Cartography in Switzerland
1984–1987

National Report for the ICA-Conference 1987 in Morelia (Mexico)
Swiss Society of Cartography

Société suisse de cartographie

CARTOGRAPHY IN SWITZERLAND 1984 - 1987

National Report presented to the 13th International Conference of the International Cartographic Association in Morelia, Mexico, 1987

Cartographic Publication Series No.8

Published by the Swiss Society of Cartography
Addresses of the Society:

Secretariate: Swiss Society of Cartography
c/o Institut für Kartographie
ETH-Hönggerberg
CH - 8093 Zürich / Switzerland

Delivery of publications: SGK-Publikationen
c/o Orell Füssli Graphic Arts Ltd.
P.O. Box
CH - 8036 Zürich / Switzerland

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The map samples have been made available by the offices and firms concerned.
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Preface

With this booklet the Swiss Society of Cartography (SSC) presents its fifth National Report to the Conference of the International Cartographic Association (ICA). As encompassingly as possible the report briefly describes the cartographic activities in Switzerland for the period 1984 to 1987. Because of the lack of funds, this report will be published only in the English language.

The undersigned would like to thank all members of the Society, the official agencies, institutes and companies who have made a contribution to this well-illustrated report in the form of a written text or by having made available map samples.

Feldmeilen, February 1987

The President of the SSC

Heinz Leuzinger
The Activities of the Swiss Society of Cartography

Aims of the Society
The Swiss Society of Cartography, founded in 1969, is an association of specialists and other parties interested in cartography. Its aims are the advancement of theoretical and practical cartography and the education of professionals. The society seeks to disseminate knowledge in the field of map production, map use and the history of mapping, and to exchange know-how with specialists at home and in foreign countries.

These aims are to be achieved through scientific meetings, technical visits and educational courses, through the work of commissions and working groups, through the publication of internal news letters (about six times per year) and through various educational publications.

Members
On January 1, 1987 the SSC had a membership of 217, made up of 194 individual and 23 collective members (official agencies, firms, institutes). The individual members consist of the following professional groups:

<table>
<thead>
<tr>
<th></th>
<th>1973</th>
<th>1986</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartography</td>
<td>70%</td>
<td>72%</td>
</tr>
<tr>
<td>Surveying</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>Geography</td>
<td>12%</td>
<td>16%</td>
</tr>
</tbody>
</table>

The year 1986 was overshadowed by the death of our highly esteemed honorary member Prof. Dr. h.c. Eduard Imhof. He was co-founder and first president (1961-64) of the International Cartographic Society.

Executive committee
Until spring 1984, the executive committee consisted of Kurt Ficker (president), Heinz Leuzinger (secretary I), Hans-Uli Feldmann (treasurer), Kurt Bigler (secretary II) and Claude Vez, Gunther Merkle and Prof. Kurt Brassel.

In 1984, after 6 and 13 years of membership respectively, Claude Vez and Kurt Ficker retired from the executive committee.
On January 1, 1987 the following members were on the executive committee:

President: Heinz Leuzinger, Zürich
Secretary I: Prof. Kurt Brassel, Zürich
Secretary II: Kurt Bigler, Bern
Treasurer: Hans-Uli Feldmann, Bern
Further members: Carmen Brun, Zug
Hans Haueter, Bern
Gunther Merkle, Zürich

Scientific and technical meetings
The following meetings were organized by the SSC between 1984 and 1987, coinciding in part with the annual general assemblies:

1984: - The 3rd International Meeting for Cartography (Austria, Germany and Switzerland) was organized by the German Society of Cartography and held in Stuttgart. Members of the SSC presented 2 excellent papers and several contributions for the exhibition 'Map Techniques'.

- Visit of the map archives at the Swiss Federal Institute of Technology (ETH) in Zürich

- Lecture and exhibition on the research of the history of cartography

- Panel discussion: Cartography in Switzerland - today and tomorrow

1985: - Visit of the exhibition of the artistic work by Prof. Dr. h.c. Eduard Imhof

- Lecture on regional land protection and conservation with an excursion to river bank conservation projects

1986: - Visit of a printing center. Introduction to automation in newspaper production.

- Lecture and exhibition on geological mapping (tasks and projects of the Swiss National Geological Survey)

1987: - Report on large-scale mapping (cadastral survey) in Switzerland
Educational courses

The following educational courses were organized by the SSC, partly in collaboration with other institutions:

1984: Interpretation of topographic maps (lectures, excercises).
   Duration: 1 day

1985: Advanced course in cartographic generalization.
   Duration: 3 hours a week from April to June

1986: Interpretation of thematic maps (lectures, excercises).
   Duration: 2 days

1987: Computer-assisted cartography (lectures, demonstrations).
   Duration: 3 days

Working groups of the SSC

- Vocational Training Commission
  In 1982 this group was formed under the supervision of Mr. Kurt Ficker with the object of reviewing the vocational training program with respect to the most recent developments in cartography. The 'Regulations for the Vocational Training and Final Examinations of Cartographers' from February 22, 1979 were found to be too restrictive and will therefore have to be revised and formulated in greater detail. Based on the regulations, all of the objectives for each year of apprenticeship are contained in this program. Together with bi-annual reports, it is a complete guide for instructors.

At the present the regulations and the training program have been submitted to the Office of Wages of the Employers Association and will be passed on to the Federal Office of Industry and Labour. Finally this office will put the new regulations into effect after a thorough inspection.

In collaboration with various firms and institutions, the SSC has organized an instruction course in computer-assisted cartography for apprentices every year since 1983. The course lasts for five days and is taken during the fourth year of the apprenticeship. It is financed jointly by cartographic firms and the SSC.
- History of cartography
The most active member of this group is its chairman, Prof. Arthur Dürrst. He and other members have taken part in conferences on the history of cartography in Germany, Austria and Canada. During the last four years, an additional series of ancient maps were reproduced as facsimile prints, again of an excellent quality and supplemented by scientific documentations.

Collaboration in ICA-commissions
In the period of this report the SSC was represented in the following ICA-commissions:

Permanent commissions:
I. Cartographic education Kurt Ficker, Bern
II. Cartographic techniques Prof. Ernst Spiess, Zürich
III. Advanced technology Prof. Kurt Brassel, Zürich
IV. History of cartography Prof. Arthur Dürrst, Zürich

Ad-hoc commissions:
VI. Urban cartography Dr. (Mrs.) Haruko Kishimoto, Zürich
IX. Census cartography Dr. Hans Steffen, Bern

Working groups:
1. Cartographic enterprises Gunther Merkle, Zürich
3. Map interpretation Dipl.-Ing. Rudolf Knöpfli, Bern

Joint inter-association working group
1. IGU/ICA Environmental Maps and Atlases Dr. Christoph Brandenberger, Zürich

Activities
Commission I: Prof. Ernst Spiess (Institute of Cartography, Swiss Federal Institute of Technology) prepared the chapter 'Map Design and Generalization' for the publication 'Basic Manual on Cartography'.
Mr. Kurt Ficker is co-ordinating the Swiss contribution for the publication 'Basic Manual, Exercises'.

Commission II: Prof. Ernst Spiess participated in the meeting of this commission in Fort Lynaes. He submitted manuscripts and illustrations to the president of the commission in Perth for a chapter of the publication
'Cartographic Techniques'. Furthermore, he participated in the translation of English texts and designed a supplement of digital techniques for the manual.

Commission III: Prof. Kurt Brassel participated in three meetings of this commission. He prepared the chapter 'Essay on Cartographic Generalization' for the publication 'Research and Development'.

Commission VI: Dr. Haruko Kishimoto participated in several meetings and she prepared the paper 'Computer Atlas and Urban Cartography'.

Working group 3: Dipl.-Ing. Rudolf Knöpflı presented several papers on the subject 'Cartographic Communication'.

Working group IGU/ICA: The Federal Office of Topography and the Department of Geography at the University of Zürich participated jointly in tests to organize a World Digital Database.

Publications
So far the SSC has published the following volumes of its cartographic publication series:


SFr. 30.-


SFr. 35.-


SFr. 30.-


SFr. 20.-

SFr. 20.-


SFr. 25.-


SFr. 30.-

The SSC will publish the following booklets in 1987:

No.8 Cartography in Switzerland 1984-1987 (National Report for the ICA-Conference in Morelia, Mexico). Approx. 80 pages, incl. 40 map samples, size 17x24 cm.

SFr. 25.-

No.9 Generalisierung (a collection of lectures on generalization, given at the SSC-course 1985). Approx. 100 pages with numerous illustrations, size 21x29.7 cm, in German.

SFr. 30.-

The publications can be ordered through bookshops or directly at the following address:

Mr. Gert Schelling, SGK-Publikationen
c/o Orell Füssli Graphic Arts Ltd.
P.O. Box
CH - 8036 Zürich

Direct delivery only if advance payment (postage included in the given prices) is made on the postal cheque account 80-8839-2, Schweiz. Gesellschaft für Kartographie, Publikationsversand, Zürich, Switzerland.
Outlook
With the boom of thematic cartography collaboration with other branches will increase sharply. This tendency is further influenced by the increasing number of possibilities in the electronic processing of spatial data based on a geographical model. Besides keeping abreast of these developments, the SSC must continue to promote classical cartography.
Cadastral surveying is under the supervision of the Federal Directorate for Cadastral Surveys. The actual surveys are made by the cantons or by private surveying firms.

The scales of the Cadastral Plans (Property Boundary Survey) vary between 1:200 for cities and 1:10'000 for mountainous areas (depending on the value of the ground and the mean size of the lots). In a project organized by the Federal Department of Justice and Police, suggestions were proposed to redefine the contents and the form of official surveying and to improve its services.

The scales of the General Cadastral Plans differ between the various cantons. Each canton has its own official map scale, even though they also reduce or enlarge their plans for different publication purposes.

<table>
<thead>
<tr>
<th>Scales:</th>
<th>Cantons:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 2500</td>
<td>ZH, BS, GE</td>
</tr>
<tr>
<td>1: 5000</td>
<td>ZG, BL, SH, AG, TG, NE, TI (southern part)</td>
</tr>
<tr>
<td>1:10000</td>
<td>BE, LU, UR, SZ, OW, NW, GL, FR, SO, AR, AI, SG, GR, VD, VS, JU, TI (northern part)</td>
</tr>
</tbody>
</table>

**Content**

The cadastral survey, legalized by the revision of the Swiss Code of Civil Law in 1912, was primarily conceived as the basis for land registry in Switzerland. Due to the growing intensity of land use in the last three to four decades, the demand for more accurate and more readily accessible information concerning land and soil has increased immensely. For this reason the contents have been redefined and classified as follows:

1. Fix points
2. Vegetation
3. Individual objects and line elements
4. Nomenclature
5. Land ownership
6. Servitude
7. Legal ownership restrictions
8. Underground utility cables and mains
9. Heights
10. Soil use
11. Administration

* = new
Form
The official survey of the future will be a numerical survey. In other words, the processing of all of the information — from registering, treatment, administration and issuing — will be computerized. Advantages of this method are on the one hand that the information is resistant to ageing and on the other hand that the combinations in processing and issuing data are almost unlimited. In addition, the graphic representation is very flexible with respect to content, scale and graphics as such. New conventions in drawing, based on the DIN and ISO norms, are being discussed and will be compulsory for cadastral plans.

The official final report will be published in the course of 1987. It will be presented to all interested parties for comments and will then serve as the basis for the badly needed revision of the legal prescriptions on the federal and cantonal levels.
Federal Office of Topography

Seftigenstrasse 264, 3084 Wabern

Hans-Uli Feldmann

Personnel
The number of employees at the Federal Office of Topography has remained a constant 150, 39 of which are engaged in the field of cartography. In addition there are 11 apprentices in cartography (apprenticeship commenced in 1984:4 / 1985:2 / 1986:2 / 1987:3) and 1 apprentice in offset printing. Because personnel expansion has been restricted since 1974 by a parliamentary ordinance, production squeezes must be met through internal job rotation and personnel shifts.

Topographic maps
The principal task of the Office of Topography is maintaining the 6-year revision cycle of the approximately 350 National Maps at the following scales:

1: 25'000:  249 sheets, series completed 1979  (map image = 70 x 48 cm)
1: 50'000:  77 1/2 sheets, series completed 1960  (map image = 70 x 48 cm)
1:100'000:  22 1/2 sheets, series completed 1964  (map image = 70 x 48 cm)
1:200'000:  4 sheets, series completed 1976  (map image = 100 x 71 cm)
1:300'000:  1 sheet, photographic reduction of 1:200'000 (revised 1985)  
            (map image = 121 x 81 cm)
1:500'000:  1 sheet, published in 1964 (revised 1986)  
            (map image = 77 x 48 cm)

(See diagram on one of the following pages)

Assembled maps: map image = up to 100 x 72 cm)
1: 25'000:  14 sheets
1: 50'000:  21 sheets
1:100'000:  3 sheets

Currently the new edition of the map 1:100'000 (map image = 100 x 70 cm) is being worked on; it is planned for publication in 1990.
Thematic maps

By order of the military and other federal offices, various thematic maps were produced and to some extent continually revised, for example:

- Aeronautical charts (by order of the Federal Office for Civil Aviation)
  - ICAO 1:500'000 (annual revision), 1 sheet
  - Charts of Air Navigation Obstacles (ONAV)
    1:300'000 (annual revision), 1 sheet
    1:100'000 (revised every other year), 22 1/2 sheets

- Map of castles 1:200'000 (in cooperation with the Swiss Castle Society)
  With the publication of sheet 4 in 1985, the set is now complete. Each set includes a general map 1:200'000, a brochure with a description of the objects and a booklet with detailed maps.

- Political maps:
  Four sheets at 1:200'000, 1 sheet each at 1:300'000 and 1:400'000 (revised 1984).

- Hiking maps 1:50'000 (in cooperation with the Swiss Hiking Association)
  10 sheets of this series have been published. A 2-color overprint shows the marked trails and the official post car routes.

- Ski route maps 1:50'000 (in cooperation with the Swiss Ski Federation)
  This series of 18 sheets is printed on syntosil. A 2-color overprint shows routes for ski tours, the public transportation to and from the routes and the official post car routes.

- Soil maps 1:25'000 (by order of the Federal Forestry Research Institute in Reckenholz)
  7 sheets have been published so far and an annual production of 3 sheets is planned.

- Atlas of Switzerland
  The publication of this atlas is a continuous task. The work on the first edition began in 1961 under the direction of Prof. Dr. h.c. Eduard Imhof and brought to a temporary halt in 1978 (after 9 deliveries of the atlas). In that year the Federal Council accepted the conviction of the editorial board that not only topographic maps but also thematic maps must be subjected to continuous revision.
Since 1978 Prof. Ernst Spiess is in charge of editing the Atlas of Switzerland. All of the map compilation work is done by a small group of the Department of Cartography at the Federal Institute of Technology in Zürich. To a considerable degree computer-assisted methods are used for the redactional work. A program package called DIAMANT has been developed to prepare diagram maps from statistical data. The final films are exposed by a light spot projector on a flatbed plotter. For all other stages in the production and reproduction of these maps, the Federal Office of Topography uses conventional methods like scribing and stripmask processes. In the future these techniques will be partly replaced by the SCITEX computer system.

Under the supervision of Prof. Spiess, the 11th edition of the Atlas of Switzerland was published in 1984 (12 sheets with 20 maps). The 12th edition should appear at the end of 1987.

The Atlas of Switzerland is structured as follows:
- General topographical and political situation
- Geology, soil, geomorphology, geophysics, climate and weather, hydrology, flora and fauna
- Historical development
- Demography
- Settlement
- Agriculture and forestry
- Natural resources and power industry
- Industry, trade, services, commerce and finances
- Traffic, communication systems
- Educational institutions
- Landscapes of the Alps, the Plateau and the Jura

DIKART
In 1984 the Federal Office of Topography launched project DIKART to register a universal digital data base of topographic elements. The information is taken from the existing National Maps. Due to technical reasons and various delays, the first step is confined to establishing a digital terrain model of Switzerland.

The next step is to venture into the field of computer-assisted cartography with the SCITEX computer system. For its future development as a technical institute, it is of vital importance that the Office of Topography acquires the necessary know-how in all of the digital processing fields. Various kinds of thematic maps have already been produced with the aid of computers.
Federal Office of Civil Aviation

Central Aeronautics Information Service,
Inselgasse, 3003 Bern

Jean-François Piller

Introduction
The Swiss official aeronautical charts are published by the Federal Office of Civil Aviation (FOCA), CH-3003 Berne. They are part of the Aeronautical Information Publication (AIP) Switzerland, but may be obtained separately. These charts are drawn at scales varying between 1:10'000 and 1:470'000 and are printed by the Federal Office of Topography (S+T). The National Map series are used as topographic base maps for most aeronautical charts.

Methods of production
The Central Aeronautical Information Service (CAIS) is in charge of the AIP and map publications; it has 3 staff members. One CAIS specialist is responsible for the compilation, the editing and revision of the charts, as well as the final proof-reading of the originals before printing. Due to the lack of specialized staff and adequate equipment, the CAIS is obliged to engage private cartographic firms to draw and reproduce the map originals.

Activities
- In the course of regular AIP amendments, Approach and Landing Charts (VAL/IAL), Aerodrome Charts, Aerodrome Obstacle Charts, Index Charts, etc. are published at an annual rate of about 30 in sizes A5 or A4 and 10 in A3 or larger format (11'000 copies per chart).

- Aeronautical Chart ICAO-1:500'000, 2253-B/Switzerland, 17th edition: 1986. By making use of digital cartographic systems, data of the aeronautical overprint are stored and readily accessible for up-dating. Some of the plotted film positives can be partly used as final originals.

- Chart of Air Navigation Obstacles (ONAV) 1:300'000, 18th edition: 1986. All available information on obstacles is stored in a computer at the S+T. This provides the CAIS with a list of obstacles and serves as a data bank for the automated production of the overprint originals. The last two editions of the ONAV chart include an aeronautical overprint with information for glider flights such as special airspaces and frequencies. As a
supplement to the chart, a booklet is published in German and French, also intended for glider pilots.

- **Radionavigation Chart (RNC) 1:1'000'000**

- **Visual Approach and Landing Charts (VAL)**
  In 1986 the scale was changed from 1:50'000 to 1:100'000. Furthermore, its base maps are furnished with a hill-shading portrayal and an overprint for wooded areas. The production of this well-proven series is being continued.

**International Activities**
The aeronautical charts conform to the specifications of Annex 4 to the Convention on International Civil Aviation (ICAO). In addition there are international agreements on the standardization of the Aeronautical Chart ICAO-1:500'000. The CAIS takes part in ICAO activities on matters of aeronautical cartography.
Since its founding in 1860, the Swiss Geological Commission, which is a private organization, has been responsible for the geological surveys and the publication of the resulting maps. In most other countries, this function is carried out by the government. This exception has lasted for exactly 125 years. With respect to the growing importance of geological research, the Federal Council passed a resolution on October 16, 1985, to integrate the activities of the 'Division of Geological Mapping' and the 'Swiss Geological Archives' into the federal administration. The present number of employees, however, has remained the same.

The Division of Geological Mapping, located in Basel, has 3 geologists, a cartographer and a secretary. The geological surveys are usually made for specific jobs. On the other hand, there are numerous geologists who are working on different surveys on a voluntary basis. The cartographic work is done either by private firms or by the Federal Office of Topography. The following maps have been completed in the period covered by this report (1984-87):

**Geological Atlas of Switzerland 1:25'000**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Area</th>
<th>Nr</th>
<th>Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>1128</td>
<td>Langenthal</td>
<td>79</td>
<td>1984</td>
</tr>
<tr>
<td>1067</td>
<td>Arlesheim</td>
<td>80</td>
<td>1984</td>
</tr>
<tr>
<td>1237</td>
<td>Albulapass</td>
<td>81</td>
<td>1987</td>
</tr>
<tr>
<td>1268</td>
<td>Lötenschental</td>
<td>82</td>
<td>1985</td>
</tr>
<tr>
<td>1192</td>
<td>Schächental</td>
<td>83</td>
<td>1987</td>
</tr>
</tbody>
</table>

**Specific geological maps**

<table>
<thead>
<tr>
<th>Nr</th>
<th>Map Description</th>
<th>Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>Geological Map of Central North Switzerland 1:100'000 (with adjoining area of Baden-Württemberg)</td>
<td>1984</td>
</tr>
<tr>
<td>122</td>
<td>Geological Map of the Swiss National Park 1:50'000</td>
<td>1987</td>
</tr>
</tbody>
</table>

Cartographic or editorial work is in process for the following sheets of the Geological Atlas of Switzerland:

- 1073 Wil
- 1106 Moutier
- 1126 Büren a.A.
- 1129 Sursee
- 1234 Lausanne
- 1247 Adelboden
- 1285 Les Diablerets
Soil Map of Switzerland

What is soil?
The soil is the upper-most, loose layer of the earth's crust. It serves as anchoring site for plants and forms an integral part of the landscape. Soil is produced by natural occurrences such as erosion, formation of humus and clay, chemical reactions, redistribution of material, etc. The important soil forming factors are climate, initial material, topography, vegetation and time.

Variety of soils in Switzerland
The pattern of distribution is determined by topography, initial material and the local climate. A colorful patchwork is formed by a changing pattern of deep and shallow, rocky and fine, wet and dry, rich and poor as well as flat and steep soils. Shallow soils are found in cold and mountainous regions and where soil changes over to rock. In the plains and hilly regions the biological activity often reaches a depth of 1 to 2 meters. In comparison to other soil zones around the world, the soils in Switzerland are considered to be young, having been covered by glaciers of the youngest period or otherwise influenced relatively recently. The soils are especially fertile in the plains and hill country and are well-suited for agriculture and forestry.

Soil maps
Soil maps can serve as guidelines in scientific research and agriculture and are a valuable basis for land use and nutritional planning. The use of a soil map depends on its scale (see list of soil maps of Switzerland).

Soil map of Switzerland 1:500'000
This map shows the geographic distribution of the most important soil associations occurring in our country. The smallest representable area measures about 10 km². Since the soil variation is usually close-meshed, there are actually several soil types represented by a single soil association area on the map. Therefore, the mapping units in small-scaled maps are very complex. The different soil associations shown in the legend are named
after the dominant soil type. The various sub-units or related types of each unit are listed in the accompanying table. These 23 units are divided into seven main groups according to the soil forming factors, namely climate, initial material and topography. Besides a general map of this kind, however, more detailed soil maps at larger scales are required.

National planning for practical soil use

Spatial planning in our country must always take into consideration the diversity of the natural factors. It should be used as an aid in fulfilling the constitutional order for appropriate soil use and well-structured settlements.

Following the pioneer work of the Institute for Municipal, Regional and Land Planning at the Federal Institute of Technology in Zürich, the first soil suitability map 1:300'000 for agricultural use was produced in 1973. It had already become evident that the spatial - cartographic representation of this first map needed to be much more detailed. In addition, the agricultural and wooded areas of a more detailed map would have to be treated separately. The soil suitability map 1:200'000 provides experts in planning, agriculture and forestry with a valuable tool. In showing the essential differences of the soils, one idea behind this map is to awaken the awareness that the limited amount of land available for cultivation in Switzerland must be used with the utmost of care.

Soil in its natural formation

The cultural landscape is changed through clearing, afforestation, agriculture, soil enrichment, riverbed corrections and construction. Mankind decides the long-term fertility, protection and destruction of the soil.

Today and in the future, no human intervention should be attempted or undertaken without first consulting a soil map.

The series of soil maps of Switzerland at 1:25'000 is a long-term project begun in 1977. Up to 1986, seven sheets (Uster, Hochdorf, Lyss, Hörlim, Grindelwald, Wohlen and Murten) as well as a part of the sheets Davos and Scarlettapass have been published (incl. explanatory text). The soil map - is an important basis for municipal and regional planning (conserving the most fertile soil, improved zoning),
- provides agriculture and forestry valuable information on practical soil use (see table on soil use in agriculture and forestry),
- is valuable to scientific research of natural areas.

**Detailed soil maps**

Maps at the scales of 1:1000 to 1:10'000 are a requisite for real-estate mergers, soil enrichment, management planning in agriculture and forestry and provide advice on environmental fertilization practices. These are usually unpublished maps used in soil assessment reports.
Computer-assisted Water Conservation Map of the Canton of Bern, 1:25'000

With the systematic publication and up-dating of the map series on water conservation, the Canton of Bern has taken a decisive step towards water conservation. Today this map is an essential tool in dealing with projects which might endanger particularly our groundwater resources and aquifers. The idea to improve the up-dating of maps was realized in a pilot project. Its goal was to be able to produce permanently revised maps in shorter cycles and smaller editions through automation. The resulting data base would then be available for other users.

After concluding a 12-month test period, the thematic content was prepared on the basis of a general topographic map 1:10'000 and registered and up-dated with computer assistance. The thematic content of the Water Conservation Map is stored on two separate levels:
- Areas of water conservation:
  - Demarcation of zones S1 (incl. divisions I, II, III), S2, A, B, C, raster, consecutive classification number
- Source and groundwater data:
  - Authorized quantity of withdrawal, flow in liters/minute, consecutive classification number within a km²

Data of general interest, which for example can be used in the production of other thematic maps, are stored on two additional levels:
- Delineation of the sheets:
  - The four corner coordinates, division in km, coordinates and lettering
- Political boundaries

The program consists of several independent modules written in standard FORTRAN F77. The data are registered and edited on a digitizer with an interactive digitizing program. Since the necessary topographic information is only available in a graphic form, the data preparation on the screen is not interactive. Instructions are displayed on the terminal or on a digitizer display. A menu inside the digitizing area can be used to activate auxiliary functions or to code line types, symbols and text. In order to
ensure the accuracy of the different layers, pass points must first be
digitized after starting the program to determine the transformation con-
stants. If no gross errors show up after a Helmert transformation, the sub-
sequently digitized data are transformed into cartesian coordinates with an
affine transformation. Besides making plausibility tests, this method auto-
matically compares the geometric field data and allows the incorporation of
additional information stored under the same address in other data banks.

Because each digitized symbol or string of text has an assigned point of
reference, the data can be edited in the usual manner (delete, insert,
append, change, etc.). The connection between the nodal points is a single
line which can be addressed at any desired position. They can also be split
into line elements and treated separately, an enormous help in up-dating.
Since all of the digitized data have an assigned feature code, the entire
map content can be treated not only per square km but also selectively
according to municipalities.

Various kinds of graphic restitutions are possible within the plot module.
Plot files with an arbitrary combination of lines, symbols and text or test
plots of the entire content can be produced and recalled on a terminal or
plotter. Having defined and processed the line-screen layer, several para-
meters are at the users disposal for the final representation of the image.
Margin coordinates can be selectively suppressed, symbol and text windows
can be projected into the line-screen input and priorities affecting the
overlay of individual elements can be set. There are two scribing tools,
the finer one having a line-width of 0.08 mm. The relative simplification
of up-dating attained through the application of hardware and software by
far outweighs the costs ensued from the digital preparation of the graphic
water conservation map series.

We would like to thank Aerni-Leuch AG, Liebefeld/Bern and Diaset AG, Hinter-
kappelen/Bern for the free reproduction of the map annex 'Water Conservation
Map of the Canton of Bern', 1146 Lyss 1:25'000, and Prof. E. Spiess,
ETH-Hönggerberg Zürich, for his cartographic assistance.
The official city map of greater Basel was digitized from 1978-79 and published at the scale 1:12'500. The map image measures 80 x 100 cm and was printed as a 4-color offset. The finely structured data base allows an arbitrary selection of scales ranging from 1:5000 to 1:80'000. The digital information is periodically up-dated before each new edition.

Maps with distorted scales are being tested for touristic purposes and for use in traffic planning. The digitized cartesian coordinates are transformed by the appropriate mathematical equation, depending on the projection. Through parametrization of the equations, specific scale parameters can be set for the center of a map. This scale decreases linearly towards the margins of the maps by a given increment.

Using this method, it is possible to represent areas with a large information density, such as the center of a city, at a large scale whereas the suburbs with a smaller information density can be shown at a smaller scale. For those needs where the scale does not have to be true, the required information can be shown on a relatively small area.
Private Cartography in Switzerland

Gunter Merkle

Introduction
Private cartography in Switzerland consists of a few firms which publish their own maps and do cartographic work to order. These firms have a staff of well-trained cartographers. In addition, there are several smaller cartographic offices where mostly free-lance cartographers work for private publishers, public offices and various other customers. Most of the cartographers are trained in Switzerland and the courses they take follow the official guidelines. The curriculum and the educational regulations are continually adapted to the changing conditions of cartographic techniques.

In the last few years the cartography departments have been exposed to changes due to the increasing influence of electronic data processing (EDP). Besides large investments, there is the problem of the proficiency of the experts working with interactive plotting systems. More intensified schooling is required and is also being realized. A particularly costly aspect is the preparation of geographic data banks and their application in the broadest sense. This new technique represents a great challenge for cartographers, especially because the specific cartographic techniques (for example generalization) have not yet been solved by the interactive systems.

Even so, maps are already being produced in Switzerland using the new technique and also experience is acquired and applied. The larger firms have realized that the demands for more up-dated maps on the one hand and the apparently increasing importance and use of the electronic media as an information and reference system on the other hand will lead to the development of the EDP-solution. The cartographic businesses are thus forced to take a leap forward.

On the following pages several firms will present their activities in publication and map production.
Aerni-Leuch AG in Bern is known for its pioneer work in Diazo copying and packaging techniques. It must be mentioned, however, that the company, founded in 1907, started out in reprography and has been active in this field ever since. Compared to larger companies, the reprography and printing branch is a rather small part of the whole firm. On the other hand, Aerni-Leuch is able to fulfill almost any special orders. It's strength lies in the fast, economic and competent way that these usually small editions are handled. It doesn't make any difference if these are city maps, construction zone blueprints, spatial planning maps or hiking maps. The cartography, photography and printing departments are all under one roof, furnished with the most modern equipment. Together with the experts in the field of mapping techniques, the customer is guaranteed a dependable product on schedule.

Worth mentioning are the production of graph paper (ranging from the simple millimeter grid to complicated probability grids, available in about 300 different variations) as well as the direct image-to-image color photography in sizes up to a length of 350 cm, requiring neither slides nor internegatives.

Counting the two specialized branches of Diazo copying and packaging, Aerni-Leuch has around 300 employees.
Kümmerly + Frey AG

Hallerstrasse 6-10, 3001 Bern                        Kurt Ficker

Kümmerly + Frey was founded in 1852 as a company with a diversified line of business, but it has always been especially proud of its cartographic branch. The products of the publishing house include 153 street maps as well as world maps, continental maps and various other kinds of small-scale maps. Each year several new titles are added to the list. About 50% of the cartographic capacity is spent on revising these maps in a one- to two-year cycle.

The publication program also includes 7 street atlases, 7 city maps, 63 hiking maps, 15 bicycling maps, 14 travel guides and 2 world atlases. Furthermore, there are 23 different illustrated books listed under geographic literature.

In addition, there are special publications for customers all over the world such as the tourist industry, banks, insurances, hotel chains, automobile representatives and airlines. In the line of school maps, there are 11 school maps including the new School Wall Map of Switzerland at the scale 1:200'000 showing cultural features, vegetation and relief shading.

The firm has 230 employees. There are 150 technical employees, 39 of which are occupied with conventional cartography and 6 with computer-assisted cartography.

Computer-assisted cartography found its way to Kümmerly + Frey in 1981. A SCITEX computer with a digital, raster-image processing system and 2 editing stations were installed. Due to the constantly increasing application of this system in cartography in the last 2 years, extensions must be added to increase its capacity in the coming years. For the time being an IBM-PC with a digitizer was installed which has brought a tremendous relief in digitizing all sorts of planning maps. A series of street maps and several geographic maps have already been digitized and the up-dates are now done exclusively interactively on the screen. These maps are primarily base maps and can thus be easily adapted and used for other purposes, which is what many customers often want. The diversified use of these kinds of products justifies the cost of establishing a data bank all the more.
Furthermore, spatial planning maps for several cantons and geological maps for the Geological Commission have been produced with computer-assisted cartography. For the first time a reduced color scale of only 6 colors has been used successfully for the geological map for NAGRA (National Co-operative for Storing Radioactive Waste).
The oldest German-speaking printer and publisher, in business ever since its founding in 1519, has evolved into a modern, diversified undertaking in the printing and publishing branch.

Special emphasis is placed on the printing of maps, the printing of banknotes, stocks and bonds and the production of credit cards as well as other kinds of publications. The firm includes 670 employees.

There are about 30 employees in the cartography department which has been a part of the printery since 1923. The main products are city maps, street maps, hiking and touristic maps. Furthermore, many products are made to order such as school atlassess and maps, relief maps at different scales, general geographic maps, geological maps, soil maps, a language atlas and a variety of thematic maps.

The long experience of the well-trained cartographers combined with the most modern reprographic equipment assure a high standard of quality for its products.

Interactive data processing has also taken a foothold at Orell Füssli. A CAD system has been installed and is primarily used for redactional and technical preparation. In the near future an interactive, raster-oriented system will be used. Digital techniques can still not be fully applied to cartography but the short-term improvements lead to the conclusion that the application of digitized map data will become increasingly interesting to a growing number of customers. Orell Füssli is striving to meet these demands.
The firm has been active since 1949 in making photogrammetric blueprints and maps and in carrying out purely geodetic work such as triangulation, tunnel surveys and cadastral surveys. Since 1959 Swissair Photo has been using its own airplanes for making aerial photos in Switzerland and in foreign countries and for making landscape and scenic photos for decorative and commercial purposes. Much of the reproduction work is done at its own modern and efficient reproduction department.

A CAD Intergraph was purchased in 1986 as a supplement to the analytical stereo plotters. This system is used for the graphic interactive conversion of digital photogrammetric data into blueprints and maps and is also applied in cadastral surveying and in producing blueprints of utility mains.

Swissair Photo has 100 employees, 10 of which are in the cartographic and drafting departments. The main activity includes photogrammetry and the graphic processing of these products into mono or multi-colored blueprints and maps at the scales 1:200 to 1:50'000.

For many years efforts have been undertaken to gain a foothold in foreign countries. Aerial photos have thus far been made in Egypt, Indonesia, Nepal, Honduras, Togo, Libya, Saudi Arabia and Greece.
In Switzerland training and education in cartography takes place at three levels. On a first level, cartographers are trained in four-year apprenticeships by the federal and several private mapping establishments. This training is accompanied by a vocational school once a week (Schule für Gestaltung) centralized in Bern. On a second level, advanced technical personnel receive their training at technical colleges (Ingenieurschulen, Höhere Technische Lehranstalten, Fachhochschulen). Due to its size, Switzerland does not maintain a training institute for cartography on this level. However, several former students of German institutions are active in Swiss cartographic establishments. The only second-level program related to cartography is a surveying curriculum at the 'Ingenieurschule beider Basel' in Muttenz. It offers a course in cartography and a few excursions to cartographic institutions in Switzerland.

Further cartographic education takes place at the academic level. On the one hand, academic programs in cartography and surveying are offered at the two Federal Institutes of Technology in Zürich and Lausanne (Eidgenössische Technische Hochschule, ETH) which lead to engineering degrees. On the other hand, cartography is taught at geography departments of cantonal universities. The emphasis at these institutes is placed on thematic mapping.

The leading training institution is the Institute of Cartography of the Swiss Federal Institute of Technology (ETH) in Zürich. This department was founded in 1925 by Professor Dr. h.c. Eduard Imhof, who died on the 27th of April, 1986 at the age of 91 years. The department is responsible for all courses in cartography offered for surveying and rural engineers and geographers. This program includes a total of 31 weekly hours in the winter semester and 19 hours in the summer semester. The courses cover basic elements of cartography, map design and map technology, thematic cartography, cartographic reproduction techniques and computer-assisted cartography. Special emphasis is placed on practical work done by the students. On the average 4 surveyors and 10 geographers graduate each year with a diploma certifying a broad knowledge of and practice in cartography. There is, however, no special curriculum for a cartographic engineer.
By order of the federal government, the department is engaged in the production of the Atlas of Switzerland and responsible for its editorial and compilation work, while the Federal Office of Topography in Wabern/Bern executes all reproduction work and printing. The 11th edition was published in 1984. It comprises 20 maps covering the following subjects:
- Satellite image of Switzerland, 1:500'000
- Administrative boundaries (municipalities) in 1983, 1:500'000
- General soil map 1:500'000
- Geomagnetic, gravimetric and geothermal surveys and recent seismicity
- Population distribution and density in 1980
- Population movement
- Confessions and languages in 1980
- Swiss and foreign population in 1970 and 1980
The 12th delivery will be published in autumn 1987 and contains the following maps:
- General topographic map at 1:500'000 (up-date)
- Geology and geotectonics 1:500'000
- Population migration 1975-1980
- Increase and decrease of population 1900-1980 and 1960-1980 (municipalities)
- Age structure of population 1980
- Structure of employment 1960 and 1980
- Daily migration 1980

The department is also in charge of editing the Swiss School Atlas (Schweizer Weltatlas, Atlas mondial suisse, Atlante mondiale svizzero). It will be a completely renewed edition of the former 'Schweizer Mittelschulatlas'. The atlas will be published in German, French and Italian versions and contains some 350 maps on 172 pages. The preparation of the final masters and the printing is being done by Orell Füssli Graphic Arts Ltd. in Zürich.

The department staff consists of one professor and 14 associates, some of whom are working part-time; they are primarily engaged in the two projects mentioned above. Their task is supported by a secretariat. Initiated by these production needs, a restricted number of research projects was realized. In order to facilitate the compilation work for the school atlas, a method for the transformation of digital map data between any kind of map projection was developed and extensively used for this purpose (Brandenberger 1984). Several variants of a complex economic map were tested in
schools. The results are presented in a Ph. D. thesis (Brodersen 1986). The department was also heavily involved in a new conception of the General Topographic Plan of Switzerland (scales 1:2000, 1:5000 or 1:10'000) and acted as pilot center in an international OEEPE test on up-dating maps at 1:25'000 with photogrammetric methods. In the period under consideration an elaborate final report on this test was published (Spiess 1985).

The Department of Image Science of the Institute for Communication Science is another unit of the ETH-Zürich where cartographic activities take place. It offers courses in image processing and maintains research projects in the field of remote sensing and applications of GIS (Grid Information System). Special activities include efforts in the extraction of structured information from topographic maps based on raster data (Rade et al. 1986).

The Institute of Photogrammetry, Swiss Federal Institute of Technology in Lausanne conducts research linking the photogrammetric data capture with cartographic presentation. One of their projects deals with the development of an interactive dynamic display as a component of the Wild System 9. This display allows the real-time representation of up to 200'000 vectors to be transformed and overlaid on air photos. It serves as a tool for image injection for photogrammetric stereo plotting devices and the simultaneous viewing of photo images and maps (Beerenwinkel et al. 1986). A second project is directed towards the automated extraction of height information (DTMS) from air photos and is conducted in cooperation with Kern, Aarau (Bernard et al. 1986).

The Department of Geography, University of Basel offers a minimum of cartographic instruction, but does not conduct specific research in cartography.

At the Department of Geography, University of Bern, cartography, surveying, remote sensing and photogrammetry are taught as technical tools for geography students. Compulsory components include a basic cartography laboratory, introduction to general cartography, thematic cartography, remote sensing, photogrammetry and surveying (including theoretical and practical components). Computer mapping methods are offered in quantitative and digital geography courses. Map production within the department in general is related to national and international research work and thesis projects. Multicolored maps are prepared by a full-time staff cartographer whereas reproduction and duplication work is delegated to private firms. Within the report period approximately 50 color maps relating to areas such as
hydrology, climatology, geomorphology, pedology, agriculture, settlement, land evaluation and historical geography have been reproduced. The scales vary between 1:10'000 and 1:50'000 and usually about 2000 - 3000 maps are printed in four to five colors. A special project worth mentioning is a shaded map of the roofs of the old town of Bern.

At the Department of Geography, University of Fribourg, cartography is integrated in the teaching and research program as a conceptual as well as a technical and applied discipline. It is primarily concerned with thematic mapping and geared to computer methods. Cartography courses are part of the regular study program. Formerly these courses were included in quantitative geography courses. The tendency now is to link thematic cartography more closely do data acquisition techniques such as remote sensing, surveying and digitizing and to methods of spatial and image analysis. The department is in the process of building an integrated data base for both teaching and research purposes. Two research projects related to cartography are in progress. A first study is concerned with pollution sources in the Canton of Fribourg. It is based on information from the national Hectar Grid Information System and will make use of mapping facilities. A second project investigates the influence of the city of Fribourg on the regional climate (temperature, ventilation). In addition to meteorological variables, elevation, exposition, slope, land cover and others are used for thermic modelling. Results will be presented cartographically.

The Department of Geography, University of Geneva offers courses in graphic semiotics and automated mapping. Research facilities include a microcomputer system with several mapping packages. The United Nations Environmental Program (UNEP) GRID (Global Resource Information Database) is linked to the University of Geneva. It is concerned with satellite image processing and Geographic Information Systems and is currently involved in mapping projects of Africa.

The Department of Geography, University of Lausanne does not maintain an actual cartography program but offers training and facilities supporting research of spatial systems and thematic mapping. Students of classical geography participate in one year of training in semiotics of geographic displays introducing cartographic data handling, the use of graphic variables and representation systems. This is followed by a sequence of courses in quantitative and theoretical geography with offer components of computer mapping and urban and regional modelling techniques. In physical geography,
cartography is not taught as a specific subject but utilized as a research tool. In the latter part of their studies all students conduct a geomorphological survey project which permits them to get familiarized with large-scale mapping of land forms.

The Department of Geography, University of Neuchâtel offers an introductory course in cartography including graphical semiotics, computer-assisted mapping and the use of statistical packages. The GIMMS package is used for mapping. Research and development projects include mapping the evolution of agricultural production in the Canton of Neuchatel, the implementation of a geographic information system on statistical information, map perception studies, and cartography of the environment and its dynamics. The department maintains close ties to local newspapers and other university departments and participates in the publication of a map of the Canton of Neuchatel.

The Department of Geography at the ETH Zürich does not offer its own cartography courses but participates in the program of the cartography department of the ETH. Within the report period it has been involved in several projects related to cartography such as: the development of systems for data analysis and computer mapping (Steiner and Gilgen 1985, Ilg 1986, Gilgen 1986); the construction of an Atlas of Solar Climate, a Global Atlas of Energy Balance, and a set of temperature distribution maps for Greenland. The objective of the Atlas of Solar Climate is to provide scientists in various disciplines with information on the distribution of global radiation in the geological time scale in the form of maps and digital values (Blatter et al.). The new Global Atlas of Energy Balance is part of a research project of the World Meteorological Organization and the Swiss National Science Foundation. It evaluates the global distribution of the energy balance components. The atlas will be based on data from ground observation, satellite-based measurements of radiative components, surface roughness and wind. The maps will be compiled for the Water Project of the World Climate Program 'Global Energy Balance Archive' (GEBA). The temperature distribution maps for Greenland are based on data from 49 stations. They differ in many ways from their predecessors since they are based on an abundance of temperature observations and appropriate statistical methods.

The Department of Geography, University of Zürich maintains a broad teaching and research program in the fields of computer mapping, remote sensing and geographic information systems. Training is offered in basic cartography and remote sensing and special advanced courses in computer-assisted map-
ping, map perception, history of cartography, geographic information systems and digital image processing. Yearly excursions are organized to mapping establishments in Switzerland and nearby foreign cities. Students are also advised to participate in the full-scale cartography program offered by the cartographic institute of the ETH (see above). During the report period, seminars on cartographic generalization, map interpretation, computer graphics, spatial data handling and remote sensing with both national and international participation have been co-sponsored by the department. The department is equipped with computer graphics teaching and research labs (VAX 11/750 and various Tektronix intelligent terminals) and a DIPIX picture processing system. It also has access to various graphics output media at the university computing center (matrix, laser and drum plotters). It supports various mapping and picture processing software packages and the ARC/INFO and GRID information systems. Various research and development projects are conducted by members of the department (Brassel 1987). A project 'Computer-assisted Modelling and Display of Spatial Structures in the Geosciences' is supported by a grant from the Swiss National Science Foundation. It analyses topics such as modelling of global structures, structuring of cartographic databases, methods of visualization, labelling, analysis and generalization of DTMs and the perception of 3-D CRT displays. Other research activities are related to the generalization of thematic maps, perception of television maps, the application of GIS, and computer mapping. In 1985 the department co-edited the 'Structural Atlas of Switzerland', a systematic collection of statistical maps on approximately 120 topics at several administrative levels (cantons, districts, municipalities) (Brassel et al. 1986). Further projects related to mapping include the digitization of the planning zones of Switzerland, the road and public transportation networks of Switzerland, and settlement boundaries and land cover information for several Swiss Cantons. In the area of remote sensing major research efforts are concerned with the interpretation of Landsat, radar, Thematic Mapper, MomaS 1, NOAA and other imagery. Major application areas include the mapping of snow cover and snow reserves, desertification in the Swiss Alps, basic research into the causes of forest damage, and land use and forest monitoring in developing countries such as Sri Lanka (Meier and Nüesch 1986, Haefner and Hugentobler 1985, Itten et al. 1986). As part of the latter project a land use map 1:100'000 is being produced. It is based on satellite image supported interpretation of black-and-white aerial photographs and extensive field work (Itten 1986). By the end of 1986, 14 out of 25 sheets of this series were printed.
To summarize, Switzerland has a broad range of upper-level educational institutions related to cartography. While several Swiss universities offer basic courses in cartography in support of geographic research, an extensive cartography curriculum is offered only in Zürich. The Department of Cartography (ETH) as the leading institution in cartography (design, automation and production) is well-complemented by the Department of Geography at the University of Zürich (spatial computer graphics, geographic information systems, remote sensing) and the Institute for Communication Science ETH (image analysis). This concentration offers advantages both for student training and scientific cooperation.

Acknowledgements:
This report was compiled from contributions by Prof. E. Spiess, Prof. A. Ohmura, Dr. M. Ilg, Prof. O. Kölbl, Mr. A. Brodbeck, Dr. H.R. Egli, Dr. Cl. Collet, Dr. Ch. Hussy, Dr. M. Cosinschi and Mr. E.F. Berthoud. We thank these colleagues for their kind cooperation.

References:


Title: National Map of Switzerland
Scale: 1:25 000
Year of publication: Revision in a 6-years-cycle
Publisher: Federal Office of Topography, Wabern
Cartographic design: Federal Office of Topography, Wabern
Contents: Contour line interval: 10 m (Jura and Central Plateau), 20 m (Alps).
           Mapped area: 70 x 48 cm
Reproduction: Scribing on glass plates 1:1
               Positive copying on coated glass plates
               Offset printing with 8 colours
Title: Ski route map
Scale: 1:50,000
Year of publication: 1986
Publisher: Federal Office of Topography, Wabern
Cartographic design: Federal Office of Topography, Wabern
Contents: Base map: National Map of Switzerland.
Thematic overprint: routes for ski tours, public transportation (shown in red), official post car routes (shown in yellow).
Mapped area: 70 x 48 cm
Thematic overprint: scribing on plastic sheets.
Positive copying on coated glass plates.
Offset printing with 6 and 2 colours on synthetic paper (Syntosil).
Title: Map of Air Navigation Obstacles
Scale: 1:100 000
Year of publication: 1987
Publisher: Federal Office of Topography, Wabern
         Federal Office of Civil Aviation, Bern
Cartographic design: Federal Office of Topography, Wabern
Contents: Base map: National Map of Switzerland
         Thematic overprint: towers and cables, with or without markings (shown in red), power transmission lines (shown in blue).
         Mapped area: 70 x 48 cm
         Up-dating: every other year
Reproduction: Base map: scribing on glass plates 1:1, positive copying on coated glass plates.
             Thematic overprint: filmplots produced on a digital cartographic system (Applicon, Ferranti) at the Swiss Federal Institute of Technology, Zürich.
             Offset printing with 10 and 2 colours.
Title: Vegetation Map (Man and his Biosphere project Davos)
Scale: 1:25 000
Publisher: Swiss Federal Research Station for Forestry, Birmensdorf
          Federal Office of Topography, Wabern
Cartographic design: Federal Office of Topography, Wabern
                   Carmen Brun-Ganzer, cartographer, Zug
Contents: Base map: National Map of Switzerland (combination of all line features in
          one colour).
          Thematic overprint: natural vegetation
          Mapped area: 58 x 82 cm
Reproduction: Base map: scribing on glass plates 1:1, positive copying on coated glass
              plates.
              Thematic overprint: filmplots produced by a digital cartographic system
              (Sci-Tex).
              Offset printing with 5 colours (black, grey, magenta, cyan, yellow).
Title: Atlas of Switzerland, 12th issue, table 24c
Increase and Decrease of population 1960–1980

Scale: 1:500,000

Year of publication: 12th issue, 1987

Publisher: Federal Office of Topography, Wabern

Cartography: Federal Office of Topography, Wabern

Author: Ernst Spiess and editorial group at the Swiss Federal Institute of Technology, Zürich

Contents: The map shows with circle diagrams the increase (red) and the decrease (blue) of inhabitants between 1960 and 1980 for each municipality. The circle diameters were calculated from the corresponding census data.

Reproduction: The map is printed in 6 colours. In addition to blue and red for the diagrams, the hydrographic features are printed in blue, the relief shading in light grey, the cantonal boundaries in brown and the lettering in black. The circle diagrams were produced computer-assisted with the program DIAMANT.
Title: Atlas of Switzerland, 12th issue, table 25a
Age Structure 1980

Scale: 1:500000

Year of publication: 12th issue, 1987

Publisher: Federal Office of Topography, Wabern

Cartography: Federal Office of Topography, Wabern

Author: Ernst Spiess and editorial group at the Swiss Federal Institute of Technology, Zürich

Contents: This map shows the age structure of municipalities in 3 groups: 0–19 years / 20–64 years / over 65 years, calculated from the data of the 1980 census. The unproductive and uninhabited areas are shown in a light grey tint.

Reproduction: The map is printed in 7 colours. In addition to the 4 standard colours, the administrative boundaries are printed in grey and the hydrographic features in dark blue.
Prozentanteile der Erwerbstätigen in der Schweiz
Pourcentage des personnes actives occupées dans les activités économiques

Für die ganze Schweiz: 1960 × 1980
Pour toute la Suisse: 1960 × 1980

Primärer Sektor
Secteur primaire
11.2% 6.3%

Sekundärer Sektor
Secteur secondaire
50.4% 39.4%

Tertiärer Sektor
Secteur tertiaire
38.4% 54.3%
This map shows with circle diagrams the number of employees per municipality. The upper half-circle shows the data from 1980, the lower from 1960.

The colours of the diagrams represent the structure of employment:
green = majority of employees working in the first sector of the economy
red = majority in the second sector
blue = majority in the third sector
violet = mostly in second and third sector
brown = mostly in first and second/third sector

The map is printed in 8 colours.
In addition to the above-mentioned colours, light grey is used for the relief shading, dark grey for the hydrographic features, brown for the cantonal boundaries and black for the lettering and diagram contours.
The circle diagrams were produced computer-assisted with the program DIAMANT.
Title: Atlas of Switzerland, 12th issue, table 33a
Daily commuters 1980

Scale: 1:500000

Year of publication: 12th issue, 1987

Publisher: Federal Office of Topography, Wabern

Cartography: Federal Office of Topography, Wabern

Author: Ernst Spiess and editorial group at the Swiss Federal Institute of Technology, Zürich

Contents: This map shows with square diagrams the number of employees living in each municipality.
The grey portion shows the number of daily commuters to the municipality, the non-hachured portion the number of commuters away from the municipality.
The hachured and the grey portions together show the potential of people working in this specific municipality.

Reproduction: The map is printed in 7 colours.
Red, blue, violet and yellow for different types of municipalities (percentage of commuters to/from). Grey for administrative boundaries and diagrams, light grey for basemap (hydrographic features, relief shading) and black.
The square diagrams were produced computer-assisted with the program DIAMANT.
Volume = immigrants + émigrants (pour la période 1975–1980)

- mehr als plus de 600%
- 500 – 599%
- 400 – 499%
- 300 – 399%
- 200 – 299%
- weniger als moins de 200%

Unbesiedelte Gebiete
Régions inhabitées
Title: Atlas of Switzerland, 12th issue, table 24e
Internal migration 1975–1980

Scale: 1:800,000

Year of publication: 12th issue, 1987

Publisher: Federal Office of Topography, Wabern

Cartography: Federal Office of Topography, Wabern

Author: Hans Steffen, Federal Office of Statistics, Bern
Ernst Spiess and editorial group at the Swiss Federal Institute of Technology, Zürich

Contents: Map 1: this map shows the number of migrants (immigrants and emigrants) per 1000 inhabitants based on municipalities within the period 1975–1980. The data are shown in 6 intervals, the unproductive and uninhabited areas are shown in a light grey tint.

Reproduction: The map is printed in 6 colours. In addition to the standard colours (magenta, yellow, black), the administrative boundaries are printed in grey and a dark red is used to emphasize the colour steps of the intervals.
Title: Atlas of Switzerland, 12th issue, table 24e
     Internal migration 1975–1980
Scale: 1:800,000
Year of publication: 12th issue, 1987
Publisher: Federal Office of Topography, Wabern
Cartography: Federal Office of Topography, Wabern
Author: Hans Steffen, Federal Office of Statistics, Bern
     Ernst Spiess an editorial group at the Swiss Federal Institute of Technology, Zürich
Contents: Map 2: In addition to map 1 showing the number of migrants per 1000 inhabitants, it seemed necessary to also show the percentage increase (yellow–red, 4 intervals) or decrease (blue, 4 intervals) of the balance (= immigrants minus emigrants) for each municipality. The unproductive and uninhabited areas are shown in a light grey tint.
Reproduction: The map is printed in 6 colours.
In addition to the 4 standard colours, the administrative boundaries are printed in grey.
Ein- und Ausflugpunkte: Entry and Exit points: MMN 3500 ft AMSL (1059 m)

W + N Ein- und Ausflugpunkte / Entry and Exit points
S Nur Einflugpunkt (wenn kein Segelflugbetrieb)
E Nur Ausflugpunkt/Exit Point only

Flüge innerhalb TMA Zürich ohne Funkverbindung mit Zürich FIC:
Flights within TMA Zurich without radio contact with Zurich FIC:

RAC 3 – 1 – 3
RAC 4 – 3 CVFR APP 1/2
RAC 5 – 1 APP 3

Lärmempfindliche Gebiete:
Noise sensitive areas:
Title: Visual Approach Chart VAL, ICAO Series, Format A5

Scale: 1:100 000

Year of publication: 1987, Sample only

Publisher: Federal Office for Civil Aviation (FOCA)
CH-3003 Bern

Compilation and editing: Central Aeronautical
Information Service
(CAIS) of FOCA

Cartography + reprography, composition:
Kartographie + Fotosatz C. Maggio,
Metrosatz, Worblauen-Bern

Offset Printing: Federal Office of Topography
CH-3084 Wabern

Contents: The charts depict the necessary information for approach
and departure procedures conducted in accordance
with Visual Flight Rules (VFR); they are included in
the Swiss Aeronautical Information Publication (AIP).
The topographic base elements are taken from the Swiss
National Map in the same scale.
Title: Geological Atlas of Switzerland, sheet Schächental
Scale: 1:25 000
Year of publication: 1987
Publisher: Swiss Geological Commission and Swiss National Hydrological and Geological Survey, Basel
Cartographic design: Orell Füssli Graphic Arts Ltd., Zürich
Contents: Base map: National Map of Switzerland (only line features). Thematic overprint: presentation of the geological facts by means of symbols and colours based on topographical survey. Mapped area: 70 x 48 cm
Reproduction: Base map: scribing on glass plates 1:1, positive copying on coated glass plates. Thematic overprint: scribing on plasticfoils (contours), colour masks with peeling method, screen copying technique. Offset printing with 16 colours on synthetic paper (syntosyl). Proof print only
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<th>Nr.</th>
<th>Blatt (heutiger Name in Klammern)</th>
<th>publiziert</th>
<th>Nr.</th>
<th>Blatt (heutiger Name in Klammern)</th>
<th>publiziert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Meovelier - Seyhières - Delémont - Courrendlin (Delémont)</td>
<td>1930</td>
<td>44</td>
<td>Scuel/Schuls - Tarasp (Scuel)</td>
<td>1963</td>
</tr>
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<td>2*</td>
<td>La Chaux - Les Verrières (Les Verrières)</td>
<td>1930</td>
<td>45</td>
<td>Rorschach</td>
<td>1964</td>
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<td>3</td>
<td>Laufen - Bretzwil - Erschwil - Mumliswil (Passwang), unveränderte Vierfarben-Reproduktion 1983</td>
<td>1936</td>
<td>46</td>
<td>Coppet</td>
<td>1964</td>
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<td>4*</td>
<td>Flawil - Herisau - Brunnadern - Schwellbrunn (Degersheim)</td>
<td>1930</td>
<td>47</td>
<td>Montreux</td>
<td>1965</td>
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<tr>
<td>5*</td>
<td>Mont-la-Ville - La Sarraz - Montricher - Cossounay (Cossounay)</td>
<td>1935</td>
<td>48</td>
<td>Genève</td>
<td>1965</td>
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<td>6</td>
<td>Lauterbrunnen, unveränderte Vierfarben-Reproduktion 1987</td>
<td>1933</td>
<td>49</td>
<td>Rodersdorf</td>
<td>1965</td>
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<td>7*</td>
<td>Mönchaltendorf - Hinwil - Widenswil - Rapperswil (Stafa)</td>
<td>1934</td>
<td>50</td>
<td>Wohlen</td>
<td>1966</td>
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<td>8</td>
<td>St-Maurice (Val d'Illiez)</td>
<td>1934</td>
<td>51</td>
<td>Val de Ruz</td>
<td>1968</td>
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<td>Scaletta (Scalettapass)</td>
<td>1935</td>
<td>52</td>
<td>Andelfingen</td>
<td>1967</td>
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<tr>
<td>10*</td>
<td>Saxen - Morcles (Dent de Morcles)</td>
<td>1937</td>
<td>53</td>
<td>Linthebene</td>
<td>1969</td>
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<td>11*</td>
<td>Iorio (Passe S. Jorio)</td>
<td>1939</td>
<td>54</td>
<td>Weinfelden</td>
<td>1968</td>
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<td>12*</td>
<td>Dardagny - Vernier - Chancy - Bernex (Chancy)</td>
<td>1938</td>
<td>55</td>
<td>Benfof</td>
<td>1969</td>
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<tr>
<td>13*</td>
<td>Grindelwald, unveränderte Vierfarben-Reproduktion 1938</td>
<td>1938</td>
<td>56</td>
<td>Andeer</td>
<td>1971</td>
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<td>14*</td>
<td>Ardez (Silvretta)</td>
<td>1940</td>
<td>57</td>
<td>Härnli</td>
<td>1970</td>
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<td>15*</td>
<td>Blauflond - Les Bois - La Ferrière - St-Imier (Les Bois)</td>
<td>1946</td>
<td>58</td>
<td>Dent de Morcles</td>
<td>1971</td>
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<td>16*</td>
<td>Plyn - Marstetten - Frauenfeld - Bussnang (Frauenfeld)</td>
<td>1943</td>
<td>59</td>
<td>Basel</td>
<td>1970</td>
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<tr>
<td>17*</td>
<td>Vallée de Joux (Le Sentier)</td>
<td>1941</td>
<td>60</td>
<td>Bieler See</td>
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<td>18*</td>
<td>Beromünster - Hochdorf - Sempach - Eschenbach (Hochdorf)</td>
<td>1945</td>
<td>61</td>
<td>Simpox</td>
<td>1972</td>
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<td>19*</td>
<td>Diablerets (Les Diablerets)</td>
<td>1940</td>
<td>62</td>
<td>Merges</td>
<td>1972</td>
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<td>20*</td>
<td>Zernez</td>
<td>1948</td>
<td>63</td>
<td>Murten</td>
<td>1972</td>
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<td>22*</td>
<td>Fraubrunnen - Wynigen - Hindelbank - Burgdorf (Burgdorf)</td>
<td>1950</td>
<td>65</td>
<td>Bischofzell</td>
<td>1973</td>
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<td>23*</td>
<td>St. Gallen - Appenzell (Gais)</td>
<td>1949</td>
<td>66</td>
<td>Bellinzona</td>
<td>1974</td>
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<td>24*</td>
<td>Finhaut (Barberine)</td>
<td>1951</td>
<td>67</td>
<td>Neuchâtel</td>
<td>1974</td>
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<td>26*</td>
<td>Neuenegg - Oberbalm - Schwarzenburg - Rueggisberg (Schwarzenburg)</td>
<td>1953</td>
<td>69</td>
<td>Lugano</td>
<td>1976</td>
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<td>27</td>
<td>Jerat (Echallens)</td>
<td>1952</td>
<td>70</td>
<td>Sciora</td>
<td>1977</td>
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<tr>
<td>28</td>
<td>Luzern</td>
<td>1955</td>
<td>71</td>
<td>St. Niklaus</td>
<td>1978</td>
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<td>29*</td>
<td>Zermatt</td>
<td>1953</td>
<td>72</td>
<td>Solorzhurn</td>
<td>1977</td>
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<tr>
<td>30</td>
<td>Monte Moro</td>
<td>1954</td>
<td>73</td>
<td>P. Campo Tencia</td>
<td>1980</td>
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<td>31</td>
<td>Saas</td>
<td>1954</td>
<td>74</td>
<td>Neunkirch</td>
<td>1981</td>
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<td>32*</td>
<td>Gemmi</td>
<td>1956</td>
<td>75</td>
<td>Eggiwil</td>
<td>1980</td>
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<td>33</td>
<td>Grand Saint-Bernard (Gd St-Bernard)</td>
<td>1958</td>
<td>76</td>
<td>Lyss</td>
<td>1981</td>
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<td>34</td>
<td>Basodino</td>
<td>1957</td>
<td>77</td>
<td>Sembrancher</td>
<td>1983</td>
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<td>35*</td>
<td>St-Leonard</td>
<td>1959</td>
<td>78</td>
<td>Sants</td>
<td>1982</td>
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<tr>
<td>36</td>
<td>Gurnigel (Riggsberg)</td>
<td>1961</td>
<td>79</td>
<td>Langenthal</td>
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<td>37</td>
<td>Monthey</td>
<td>1960</td>
<td>80</td>
<td>Arlesheim</td>
<td>1984</td>
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<td>38</td>
<td>Diessehollen</td>
<td>1961</td>
<td>81</td>
<td>Albulapass</td>
<td>1987</td>
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<tr>
<td>39</td>
<td>Tessereite</td>
<td>1962</td>
<td>82</td>
<td>Lütshenthal</td>
<td>1985</td>
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<td>40</td>
<td>St-Ursanne</td>
<td>1963</td>
<td>83</td>
<td>Schächental</td>
<td>1987</td>
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<td>41</td>
<td>Lenk</td>
<td>1962</td>
<td>84</td>
<td>Sursee</td>
<td>in Vorbereitung</td>
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<td>42</td>
<td>Orbe</td>
<td>1963</td>
<td>85</td>
<td>Lausanne</td>
<td>im Druck</td>
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<td>43</td>
<td>Randa</td>
<td>1964</td>
<td>86</td>
<td>Wil</td>
<td>in Vorbereitung</td>
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<tr>
<td>44</td>
<td>Scuel/Schuls - Tarasp (Scuel)</td>
<td>1963</td>
<td>87</td>
<td>Adelboden</td>
<td>in Vorbereitung</td>
</tr>
</tbody>
</table>
Bodenkarten der Schweiz 1:25 000
Cartes des sols de la suisse 1:25 000
Soil Maps of Switzerland 1:25 000

Publizierte Blätter, Stand 1986
Published sheets, state 1986
Blätter in Vorbereitung
sheets in preparation
MAß-Testgebiet Davos
MASS-testarea Davos

andere publizierte Karten:
further published maps:
1:200000 1–4
1:300000
1:500000 (Atlas der Schweiz / Atlas of Switzerland)

© Bundesamt für Landestopographie 3084 Wabern
© Office fédéral de topographie 3084 Wabern
© Federal Office of Topography 3084 Wabern
Title: Soil Map (Section of sheet 1229 Grindelwald or 1093 Hörnl)
Scale: 1:25,000
Publisher: Swiss Federal Research Station for Agronomy, Zürich–Reckenholz
Cartographic design: Swiss Federal Research Station for Agronomy, Zürich–Reckenholz
Printer: Federal Office of Topography, Wabern
Contents: Base map: National Map of Switzerland (combination of all line features in grey and hydrographic features in blue). Thematic overprint: representation of soil types. Mapped area: 70 x 48 cm
Reproduction: Contour lines: scribing on glass plates or plastic foils. Colour units: filmplots produced by a digital cartographic system (Sci-Tex). Offset printing with 6 colours (black, grey, blue, magenta, cyan, yellow).
<table>
<thead>
<tr>
<th>geeignet</th>
<th>ungeeignet</th>
<th>geeignet (vorwiegend Weide)</th>
</tr>
</thead>
</table>

höhere Lagen über 900 m ü. M.  
(N-exponiert über 800 m,  
S-exponiert über 1100 m ü. M.):  
Tannen-Buchenwälder

and Föhrenwälder  
auf trockenen,  
flachgründigen  
Kuppen/Rippen

- ahorn- und  
eschenreiche  
Schluchtwälder

** aufgrund der Vegetationsdauer und des Niederschlagshaushaltes

Schreiber, 1977

te dei suoli della Svizzera 1:25000
Title: Hydrogeological map of the Canton of Berne, 1146 Lyss
Scale: 1 : 25 000
Published: 1986
Preparation and publication: Department of Waterworks of the Canton of Berne, Division of Geology, Berne
Computer controlled cartography: Balzari and Schudel Co Berne
Reprography and typographical execution: Diaset Co Hinterkappelen, Berne
Printing: Aerni-Leuch Co Liebefeld, Berne
Topographic basis: Reduced general map, scale 1 : 10 000, published by the Cantonal survey office, Berne
Content:
grey: Topography not digitally transposed
red: Protection areas of spring- and groundwater catchments, map subdivisions, and community boundaries
Reproduction:
Designed on a copy of a general map, scale 1 : 10 000. Digitalized and reproduced by the WEA-DIGI programme system. Engraved on red foil, scale 1 : 25 000, copied on offset film, setting title/legend, ink plot red, scale 1 : 10 000 (four sheets working- and pursuance copies), two colour offset printing.
<table>
<thead>
<tr>
<th>Title</th>
<th>School Wall Map of Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>1:200,000</td>
</tr>
<tr>
<td>Publishers</td>
<td>Kümmerly+Frey Ltd., Berne</td>
</tr>
<tr>
<td>Cartographic design</td>
<td>Kümmerly+Frey Ltd., Berne</td>
</tr>
<tr>
<td>Contents</td>
<td>Combination of relief-layout and vegetation. Hydrography, roads, railways, localities, conventional symbols, lettering</td>
</tr>
<tr>
<td>Reproduction</td>
<td>Original hand-painted at production scale 1:400,000 and reproduced in 4 colours at new scale 1:200,000 (48 dot screen). After cartographic editing, the linear sketch was processed by the computer-aided carto system (Scitex) and a vector data-base was established at the scale 1:500,000. Data output at the scale 1:200,000 in resolution 32. The lettering at the scale 1:500,000 was mounted in conventional cartographic methods photographically enlarged to 1:200,000. Printed in 6 colours.</td>
</tr>
</tbody>
</table>
Title: Geological Map of the Central Part of Northern Switzerland

Scale: 1:100,000


Cartographic design: Kümmerly+Frey Ltd., Berne

Contents: Topographical base map material: National map 1:100,000 by the Topographical Survey of Switzerland (3 colours). Geological formations in layered colours, structured screen and symbols (5 colours)

Reproduction: Topographical base map material, title and legend prepared by conventional cartographic methods. Geological formations (linear elements and layered colours) processed by computer-aided cartography (Scitex). After combination of topographic and thematic information, printing undertaken in 6 colours.
<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Pictorial City Map of Vienna</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scale</strong></td>
<td>1:17,500</td>
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<tr>
<td><strong>Publishers</strong></td>
<td>Kümmerly+Frey Ltd., Berne</td>
</tr>
<tr>
<td><strong>Cartographic design</strong></td>
<td>Kümmerly+Frey Ltd., Berne</td>
</tr>
<tr>
<td><strong>Contents</strong></td>
<td>Roads, railways, public transport system, buildings, important public buildings in perspective layout, woods, parks, lettering</td>
</tr>
<tr>
<td><strong>Reproduction</strong></td>
<td>Pictorial map originally hand-painted and reproduced in 4 colours. The public transport system and the lettering were worked out by conventional cartographic methods and combined in the above-mentioned colours.</td>
</tr>
</tbody>
</table>
Title: Vorderasien, Übersicht
Scale: 1:15 000 000
Publisher: Konferenz der Kantonalen Erziehungsdirektoren
Cartographic design: Prof. E. Spiess, Dr. L. Brodersen, Dr. G. Jung.
Contents: General chorographic map for the Middle East area in the new edition of the Swiss school atlas.
Vegetation elements are combined with hill shading, with a transportation network and with town symbols and names.
Reproduction: Cartography, reproduction and printing in 6 colours by Orell Fussli Graphic Arts Ltd. Zurich.
Title: Vorderasien, Wirtschaft
Scale: 1:15 000 000
Publisher: Konferenz der Kantonalen Erziehungsdirektoren
Cartographic design: Prof. E. Spiess, Dr. L. Brodersen, Dr. G. Jung
Contents: General economic map for the Middle East area in the new edition of the Swiss school atlas. The cultivated land is divided up in some land use categories of main crops. Additional point symbols are used for special crops. Mining and oil fields, industries and services are indicated by point symbols as well. The main transportation network (pipelines, railways, shipping lines etc.) are shown also.
Reproduction: Cartography, reproduction and printing in 6 colours by Orell Fussli Graphic Arts Ltd. Zurich.
Title: Lima, Peru
Scale: 1:200 000
Publisher: Konferenz der Kantonalen Erziehungsdirektoren
Cartographic design: Prof. E. Spiess, Dr. G. Jung
Contents: Map for the new edition of the Swiss school atlas showing functional elements of a Latin American metropolis, especially squatters, as well as some temporal aspects of the extension of this town, by areal symbols combined with hill shading.
Reproduction: Cartography, reproduction and printing in 6 colours by Orell Fussli Graphic Arts Ltd. Zurich.

Title: Switzerland, Environmental changes Bielersee–Berner Jura, roads constructed between 1952 and 1982
Scale: 1:200 000
Publisher: Department of Cartography, ETH Zurich
Cartographic design: A group of students under the guidance of Prof. E. Spiess and H. Stoll
Contents: The map bases on a comparison of large scale topographic maps at 1:25 000 of 1952 and 1982. All detected changes in the road network between the two editions have been retained with red lines and combined with a base map.
Reproduction: 5 colour offset printing by Orell Fussli Graphic Arts Ltd. Zurich.
GGLOMERATION ZÜRICH
achführung einer flächenhaften Siedlungsdarstellung mit Large Format Camera - Bildern

1 : 100 000

km

City, Altstadt
Siedlungsfläche mit hoher Bebauungsdichte
Siedlungsfläche mit niedriger Bebauungsdichte
Autobahn
Hauptsstrasse
Einzehäuser
Grube

Äquidistanz der Höhenkurven 50 m

Title: Agglomeration Zurich
Scale: 1:100,000
Publisher: Department of Cartography, ETH Zurich
Cartographic design: R. Kuster, H. Stoll, E. Spiess, U. Wild
Contents: Result of a research project on the use of Large Format Camera imagery for updating topographic maps at 1:100,000 executed together with students in connection with their diploma work. Stereophotogrammetric restitution of updates at the WILD AVIOLYT AC-1. Interpretation problems occurred especially in the context of road junctions, as can be verified by comparing the map with the above section of a conventional revision based on large scale photogrammetry.
Reproduction: 6 colour offset printing by Orell Fussli Graphic Arts Ltd. Zurich.
A Comparison between a Landsat-2 Scene and a Land Use Map at 1:500 000

Title: A Comparison between a Landsat-2 scene and a Land Use Map

Scale: 1:500 000

Publisher: Department of Cartography, ETH Zurich

Cartographic design: P. Laager and P. Meyer

Contents: Landsat-2 scenes of 20.4.1978 and 22.6.1978, annotated with roads and a few place names.
Land use generalized from 1:100 000 land use maps produced by the Swiss Remote Sensing Project in Sri Lanka.
Those land use maps were the result of photointerpretation of large scale aerial photographs.

Reproduction: Landsat colour composite scanned on a repro scanner by Nievergelt, Zurich. Land use map: 4 colour composite prepared from strip masks for each category.
Kaffeeplantagen im Brasilianischen Bergland
1 : 50 000

Kartographisches Praktikum 1986/87 am Institut für Kartographie der ETH Zürich
Cartographic Laboratory 1986/87 at the Department of Cartography of the ETH Zurich

Coffee plantations in the Brasilian Highland
1 : 50 000

Danuta Rogalska, Hansruedi Bär, Christoph Graf
Direction; Leitung: Prof. Ernst Spiess, Heinz Stoll
Title: Coffee plantations in the Brasilian Highland
Scale: 1:50,000
Publisher: Department of Cartography, ETH Zurich
Cartographic design: D. Rogalska, H. Bär, Ch. Graf, under the guidance of Prof. E. Spiess and H. Stoll
Content: Cartographic laboratory work by students of geography. Map to be incorporated in a similar version in a school atlas that shows the environment of Brasilian coffee plantations. Experimenting with different colours and patterns.
Reproduction: 6 colour offset printing by Orell Fussli Graphic Arts Ltd. Zurich.
Title: Übersichtskarte Fidschi-Inseln (Mapa ogólna Wysp Fidżi)
Scale: 1:2 000 000
Publisher: Department of Cartography, ETH Zurich
Cartographic design: D. Rogalska, under the guidance of Prof. E. Spiess and H. Stoll
Contents: Land use categories: Forest, shrubland, grassland, coconut palm trees, cropland, settlements. Other symbols for shipping lines, ports, airports, mines, sugar plants, tourist centers etc. Hill shading.
Reproduction: 6 colour offset printing by Orell Fussli Graphic Arts Ltd. Zurich.
Title: Übersichtskarte Sognefjorden
Scale: 1:1000 000
Publisher: Department of Cartography, ETH Zurich
Cartographic design: A group of students under the guidance of Prof. E. Spiess and H. Stoll
Contents: Exercise work in cartographic design and production. The map combines forests and glaciers with hill shading and with symbols for tourist information and a road network.
Reproduction: 6 colour offset printing by Orell Fussli Graphic Arts Ltd. Zurich
Title: The Muldrow Glacier, Mt. Mc Kinley, Alaska
Scale: 1:10 000
Year of publication: 1983
Publisher: Swiss Foundation for Alpine Research, Zürich, Switzerland and Boston's Museum of Science, Boston, Massachusetts, USA
Photogrammetry and cartographic design: Swissair Photo + Surveys Ltd., Zürich, Switzerland
Orthophotoproduction: WILD Heerbrugg Ltd., Heerbrugg, Switzerland
Printing: Federal Institute of Topography, Wabern, Switzerland
Contents: During this map production the orthophoto technique in topographically very extreme territory was tested for the first time over a large area. The very detailed contour line restitution combined with the orthophotos was an ideal indicator to examine the rectification exactness.

At the same time new reproduction procedures for a homogeneous assembly of the different orthophotos was searched. To maintain a best possible picture-detail during printing a very differentiated dodging during the several reproduction-steps was mainly required.

The map was produced as a base for scientific glacier work.

Contour interval 20 meters, 10 meters on the glacier
Mapped area 310 sq. km on 5 sheets

Reproduction Scribing on K+E scribecoat foil
3-colors offset printing
Title: Dachlandschaft der Berner Altstadt

Scale: 1:7000

Publisher: Institute of Geography, Berne University, 1986

Photogrammetry: M. Zurbuchen, Institute of Photogrammetry and Engineering Survey, Berne

Shading: G. Glanzmann and R. Suhner, students of Geography, Berne

Printing: Stämpfli Ltd, Berne

Contents: The shading picture (original scale 1:500, scale of printed copies: 1:1000) has been made (in pencil, the light thrown on from the southeastern direction, the sunny side upwards and the shady side heightened downwards) on the basis of the contour plan worked out photogrammetrically (original scale 1:200). In addition, a photograph taken from the air has been reproduced as a possibility for comparison. The plans are above all useful to the authorities giving permission for the construction or alteration of buildings and the persons in charge of the protection of the (historical) monuments.

Reproduction: Offset printing with 2 colours.
**Title:** Die Herrschaft Erlach: Parzellierung und Landnutzung 1530/1780

**Scale:** 1:10 000

**Publisher:** Institute of Geography, Berne University, 1983

**Author:** H.-R. Egli, Institute of Geography, Berne

**Cartography:** A. Brodbeck, Institute of Geography, Berne

**Printing:** Stämpfli Ltd, Berne

**Contents:** The use of land (arable land, fields, vine-yards, pasture land, woods), of the 16th, 17th and 18th centuries is represented on the basis of a «Rückschreibung» of the reconstructed parcel plan. Boundaries, ridges, hedges and fences have been chosen as linear elements and buildings, quarries, bridges etc. as single elements. The map is the analytical basis to the reconstruction of the development of the open-fields-systems in the Swiss Central Plateau.

**Reproduction:** Ink drawing and conventional cartographic reproduction techniques. Offset printing with 4 colours.
Samples of soil maps in Ethiopia

1:10 000

Institute of Geography, Berne University, 1986

G. Weigel, R. Bono and W. Seiler

H. Hurni and B. Messerli, Institute of Geography, Berne

Base topographic map by M. Zurbuchen, Institute of Photogrammetry and Engineering Survey, Berne

A. Brodbeck, Institute of Geography, Berne

Stämpfli Ltd, Berne

Mapping of soil units in various test areas of the Soil Conservation Research Project in Ethiopia. Major colours represent soil units. Soil phases, soil depths and other diagnostic characteristics are differentiated through variations of each major colour.

Topographic base map produced by scribing on coated glassplate. Colour tints added using the strip-mask technique. Offset printing with 4 colours and grey.
Title: Accessibility of Residential Areas to Public Transport

Scale: See map.

Publisher: Department of Geography, University of Zurich

Cartographic Design: Matthias Bopp, Department of Geography, University of Zurich

Contents: Residential Areas in three categories, depending on distance to next stop of public transport; public transport network and kind of transport; all stops, with emphasis on low-frequency stops; four land use categories and a few names facilitating orientation.

Reproduction: The map was generated by ARCPLOT-Routines of the Geographical Information System (GIS) ARC/INFO (ESRI, Redlands USA). Original Data was digitized as polygons (residential area, land use categories), lines (transport) or points (stops). The distance categories resulted of an equidistant buffering process followed by an intersection with the original polygons. GIS-technology allows to visualize in a relatively short time different scenarios and helps to locate problem areas and spatial conflicts. Additional advantages arise from easy variation of scale, colours and symbols. The shown map was generated on a Tektronix 4115 screen with a resolution of 1280 x 1024 pixels. The resulting slide was scanned and reproduced in four colours. Colours were chosen with respect to reproduction - in the ordinary case (screen as final display) more transparent colours seem to be preferable.
Title: Main roads overlaid on a three dimensional view
Scale: variable (digital elevation model (DEM) is 15 x 17 km)
Publisher: Department of Geography, University of Zurich
Cartographic design: René L'Eplattenier, Department of Geography, University of Zurich
Contents: Region of Zurich from an extract of the DEM of Switzerland with a resolution of 100m x 100m. The model is overlaid with the main network of roads.
Reproduction: The three dimensional view was generated by subroutines written by the author. The subroutines make use of the 3D capabilities of Tektronix 4129 workstation with a resolution 1280 x 1024 pixels and 8 bit planes. The model is Gouraud-shaded and for the reflection model we used three light sources (one main and two secondary). The resulting slide was scanned and reproduced in four colours.

Title: Translucent planes in a three dimensional view
Scale: variable (digital elevation model (DEM) is 5 x 7 km)
Publisher: Department of Geography, University of Zurich
Cartographic design: René L'Eplattenier, Department of Geography, University of Zurich
Contents: A small region near Glarus from an extract of the DEM of Switzerland with a resolution of 100m x 100m. The model is overlaid with translucent horizontal planes.
Reproduction: The three dimensional view was generated by subroutines written by the author. The subroutines make use of the 3D capabilities of Tektronix 4129 workstation with a resolution 1280 x 1024 pixels and 8 bit planes. The model is Gouraud-shaded and for the reflection model we used three light sources (one main and two secondary). The effect of translucency of the planes is derived by using special translucency patterns offered by the workstation. The resulting slide was scanned and reproduced in four colours.
Title: Automated Shaded Relief Display and Analytically Extracted Structure Lines

Scale: 1:50,000

Publisher: Department of Geography, University of Zurich

Cartographic design: Robert Weibel, Department of Geography, University of Zurich

Contents:
- Shaded Relief (part of Rhine Valley, Grisons)
- Structure Lines (only on right side of map)
  - Valleys (blue)
  - Ridges (red)

Basis of the display is a gridded Digital Elevation Model (DEM) that was generated at the Department of Geography of the University of Zurich from scanner-digitized 1:25,000 contour lines with an equidistance of 20m (used by kind permission of the Federal Office of Topography, Wabern, Switzerland). The interpolation procedure used was a Delaunay triangulation with subsequent interpolation within the triangles. Relief shading was produced automatically by analytical hillshading. Structure lines (i.e. valleys and ridges) were extracted by an automated procedure directly from the DEM. The algorithm applied simulates the flow of water over the terrain. Valleys are then made up of grid points with the locally highest flow-through of water. Ridges are found by turning the DEM upside down and applying the same algorithm as for the valleys. The structure lines are shown as raster points; however, they could also be vectorized by following the raster points upstream.

Reproduction: The final raster files were displayed using PostScript page description language on a Linotronic 100 photo typesetting device (resolution of 570 dots per cm using a half-tone screen of 35 pixels per cm). PostScript code was automatically generated by another procedure.
Title: Panoramic View of a Digital Elevation Model (DEM)
Observation Point: Near Simplon Dorf (Canton of Valais)

Scale: variable (DEM is 17.5 x 12 km)

Publisher: Department of Geography, University of Zurich

Cartographic design: Adrian Herzog and Robert Weibel, Department of Geography, University of Zurich

Contents: Panoramic views are a newly developed feature in the raster-based Geographical Information System GRID/GRIDUNI. This more realistic view of DEM allows a better perception of terrain shapes and intervisibilities, and supports the examination of DEM quality. The following steps are used to generate this kind of panorama: 1. Input to the procedure is a gridded DEM (in our case a DEM with a resolution of 25m) and a set of parameters (e.g. observation point, light source). The DEM was interpolated at the Department from scanner-digitized contour lines with an equidistance of 20m (used by kind permission of Federal Office of Topography, Wabern, Switzerland). 2. Each grid cell is divided into two triangles, for which their relative position to the observer is calculated. 3. Triangles are sorted by descending distance to the observer point. 4. Triangles are rasterized into a grid file (in our case two files of 1800 by 600 cells, each file covers 200 degrees of the full circle). This grid file can now be displayed in various ways.

Reproduction: The final raster file was displayed using PostScript page description language on a Linotronic 100 photo typesetting device (resolution of 570 dots per cm using a halftone screen of 35 pixels per cm). PostScript code was automatically generated by an other GRID/GRIDUNI-procedure.
Title: Perspective View of Parts of the Siebenhengste-Cave System

Scale: 1:3300; viewing angle: azimuth 30°, inclination -10°

Publisher: Department of Geography, University of Zurich

Cartographic design: Martin Heller, Department of Geography, University of Zurich

Contents: The Siebenhengste-Cave system near Interlaken (Canton Bern) is one of the longest caves in the world. More than 95 km passages are currently surveyed and mapped to scale 1:500. It is obvious that one frame is not adequate to represent its high three-dimensional complexity. Therefore, an interactive visualizing tool is essential to analyze and understand cave morphology. The comprehensive cave mapping program package TOPOROBOT has been developed since 1972 and is used by many cavers worldwide.

Reproduction: The image was calculated on a Vax 750 and previewed on a Tektronix 4129. Copyproofing was done on an Apple LaserWriter and the final output was generated on a Linotronic 100 with a resolution of 108 pixels per inch. PostScript was instrumental in producing this picture.
<table>
<thead>
<tr>
<th>Title</th>
<th>School map Kanton Zürich</th>
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<tr>
<td>Scale</td>
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<tr>
<td>Publisher</td>
<td>Lehrmittelverlag des Kantons Zürich</td>
</tr>
<tr>
<td>Cartographic design</td>
<td>Orell Fussli Graphic Arts Ltd., Zurich</td>
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<tr>
<td>Contents</td>
<td>Roads, settlements in generalized representation, rivers, railways. Symbols for thematic information. Relief shading in hypsometric coloured levels.</td>
</tr>
<tr>
<td>Reproduction</td>
<td>Offset printing in 12 colours, special colour system.</td>
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</tbody>
</table>
Title: Geological Atlas of Switzerland
       sheet «Schächental»
Scale: 1 : 25 000
Publisher: Geologische Landesaufnahme, Basel
Cartographic design: Orell Fussli Graphic Arts Ltd., Zurich
Contents: Presentation of the geological and tectonic facts by means of signs and
          colours based on the topographical map elements.
Reproduction: Scribing of the colour contours, drawing and assembling of the geological
             information. Using the stripmask-method for preparing the colour-
             screen plates.
             Printing in 16 colours, special colour system, on Syntosil paper.