

FRONTISPIECE. Use of a sorting needle for extracting cards for a mixed deck. By repeated sensing of holes in a given field, unwanted cards are progressively removed until only the desired stereograms remain in the deck.

DR. T. EUGENE AVERY
University of Illinois
Urbana, Ill. 61081

All SORTS of Stereograms

Edge-punched cards assist in retrieving illustrations from a random file.

(Abstract on page 1399)

INTRODUCTION

ORGANIZATIONS THAT accumulate large files of aerial photographs in the form of annotated stereograms sometimes experience difficulty in locating needed reference illustrations on short notice. In many cases, the mounting of these stereograms on standard edge-punched cards provides a ready solution to the problem of filing, indexing, and relocating selected aerial views. Stereogram cards may be numerically coded according to subject matter, geographic region, scale, season, date of photography, type of film, and other classifications. Once coded and notched, all cards in a particular category can be easily retrieved through a simple system of mechanical sorting with a wire needle. 50 to 100 cards can be handled per sort, and the system is well suited for stereogram files containing random mixtures of several hundred reference cards.

Stock cards may be purchased in several standard sizes, such as $2\frac{1}{2} \times 6\frac{1}{2}$ inches, $3\frac{1}{4} \times 7\frac{1}{2}$ inches, 5×8 inches, and larger. The cost ranges from \$10 to \$20 per 1000, depending on card size, quantity ordered, or special printing requested. A 5×8 -inch stereogram card printed to the author's specifications is illustrated in Figure 1. The marginal numbering scheme of 7-4-2-1 for each *field* of four holes is one of several standard digital arrangements; identifications of these fields and groupings of two fields into *sections* were accomplished by special printing.

DEVELOPMENT OF CODES

To make use of edge-punched cards, all marginal information to be entered must first be reduced to a logical system of numerical codes. For example, the general type of subject matter illustrated, i.e., card class, might be coded as follows:

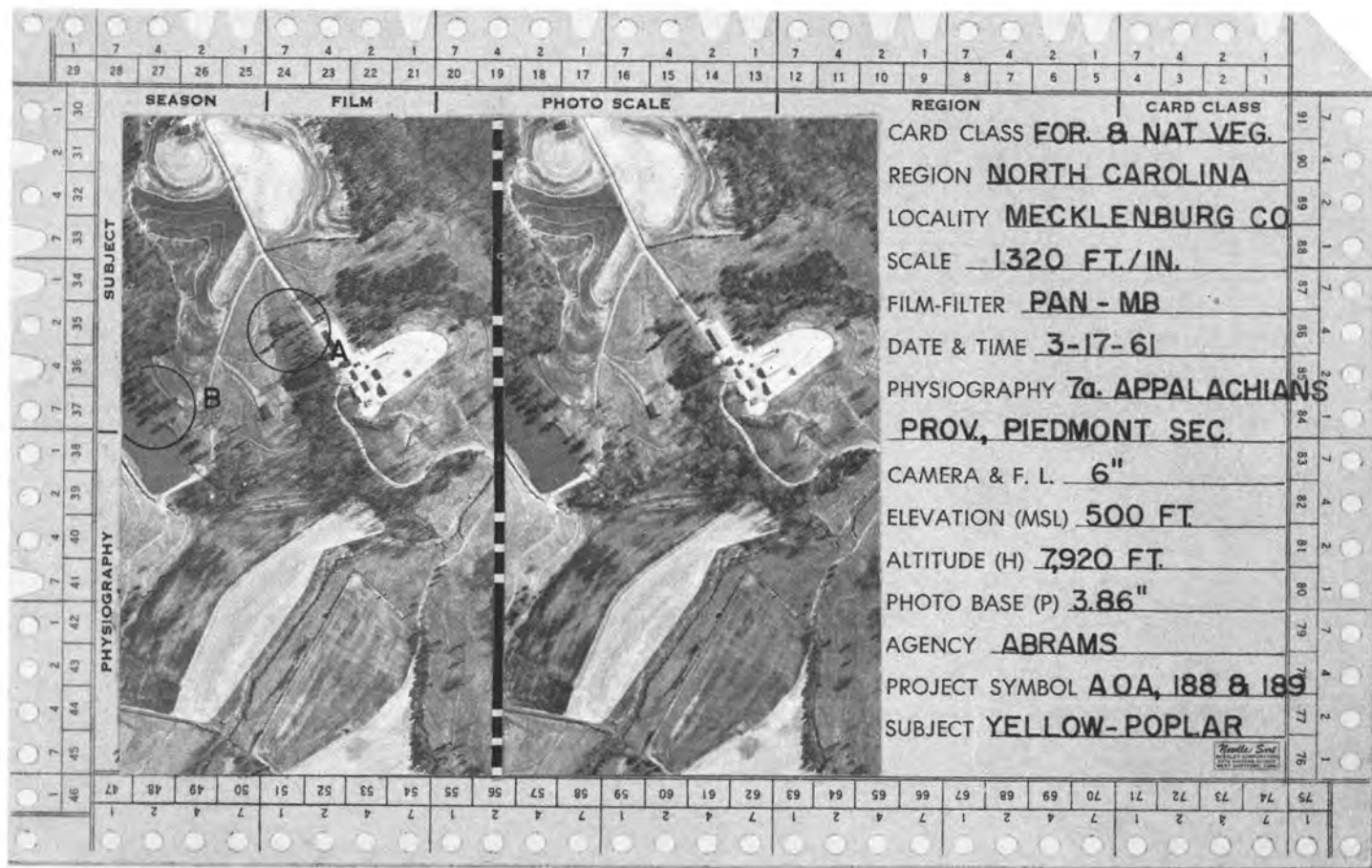


FIG. 1. Example of an edge-punched stereogram card. Original size was 5×8 inches. This particular imagery illustrates tree shadow patterns for (A) eastern redcedar and (B) loblolly pine.

- 1—Forests and natural vegetation
- 2—Agricultural crops and conservation practices
- 3—Soils and erosional patterns
- 4—Water, drainage systems, and shoreline features
- 5—Range and wildlife management
- 6—Landforms and physiographic features
- 7—Structural geology
- 8—Glaciation
- 9—Mining and excavation
- 10—Archeology
- 11—Urban-residential patterns
- 12—Industrial and transportation features
- 13—Engineering structures and uses
- 14—Military and defense installations

series of numbers (ranging from 1 to 91) could be used for *direct coding*, i.e., assigning a specific meaning to each individual number. This method is simple and provides for rapid card retrieval, but the amount of data that can be coded is rather limited in comparison with the use of the 7-4-2-1 fields.

HAND NOTCHING AND SORTING

Once the classification system and corresponding codes have been developed, card margins are usually notched with a special hand punch. To minimize errors, it is often

ABSTRACT: The report describes the use of standard, edge-punched cards on which stereograms may be mounted for easy reference. In this instance, aerial photographs of forest cover types have been coded according to several classifications for efficient hand sorting and information retrieval. With a simple reference file of this kind, stereograms illustrating a particular type of vegetation, film, or physiographic region can be quickly extracted from a deck of randomly mixed cards.

Because just 14 categories are involved here, this classification requires only one of the 7-4-2-1 fields on a card. As seen from the card-notching scheme in Table 1, each field can accommodate numerical values from 0 to 14 (no punches to all 4 notches) for a total of 15 classifications.

Referring again to the notched card in Figure 1, it will be noted that the *card class* is coded as 1, indicating that the stereogram was prepared to illustrate some aspect of forests and natural vegetation. Further study of the marginal values on the card yields the coded entries shown in Table 2.

The foregoing interpretations may be verified by reference to the sample codes listed subsequently. It will be noted that only two of the four card margins are utilized here, so the classifications coded could be increased considerably above that illustrated. As an alternative method of recording, the inner

TABLE 2. CODED ENTRIES USED IN FIGURE 1

<i>Coded items</i>	<i>Interpretation of codes</i>
Region.....	33 = North Carolina
Photo scale....	13 = Approximately 1,300 feet per inch
Film.....	1 = Panchromatic
Season.....	3 = March
Subject.....	59 = Yellowpoplar-N. red oak-white oak cover type
Physiography..	07 = Older Appalachians Province

TABLE 1. CARD NOTCHING SCHEME

<i>Code</i>	<i>Notches used</i>	<i>Code</i>	<i>Notches used</i>
1 = 1		8 = 7 & 1	
2 = 2		9 = 7 & 2	
3 = 2 & 1		10 = 7 & 2 & 1	
4 = 4		11 = 7 & 4	
5 = 4 & 1		12 = 7 & 4 & 1	
6 = 4 & 2		13 = 7 & 4 & 2	
7 = 7		14 = 7 & 4 & 2 & 1	



DR. T. EUGENE AVERY

advisable to first mark the holes to be notched with a pencil.

Sorting is accomplished with a special wire needle (a knitting needle will often suffice). A stack of 50 to 75 cards may be handled during each sort, provided they are perfectly aligned and carefully "fanned out" on the needle to avoid friction between cards. Selective sorting is merely a process of elimination—the cards *not wanted* are progressively removed from the deck. To make a selective sort of a numerical code, one should start at the left of the field (with the highest digit) and work toward the right-hand side or lower digits. For example, if the month of March is coded as 3 (2 and 1) in a 7-4-2-1 field, one would first sort on the digit 7; all cards that drop from the needle would be discarded. Then a sort is made on the digit 4, and again all cards that drop are discarded. The cards remaining at this point can have notches only in positions 2, 1, or both. Thus as the needle is passed through each of these holes, discards will be lifted out and the cards *remaining* (i.e., those notched in both the 2 and 1 positions) will represent the month of March. Similar procedures are followed for sorting in other fields (Frontispiece).

SAMPLE STEREOGRAM CODES

The codes that follow are not intended to be all-inclusive, even for the description of forests and natural vegetation. Instead, they merely provide examples of the kinds of information that can be recorded on edge-punched cards. For the forest cover types, codes were derived from a numbering scheme published by the Society of American Foresters. Physiographic classifications represent descriptive regions recognized by many professional geographers. For other categories, codes are self-explanatory.

Region (state)

- 01—Alabama
- 02—Alaska
- 03—Arizona
- 04—Arkansas
- 05—California
- . . . etc.
- 50—Wyoming

Photo scale (in hundreds of feet/inch)

- 01—100
- 02—200
- 03—300
- 04—400
- 05—500
- . . . etc.
- 20—2,000

Film

- 1—Panchromatic
- 2—Infrared
- 3—Pan-infrared combination
- 4—Conventional color
- 5—Color infrared
- 6—Radar imagery
- 7—Thermal imagery

Season (month)

- 1—January
- 2—February
- 3—March
- 4—April
- 5—May
- 6—June
- 7—July
- 8—August
- 9—September
- 10—October
- 11—November
- 12—December

Subject (forest cover type)

- 01—Jack pine
- 02—Black spruce-white spruce
- 03—Jack pine-paper birch
- 04—White spruce-balsam fir
- 05—Balsam fir
- . . . etc.
- 99—Slash pine-swamp tupelo

Physiography

- 01—Laurentian Upland Province
- 02—Arctic Archipelago Province
- 03—Greenland Province
- 04—Atlantic and Gulf Coastal Plain
- 05—Continental Shelf
- . . . etc.
- 31—Lesser Antilles

A LARGER CLASSIFICATION PROBLEM

The elementary classification techniques described here represent only a partial solution to a growing problem. What is needed is a universal, internationally accepted method for the classifying, coding, and retrieval of aerial photographs, film negatives, and related imagery now produced in enormous quantities by a variety of remote-sensing devices. In most cases, such imagery is currently classified and filed by project number, geographic location, or date; few organizations have managed to arrange their files so that selected imagery of specific *features* or *subjects* can be quickly extracted.

Any proposed scheme for describing and coding aerial imagery should utilize the best attributes of accepted library classification methods and automated information retrieval systems. The derivation and adoption of a universal technique for retrieving aerial imagery according to several subject classifications would be a boon to agencies that re-

quire efficient cross-indexing for the thousands of photographs that they annually accumulate. By designing a classification system that is readily adapted to the latest in data-processing machines, a research scientist seeking imagery of copper smelters, mangrove forests, or coral atolls might conceivably "search" through all photographs held by the National Archives or the Department of Defense in a matter of a few hours.

REFERENCES

- Anonymous. 1957. *The Needle Sort Instruction Manual*. Business Forms, Inc., West Hartford, Conn. 14 pp., illus.
- Chester, G. S. 1965. A method of preparing an edge-punched card literature reference file. *Forestry Chron.* 41 (2): 207-214, illus.
- Society of American Foresters. 1954. Forest cover types of North America, exclusive of Mexico. *SAF Committee on Forest Types*, Washington, D. C. 67 pp., illus.

XI CONGRESS ISP, LAUSANNE, SWITZERLAND

Here are brief samples of the package tours that are described more completely on page 1193 of the October issue of *PHOTOGRAMMETRIC ENGINEERING*:

PACKAGE No. 1, July 6. Depart New York, N. Y.; July 8-19, XI Congress Lausanne; 20-27 July, Genoa, Pisa, Florence, Rome, Sorrento, Naples; July 27, N. Y. \$695.00; Children (2-12 years) \$523.00

PACKAGE No. 2, July 6. Depart New York, N.Y.; July 8-19, XI Congress Lausanne; July 20-27, Blackforest, Heidelberg, Luxembourg,

Brussels, Amsterdam, Hook of Holland, Harwich, London; July 27, N.Y. \$665.00; Children (2-12 years) \$519.00.

PACKAGE No. 3, July 6. Depart New York, N.Y.; 8-19 July, XI Congress to Montreux, Castle of Chillon; 21 July, N.Y. \$450.00; Children (2-12 years) \$305.00.

PACKAGE No. 4, July 5. Depart New York, N.Y.; July 7-19, XI Congress Lausanne; 20-28 July, make your own arrangements at your own expense; 28 July, board flight for N.Y. in either Geneva or London. \$525.00; Children (2-12 years) \$335.00.

RESERVATION REQUEST FORM

TO: Mrs. Walter H. Katherman, Jr., American Express Tour Department
622-14th Street, N. W., Washington, D. C. 20005

Please confirm _____ reservations for package no. _____

Enclosed is deposit* in the amount of \$_____ as requested.

For: Mr. _____
Mrs. _____
Miss _____

Please indicate ages of children if applicable.

* (Checks to be payable to AMERICAN EXPRESS COMPANY)

Travel arrangements covered by:

- _____ Government or AGU grant or Government Contract
_____ Government T/R
_____ Personal or other funds.

Please confirm connecting flight reservations for _____ persons.

From _____ to New York (J.F.K.)

From New York to _____

In connection with package selected.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____