

**An aid to 'uncovering'
mathematics: a select bibliography**

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Some books are to be tasted, others to be swallowed,
and some few to be chewed and digested.

- Francis Bacon

An aid to 'uncovering' mathematics: a select bibliography

Some mathematics teachers have traditionally thought of their work in terms of "covering topics". Given a class and a certain number of periods per week, one took a textbook and proceeded to cover the material. It was all quite straightforward, but there were two problems. The first was that for all too many students, one might just as well have been covering "Geometric Constructions", or whatever, with a blanket. The other problem was that over the years the danger of slipping into a pedagogical rut was very great.

Many teachers now find it helpful to think, not just in terms of "covering" topics, but also in terms of "uncovering" them as well. Instead of just pulling students through a well-travelled but narrow groove, they attempt to open up to students a number of alternative areas related to a given topic. To work effectively in this manner, however, one needs to have a knowledge of a considerable range of source materials. The writer has found the following books to be of help in "uncovering" mathematics, both for himself and for his students. Hopefully they will be of use to other mathematics teachers as well.

Three particular groups of teachers have been kept in mind during the compilation of the bibliography. They are:

- those who are in a position to suggest library purchases in their school;
- those seeking sources for "option" or "enrichment" lessons;
- those wishing to increase their own mathematical knowledge.

Mathematical soundness was the only essential criterion that the books had to meet. The bibliography is by no means exhaustive but does include a large percentage of what the writer believes to be the best works in the field. To maximize information while minimizing space the following coding system has been employed:

- | | |
|-----------------------------|--------------------------------------|
| * recommended | \$ good value for money |
| ** highly recommended | \$\$ especially good value for money |
| *** most highly recommended | hb hardback edition |
| | pb paperback edition |

The "reading level" for each book has been estimated on a scale ranging from (1) to (6). The scale is roughly linear, with books graded (1) being readable by the least capable junior high students and those graded (6) being readable by the most capable senior high students.

Nearly all the titles should be obtainable through any good bookstore and most of the books will be available through the larger libraries. Book prices have been obtained from the 1972 edition of *Books in print*. A question mark following an entry signifies that the information was not verified.

A few titles are available only in the United Kingdom; these have U.K. following the publisher in the entry. Several titles are significantly cheaper in their U.K. editions and are priced U.K.£___. W. Heffer and Sons Ltd., 20 Trinity Street, Cambridge, England CB2 3NG, have an efficient and friendly mail-order service. They can also be paid in Canadian funds by cheque; £1.00 is approximately \$2.52.

For convenience, the bibliography has been divided into five sections: Texts and teachers' handbooks, Special topics, General surveys, Recreational and activity, and Associations, journals and bibliographies.

TEXTS AND TEACHERS' HANDBOOKS

- Banwell, C. *et al*, *Starting points*. Oxford University Press, 1972, 246 pp.
▶ ***, (3), pb \$7.75 (U.K. £2.75). Described as a "collection of suggestions for the teaching of mathematics", this highly imaginative, lively, handbook has sections on methodology, situations and materials. Appropriate for junior high school and upwards; British terminology.
- Del Grande, J.J. *et al*, *Math, book 1*. Gage Educational, 1971, 342 pp.
▶ ** (2), hb \$5? The first text in a new series written in Ontario. The second volume, *Math, book 2*, for Grade VIII, appeared in 1972; others are to follow. A smooth integration of standard topics such as ratio with non-standard ones such as Papygrams and Pick's Theorem. Colorfully illustrated and well produced.
- Hess, A.L., *Mathematics projects handbook*. D.C. Heath, 1962, 60 pp.
▶ (4), pb \$2? Although somewhat dated, this pamphlet still has a number of worthwhile suggestions for the teacher considering project work. Topic list and bibliographies.
- Jacobs, H.R., *Mathematics: a human endeavor*. W.H. Freeman, 1970, 529 pp.
▶ **, (4), \$, hb \$8.50. Subtitled "A textbook for those who think they don't like the subject", this book is just that. A painless introduction to functions, logs and statistics with well-chosen, interesting exercises. Generously, aptly and humorously illustrated. A must for "Peanuts" fans and libraries.
- Johnson, D.A. and G.R. Rising, *Guidelines for teaching mathematics, second edition*. Wadsworth, 1972, 544 pp.
▶ (5), hb \$9.95. Probably still the best of the "Math Ed" texts. Sometimes rather stuffy but complete. Very good appendices on instructional aids, enrichment materials and publications.
- Paling, D. *et al*, *Making mathematics 1, second edition*. Oxford University Press, 1971, 95 pp.
▶ **, (1), \$, hb \$1.50? (U.K. £0.50). The first of a four volume series intended for the "non-academic" secondary school student in Britain. Simplicity without condescension. Workbooks and topic books are available to accompany the course.

Wheeler, D.H. (ed.), *Notes on mathematics in primary schools*. Cambridge University Press, 1969, 340 pp.

- ▶ **, (3), \$pb, pb \$5, hb \$10? (U.K. pb £1.50, hb £3.15). By members of the Association of Teachers of Mathematics in the U.K. Don't be misled by the title; this is a treasure-trove of starting points from elementary school to senior high. Well illustrated; bibliography.

SPECIAL TOPICS

Adler, I., *Magic house of numbers*. Signet, 1957, 126 pp.

- ▶ (2), \$pb, pb \$0.60 (hb \$3.69, John Day). One of the better collections of number curiosities, calculating tricks and games.

Bell, E.T., *Men of mathematics*. Simon and Schuster, 1963?, 596 pp.?

- ▶ (4), \$pb, pb \$2.95, hb \$7.95 (U.K. pb £0.60, 2 volumes, Penguin). Biographies of some 30 mathematicians from Zeno to Cantor. An entertaining presentation which emphasizes the social context of the mathematician's work.

Budden, F.J., *An introduction to number scales and computers*. Longmans (U.K.), 1965, 192 pp.

- ▶ *, (4), pb £0.65. A comprehensive survey of "bases" with applications ranging from the elementary to the complex. Good exercises with answers; bibliography.

Cundy, H.M. and A.P. Rollett, *Mathematical models, second edition*. Oxford University Press, 1961, 286 pp.

- ▶ **, (5), \$, hb \$6.50 (U.K. £1.50). The classic work in this area. Models of all sorts: wire, wood, perspex; linkages, knots, curvestitching, polyhedra. Just the thing for the "meccanno"-ly minded. Lots of "real" mathematics here; bibliography.

Davis, P.J., *The lore of large numbers*. Random House, 1961, 165 pp.

- ▶ *, (4), pb \$2.50. A title in the SMSG monograph series. A potpourri of number lore at many levels. A good reference to have around; excellent problems and appendices.

Fielker, D.S., *Topics from mathematics*. Series. Cambridge University Press, 1967 and on, 32 pp.

- ▶ *, (1), \$, pb \$1 (U.K. £0.30). Fielker has written four booklets in this series - "Cubes", "Computers", "Towards probability" and "Statistics". The series (See also J. Mold.) is straightforward and well written. Junior high students would enjoy working through some of them for a project.

Gardner, M., *Mathematics, magic and mystery*. Dover, 1956, 176 pp.

- ▶ * (3), \$\$, pb \$1.50. One of Gardner's earlier books but of the high quality we have come to expect from him. Just the thing for the back-corner blackjack players or the nimble-fingered teacher.

Golomb, S., *Polyominoes*. Scribners, 1965, 181 pp.

- ▶ ** (3), hb \$6.50. Golomb invented polyominoes when he was a graduate student at Harvard in the early 1950s. This "space filling" situation (the

3-dimensional version is marketed as "Soma") has appeal at all levels. Some fairly high level combinatorial theory can be painlessly taught here.

Johnson, D.A. and W.H. Glenn, *Exploring mathematics on your own*. Series. McGraw-Hill, 1961, 64 pp.

▶ *, (3), pb \$1.80 per booklet. There are 16 titles in this series: "Adventures in graphing", "Basic concepts of vectors", "Computing devices", "Curves in space", "Finite mathematical systems", "Fun with mathematics", "Geometric constructions", "Logic and reasoning", "Number patterns", "Numeration systems", "Probability and chance", "Pythagorean theorem", "Sets", "Shortcuts in computing", "World of measurement" and "World of statistics". They make good companion or enrichment booklets to many areas.

Mold, J., *Topics from mathematics*. Series. Cambridge University Press, 1967 and on, 32 pp.

▶ * (1), \$, pb \$1 (U.K. £0.30). Mold's titles in this series are: "Circles", "Rolling", "Solid models", "Tessellations" and "Triangles". See comments on D. Fielker.

Stover, W., *Mosaics*. Houghton-Mifflin, 1966, 34 pp.

▶ *, (5), pb \$2? A small but fully-packed booklet on nets/tiling patterns. Exercises, project suggestions and bibliography.

Walter, M.I., *Boxes, squares and other things*. NCTM, 1970, 88 pp.

▶ *, (3), pb \$1.80. Subtitled "A teacher's guide for a unit in informal geometry", this booklet describes a mathematical journey from carton folding to group theory. Suggestions for extension of work and an excellent bibliography.

Wenninger, M.J., *Polyhedron models*. Cambridge University Press, 1971, 208 pp.

▶ *, (4), hb \$15? (U.K. £5). This book presents 119 polyhedra, from the tetrahedron to the great dirhombicosidodecahedron. Photographs, nets and advice for every polyhedron; bibliography. (Caution - may be addictive.)

Wisner, R.J., *A panorama of numbers*. Scott Foresman, 1970, 176 pp.

▶ **, (4), \$, pb \$2? A delightful introduction to number theory. The complete preface to this book reads, "I wrote this book because I wanted to." We should be pleased that he did.

GENERAL SURVEYS

Bergamini, D., *Mathematics*. Time-Life Books, 1963, 200 pp.

▶ **, (3), hb \$7.60. A volume in the Life Science Library with 8 well-written chapters. Superbly illustrated; another library must.

Hogben, L., *Mathematics in the making*. MacDonald (U.K.), 1960, 320 pp.

▶ *, (5), hb £3.50. A well-written and profusely illustrated view of the development of mathematics. Despite the generally advanced nature of most of its topics, junior high readers could browse with benefit.

- Kasner, E. and J. Newman, *Mathematics and the imagination*. Simon and Schuster, 1964?, 380 pp.
 ▶ *, (5), \$U.K., pb \$1.95, hb \$4.50 (U.K. £0.40, Penguin). Some quite original material in this classic. Chapters on puzzles, paradoxes, topology and calculus are written with flair and are well illustrated.
- Kline, M. (ed.), *Mathematics in the modern world*. Freeman, 1968, 409 pp.
 ▶ **, (6), \$pb, pb \$6.50, hb \$10. A collection of 50 readings taken from *Scientific American* over a period of 20 years. Sections on biography, foundations and applications. Compact, well written articles, most by first-class mathematicians, make this a valuable reference volume.
- Newman, J.R. (ed.), *The world of mathematics*. Simon and Schuster, 1956, 2,537 pp.
 ▶ **, (6), \$pb, pb \$15, hb \$30. Subtitled "A small library of the literature of mathematics from A'h-mose the scribe to Albert Einstein presented with commentaries and notes", this massive 4-volume set is brilliantly edited, and contains much material that is almost impossible to obtain elsewhere, including original papers and large sections of out-of-print books. The volume titles are: 1. *Men and numbers*, 2. *World of laws and the world of chance*, 3. *Mathematical way of thinking*, 4. *Machines, music and puzzles*.
- Sackett, D., *The discipline of numbers: foundations of mathematics*. S. Low, Marston (U.K.), 1966, 128 pp.
 ▶ *, (3), \$, hb £1.70. A volume in the Foundations of Science Library, this book has an applications orientation to most of the standard secondary school topics. Very well illustrated.
- Sawyer, W.W., *Introducing mathematics*. Series. Penguin.
 ▶ *, (5), \$. This 3-volume set contains a wealth of teaching methods and suggestions. Sawyer has no peer as a popularizer of traditional mathematics. The volume titles are: 1. *Vision in elementary mathematics*, 1964, 346 pp., pb \$1.75 (U.K. £0.40), 2. *The search for pattern*, 1970, 349 pp., pb \$1.95 (U.K. £0.40), 3. *A path to modern mathematics*, 1966, 224 pp., pb \$1.25 (U.K. £0.30). Two earlier books of considerable merit also are *Mathematician's delight*, 1943, 238 pp., pb \$1.25 (U.K. £0.20) and *Prelude to mathematics*, 1955, 214 pp., pb \$1.25 (U.K. £0.20).
- Stein, S.K., *Mathematics: the man-made universe, second edition*. Freeman, 1969, 415 pp.
 ▶ *, (6), hb \$8.50. Subtitled "An introduction to the spirit of mathematics", this book catches the flavor of mathematical research in several of the chapters. High-powered but not overwhelming; extensive exercises and references.

RECREATIONAL AND ACTIVITY

- Ball, W.W.R., *Mathematical recreations and essays, 11th revised edition*. Macmillan, 1939, 418 pp.
 ▶ **, (5), \$pb, pb \$2, hb \$6. The granddaddy of the mathematics recreation books, with the first edition in 1892. This edition is revised by H.S.M. Coxeter. Crammed full of material; quite a few "new" games can be found if one is diligent.

Domoryad, A.P., *Mathematical games and pastimes*. Pergamon (U.K.), 1963, 298 pp.
▶ **, (5), hb £2.05. The Russian view of most of the standard mathematical recreations, which frequently differs significantly from the western approach.

Gardner, M., *Scientific American book of mathematical puzzles and diversions*. Simon and Schuster, 1959, 178 pp.

▶ ***, (4), \$pb, \$\$pb U.K., pb \$1.45, hb \$5.95 (U.K. 0.30, Penguin).

———, *Second Scientific American book of mathematical puzzles and diversions*. Simon and Schuster, 1961, 253 pp.

▶ ***, (4), \$pb, \$\$pb U.K., pb \$1.95, hb \$4.95 (U.K. 0.30, Penguin).

———, *New mathematical diversions from Scientific American*. Simon and Schuster, 1966, 253 pp.

▶ ***, (4), \$pb, pb \$2.95.

These books are the first 3 collections of Gardner's excellent monthly column, "Mathematical games", in *Scientific American*, which has been running continuously since 1956. Gardner writes with great clarity. His column now serves as a meeting point for some of the best mathematical minds of the day.

Kraitchik, M., *Mathematical recreations, second revised edition*. Dover, 1953, 330 pp.

▶ *, (5), \$, pb \$2.50. Another classic, this book is based on articles from the recreational mathematics magazine, *Sphinx*, which was published in the 1930s.

Lukacs, C. and E. Tarjan, *Mathematical games*. Pan, 1970, 192 pp.

▶ *, (2), \$\$pb, pb \$1, hb \$4.95 - Walker. A Hungarian view of recreational mathematics. Of particular value are some analyses of popular games such as Solitaire (Hi-Q).

Merrill, H.A., *Mathematical excursions*. Dover, 1957, 145 pp.

▶ *, (3), \$, pb \$1.50. Subtitled "Side trips along paths not generally travelled in elementary courses in mathematics", this is a particularly clearly written exposition of several recreational stalwarts.

Pearcy, J.F.F. and K. Lewis, *Experiments in mathematics*. Longmans (U.K.), 1966-67, 64 pp., 3 "stages".

▶ *, (3), \$, pb £0.35. A collection of activities for a lab-type approach. Appropriate for the junior high level.

Steinhaus, H., *Mathematical snapshots, second edition*. Oxford University Press, 1969, 311 pp.

▶ *, (4), hb \$7.50. A collection of several quite original recreational mathematics topics from a noted Polish mathematician. Particularly good use of photographs.

ASSOCIATIONS, JOURNALS AND BIBLIOGRAPHIES

Association of Teachers of Mathematics (ATM). *Mathematics Teaching* is the stimulating quarterly journal of this very active U.K. association. Overseas membership (at \$8 per annum) includes a subscription. The ATM also publishes a number of excellent pamphlets such as Dick Tahta's *Pegboard games* (\$0.75) and *Examinations and assessment* (\$1.25). Write ATM, Market Street Chambers, Nelson, Lancashire, England BB9 7LN.

Hardgrove, C.E. and H.F. Miller, *Mathematics library: elementary and junior high school*. NCTM, 1968, 50 pp. \$0.80. Annotated bibliography.

Mathematics Council of The Alberta Teachers' Association (MCATA). *Delta-K* is the quarterly newsletter of MCATA, which is affiliated with NCTM. Membership of \$5 per annum includes subscription to *Delta-K* and the monographs as published. Write MCATA, Barnett House, 11010 - 142 Street, Edmonton, Alberta T5N 2R1.

National Council of Teachers of Mathematics (NCTM). *The Mathematics Teacher* and the *Arithmetic Teacher* are the two major journals of NCTM, having, respectively, secondary and elementary school orientations. The subscription fee, which includes NCTM membership, is \$9 for one journal or \$13 for both, per annum. Eight numbers of each journal are published per annum. NCTM also publishes *The Mathematics Student Journal* four times per annum, which is \$0.60 for NCTM members or \$2.50 for 5 subscriptions, and many other very good pamphlets and books on mathematics education. Write NCTM, 1201 - 16 Street NW, Washington, D.C. 20036.

Schaaf, W.L., *A bibliography of recreational mathematics*. NCTM, Volume 1, fourth edition, 1970, 148 pp.; Volume 2, 1970, 191 pp. \$3 and \$4 respectively. An essential for anyone seriously interested in recreational mathematics.

———, *The high school mathematics library, fourth edition*. NCTM, 1970, 86 pp. Annotated bibliography.

Sawyer, W.W. (ed.), *Student Mathematics, the Canadian student journal*. Published annually in September (1972 issue was No.3). Send \$0.10 per copy and a stamped, self-addressed envelope (at least 9"x4") to Student Mathematics, Room 373, College of Education, 371 Bloor Street W., Toronto 181, Ontario.



