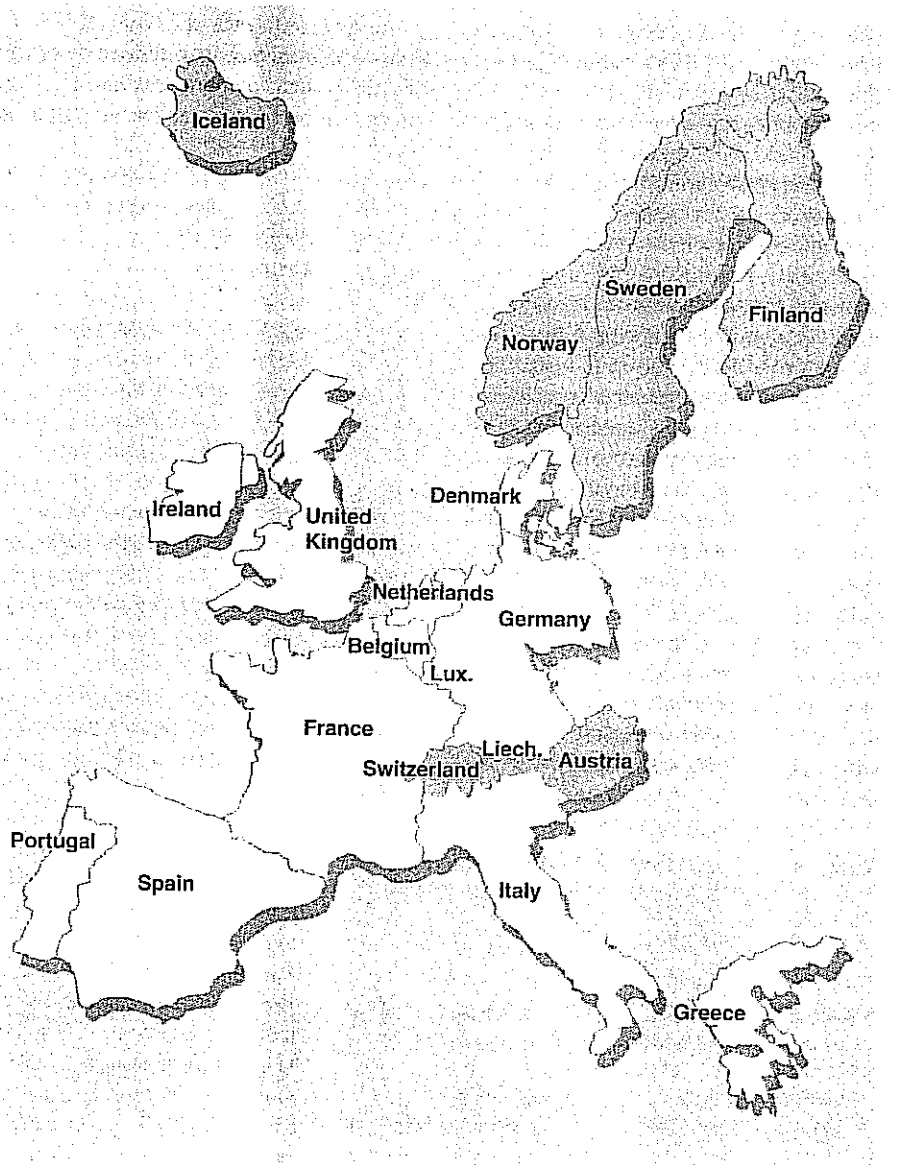
THE COMETT PROGRAM

The Commission of the European Communities' COMETT program has been designed to encourage cooperation between universities and industry to develop and provide training in advanced technologies. Although many of the COMETT projects address manufacturing, research, and medical technology, GIS falls within the program's mandate. Transnational exchanges of expertise and training resources are a fundamental element of COMETT projects. In addition to organizations in the 12 member countries of the EC, organizations in the seven members of the European Free Trade Association (EFTA) are also invited to participate in the program.

Using the opportunities provided by the COMETT program, the Department of Geoinformation at the Technical University of Vienna, under the direction of Professor Andrew U. Frank and in association with universities and private enterprises in Austria, Germany, Greece, the United Kingdom, the Netherlands, Italy, and Spain, has been awarded a 350,000 ECU (about \$427,000), multiyear grant to develop an International Postgraduate Course in GIS. Table 1 lists partners in the project. Funding and support of this magnitude provides an opportunity, equaled only by those provided to nationally supported organizations such as NCGIA, to initiate a comprehensive, international, GIS education concept and to ensure its full development.

THE INTERNATIONAL POSTGRADUATE COURSE IN GIS

To provide both the necessary depth and breadth, the structure of the International Postgraduate Course in GIS is a compromise between full-time, semester-length courses that provide extensive information spread thinly over a long period of time and short, one- or two-day intensive workshops that cover single topics in great depth or general topics superficially. The structure of the course is based on experience gained from the success of a professional GIS course now being conducted in Austria under the direction of Professor



EC countries are shown in blue-green; EFTA countries are shown in purple.

Karl Kraus at the Technical University of Vienna. In that course, during the past two years, a group of 36 Austrian professionals have received an in-depth education in the foundations and applications of GIS technology.

The proposed COMETT course consists of a sequence of three, two-week intensive units taught in the classroom, together with a practical project unit completed by each student at home. The four-unit set will be presented during a one-year period. This structure will allow students to continue their regular work duties with minimal interruption while receiving more than 200 hours of classroom and laboratory instruction, plus more than 70 hours of practical experience. Using the NCGIA *Core Cur-*

riculum concept of 75 one-hour lectures plus weekly laboratory sessions as a model, this course provides considerably more hours than a standard, year-long, university course. After successful fulfillment of course requirements students will receive an internationally recognized diploma.

The courses will give participants a common background in GIS architectures, their functionalities, and their integration into various administrative processes; however, it also will contain an eclectic mixture of general and specific topics. Unlike traditional university courses that are offered as part of a full curriculum, this postgraduate course must stand alone. Although students will be expected to have

completed a university degree in any subject area related to GIS — including geography, surveying, geology, economics, or computer science — the diversity of formal and informal educational backgrounds will necessitate including elements of basic topics such as statistics, computer science, and geography.

COURSE DEVELOPMENT

Based on experience gained during development of the NCGIA *Core Curriculum*, this project has begun with a comprehensive examination of the special needs of postgraduate students and of the workplaces in which they are employed. Using a modified Delphi approach (Linstone and Turoff, 1975), we are currently soliciting and compiling the opinions of a large group of GIS educators, industry professionals, and government managers about the skills and knowledge they believe GIS professionals should have. The results of this survey, expected in late spring 1993, will provide the backbone for developing the course.

Responsibility for developing the materials within each course unit will be shared by the project partners; overall development will be coordinated by the Technical

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University of Vienna. Teachers, laboratory instructors, and teaching materials will be developed by the participating universities; industry partners will contribute equipment, additional instructors, and materials for hands-on exercises. By coordinating contributions from individuals and organizations in many different countries, an international, though mainly European, focus will be ensured.

During development of the teaching materials the course will be offered three times under the terms of the original COMETT grant: during 1993 in Vienna, 1994 in Italy, and 1995 in Spain. Because the COMETT program stresses international cooperation, participants in these courses will come from all over Europe.

The first three rounds of the course will allow the development team to evaluate and revise the course materials before they are prepared in their final form. Under the conditions of the COMETT contract, course materials in the form of student workbooks, data sets for laboratory exercises, and teacher's notes and overhead transparencies will be available for purchase. We anticipate distributing these products through a traditional publishing house, although we are committed to ensuring that costs will not be prohibitive. Additionally, a continuing series of these courses likely will be offered in various European locations during the next several years.

GIS EDUCATION IS MATURING

It is satisfying to see GIS education maturing. NCGIA's development of the *Core Curriculum* occurred in an atmosphere of impatience and general naiveté as colleges and universities rushed to meet the needs of the rapidly expanding GIS industry. Now, in North America at least, the desperate need for materials and programs in GIS education increasingly is being satisfied. Time is now available to look at GIS education in a broader perspective and to fine-tune how it is packaged and presented for different student audiences and applications. Both the newest nationally directed efforts of NCGIA and the international efforts of the European Community through the Technical University of Vienna are sure to result in a more satisfying and productive educational environment.

For more information about the Delphi survey or the professional course and related teaching materials, please contact Karen Kemp, Department of Geoinformation, Technical University of Vienna, Guss-hausstrasse 27-29/127, A-1040 Vienna, Austria, fax: 43 1 504 3535 and electronic mail: kemp@geoinfo.tuwien.ac.at.

REFERENCES

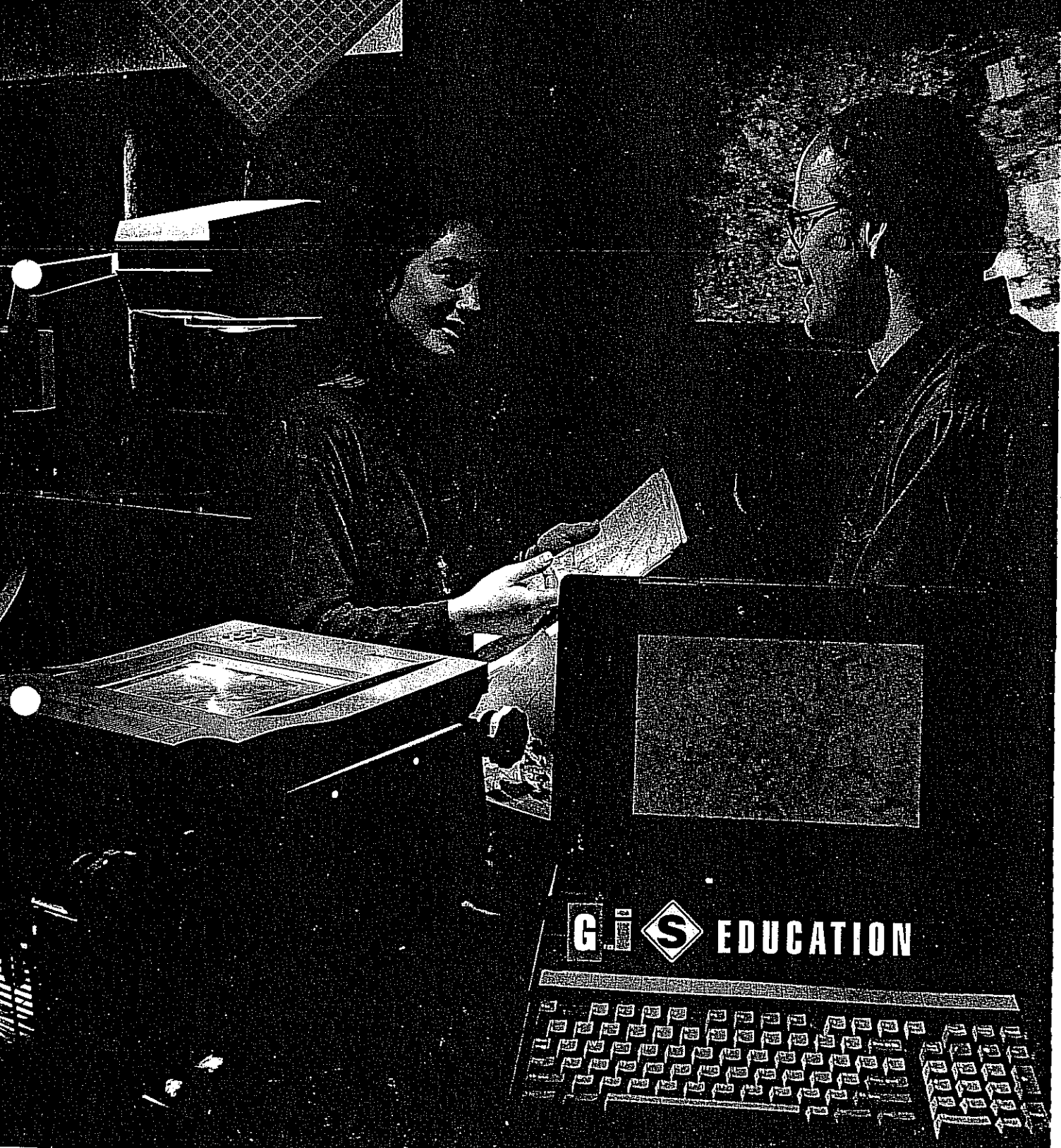
Linstone, H.A., and M. Turoff. 1975. *The Delphi Method*. Reading: Addison-Wesley. ■

Table 1. Partners in the International Postgraduate Course in GIS

Project coordinator	Technical University of Vienna, Austria
Project contractor	Engineering Technology Services, Pisa, Italy
Industry partners	Andreas VANA Automatische Datenverarbeitung, Vienna, Austria Dipl.-Ing. Höflinger, Innsbruck, Austria Dipl.-Ing. Peter Schmid, Vienna, Austria ESRI Espania Hellenic Information Systems, S.A., Athens, Greece 3M Austria, Vienna Siemens/Nixdorf, Munich, Germany Smallworld Systems LTD, Cambridge, United Kingdom
University partners	Delft University, The Netherlands National Technical University of Athens, Greece University of Karlsruhe, Germany University of Glasgow, Scotland, United Kingdom Universidad Autonoma de Madrid, Spain
Other organizations	Comité European des Responsables de la Cartographie Officielle (GERCO), Paris, France Institute of Italian National Research Council (CNUCE), Pisa, Italy Surveying and Mapping Agency, North Rhein-Westfalia Region, Bonn, Germany Research Institute for Applied Knowledge Processing (FAW), Ulm, Germany University-Enterprise Training Partnerships (UETP): UETP Danube-Austrian Network of Universities and Business for Education (DANUBE) UETP Women into Technology in the EC (WITEC) UETP Toscana

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