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# CARTOGRAPHICA

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Special Issue: ICA Commission on Mountain Cartography  
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# Introduction

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This special issue was conceived at the Eleventh General Assembly of the International Cartographic Association (ICA) in Ottawa, Canada, 14–21 August 1999, following a particularly lively session on relief depiction, which included presentations by Karel Kriz and Lorenz Hurni and was chaired by Roger Wheate. The conference also included the first meeting of the ICA Commission on Mountain Cartography (CMC) group, where Tom Patterson proposed a workshop at Mt. Hood in 2002, which proved to be the final gathering of papers for this issue. As a collective goal, they attempt to describe the status and progress of mountain cartography either within a region or country, or within techniques of representation, that are important to mountain cartography.

## Special Challenges in Mountain Cartography and the General Overview, Ideas, and Goals of the ICA-CMC

The challenges of mountain cartography have become more urgent in recent years because of the increased social and economic importance of mountain regions. The growing use of high-mountain areas as outdoor leisure parks can be observed in the recreation-oriented societies of Europe, North America, and Japan. In Europe, the Alpine and other mountainous countries play a major role for transit traffic between northern and southern regions of the continent. In Third World countries the population pressure leads to a more intensive settlement and economic harnessing of mountain regions. Not surprisingly, the number of natural hazards with devastating consequences to humans is increasing as a result. The combined influence of these developments will create an important demand for economic, societal, cultural, and scientific action in mountainous areas during this century.

Considering the growing importance of mountain areas, the demand for adequate cartographic base data with respect to its content, application, graphic design, and media is also increasing. The analysis and visualization of a large spectrum of new themes requires new cartographic methods and approaches, which go beyond classic topographic and thematic cartography. In this endeavour, mountain cartographic research stands only at its beginnings.

During the Nineteenth International Cartographic Conference in Ottawa in 1999, a new ICA Commission on Mountain Cartography was established in order to meet these demands.

The ICA General Assembly accepted the following Terms of Reference (see <http://www.karto.ethz.ch/ica-cmc>):

- Definition of the scope of subjects of high mountain cartography
- Promotion of mountain cartography
- Provision of a platform to promote the exchange of ideas and scientific collaboration
- Compilation of a Web-based compendium
- Collection of mountain cartography and related on-line links
- Collection of bibliographic references
- Status of national mountain cartography activities (federal agencies, private companies, etc.)
- Promotion of joint research projects with other organizations and ICA commissions

## Past ICA-CMC Meetings

The Working Group on Mountain Cartography of the German Society of Cartography (the forerunner of the Commission on Mountain Cartography) was established in 1996 during the International Cartography Congress held at Interlaken, Switzerland. The main aim of this group was the discussion on special issues of high mountain cartography, its promotion, and the scientific exchange between international researchers. In order to realize these goals a general workshop forum was established. The core members of the ICA-CMC now organize biannually an international workshop to bring together scientists, practitioners, and even artists in the field of mountain cartography. The first such workshop took place in 1998 in the Silvretta in the Austrian Alps.

WORKSHOP SILVRETTA, 26 FEBRUARY TO 1 MARCH 1998  
Thirty-four participants from seven nations gathered for the first workshop of the Working Group on High Mountain Cartography in the Silvretta area (Bielerhöhe Pass) in Austria (Germany ten, Austria nine, Switzerland eight, Poland three, Italy two, USA one participants). This work-

shop was organized by Karel Kriz from the University of Vienna and covered a broad thematic spectrum in order to survey the extent of the mountain cartography discipline. Considering the workshop's theme, it was advantageous to find a venue in a high mountain area. Accommodation and the conference facilities at the Silvretadorf (Madlenerhaus, 1986 metres above sea level) proved ideal for this event. Based on the incoming contributions, the workshop consisted of a total of 22 contributions in three thematic sessions: Topographic Cartography, Thematic Cartography, and Map-Related Representations and Multimedia Cartography. The results of the workshop were published in the series Wiener Schriften zur Geographie und Kartographie in fall 1998.

WORKSHOP RUDOLFSHÜTTE, "HIGH MOUNTAIN  
CARTOGRAPHY 2000," 29 MARCH TO 2 APRIL

Forty-four participants from nine nations gathered between the second Workshop on High Mountain Cartography at Rudolfshütte, Austria. The workshop was held under the auspices of the ICA Commission on Mountain Cartography and was organized by Manfred Buchroithner and his team from the Technical University of Dresden, as well as by Heinz Slupetzky of the University of Salzburg. The aim of the workshop was to cover all aspects of the visualization of high mountain terrain, both topographic and thematic, as well as multimedia developments. TU Dresden published the proceedings of the workshop in 2001.

MT. HOOD, MOUNTAIN CARTOGRAPHY WORKSHOP,  
15–19 MAY 2002

The International Cartographic Association Commission on Mountain Cartography held its third Mountain Cartography Workshop at 1829 metres / 6000 feet above sea level on the volcanic slopes of Mt. Hood, Oregon, USA. The workshop covered all topics related to mountain mapping, including avalanche mapping, geo-visualization, glacier mapping, relief presentation, photogrammetry, remote sensing, multimedia, software development, tourist mapping, and GPS. It was organized and carried out by Tom Patterson from the US National Park Service. The 2002 Mountain Cartography Workshop – the first ICA Mountain Cartography Workshop to be held in North America – attracted 40 participants from nine nations (Austria, Canada, Germany, Japan, Romania, Slovenia, Spain (Catalunya), Switzerland, and USA). Lawrence Faulkner, president of Solid Terrain Modeling, Inc., delivered the opening keynote address; and Bill Stoehr, president of National Geographic Maps gave the closing banquet address. The proceedings are available on-line at [http://www.karto.ethz.ch/ica-cmc/mt\\_hood/proceedings.html](http://www.karto.ethz.ch/ica-cmc/mt_hood/proceedings.html).

### Overview

The papers in this special issue of *Cartographica* describe

the nature of mountain cartography across seven different countries in Europe and North America and can be divided into three groups. The papers by Petrovic, Baella and Pla, and Wheate and others, outline the history, current activities, and future prospects for mountain cartography in Catalunya, Slovenia, and Canada respectively. Their situations contrast a rugged mountain region served by a dedicated cartographic institute, a small country with a rich tradition of mountaineering, and a large, sparsely populated country with extensive mountain areas.

The second group of papers by Haberling and others, Hurni and others, and Jenny focus on specific techniques in relief cartography, respectively for glacier mapping, cliff drawing, and relief shading. These outline advances in digital procedures, in comparison with their analog counterparts. All three contributions are from Switzerland, an indication of the leading contributions of this nation to automated cartographic research, long established in analog cartography.

The third group of papers by Kriz, Patterson, and Wood share the central theme of visualization, enhancing the three-dimensionality of the relief surface to depict avalanche phenomena in Austria, and mountain panorama in the United States and Scotland respectively. Collectively they identify the tradition of 3-D cartography and the additional advantages of digital techniques in surface representation.

### Conclusions

Mountains pose unique challenges to the cartographers who map them, as they are higher, colder, more remote, and more rugged than adjacent lowlands. Just obtaining data is often difficult. In addition, the data and tools common to the mapping profession – aerial photographs, digital elevation models, and GPS – exhibit limitations and require special handling when used for mountain mapping. For example, dense shadows often completely obscure the steep slopes of mountains on aerial photographs – a problem seldom encountered on gentler terrain. When it comes to cartographic presentation, the pronounced three-dimensionality of mountains complicates the fundamental problem of depicting the round earth on flat map surfaces, be they paper or digital displays.

Despite these challenges, or perhaps because of them, mountain mapping has spurred innovation. The development of shaded relief during the last two centuries largely resulted from cartographers' in the Alpine countries of Europe seeking a better way to depict high mountains, a benefit to map users everywhere. The rock drawings (hachures) used to depict alpine crags on their maps solved a specific mountain mapping problem not addressed by conventional cartographic design. As cartographers from all backgrounds experiment with new data formats, software applications, and visualization techniques, mountain landscapes will continue to be a rigorous proving ground for testing geo-spatial ideas.

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The papers that follow give readers a sampling of mountain cartography's rich history and contemporary research, and a glimpse at its future direction.

#### **General Information**

All figures integrated in this special issue can also be accessed in colour through the ICA-CMC homepage at <http://www.karto.baug.ethz.ch/ica-cmc>

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