News

Standards for Musical Information

ANSI

The American National Standards Institute subcommittee charged with developing a capability for machine interchange of musical information (colloquial name, MIPS, for Musical Interchange Processing Standards; official name, ANSI X3V1.8M) held week-long meetings in Washington D.C. in November 1986, in San Jose in February 1987, and in Minneapolis in June. Charles Goldfarb (IBM) serves as chairman; Steven Newcomb (Center for Music Research, FSU) is vice chairman. Alan Talbot (New England Digital), the secretary, is compiling a "Journal of Technical Developments." Anyone interested in interacting with MIPS should contact the MIPS Secretariat c/o Steven R. Newcomb (Center for Music Research, Florida State University, Tallahassee, FL 32306-2098).

MIPS takes the view that its charge is to develop a "language" that can express any music that can be written in standard notation. The standard is intended "as a storage and interchange format for musical ideas." Provisionally, the subcommittee has decided to differentiate these kinds of musical data: "the underlying musical form ['core']; a set of performances ['gestural']; a set of scores ['visual']; and a set of theoretical analyses ['analytical']. This hierarchical structure will be codified in terms of elements; each element has a related information set consisting of attributes." The coding is compatible with Standard Generalized Markup Language, a tool developed by Goldfarb for designing structured languages.

IFF

The Interchange File Format (IFF) for music is a group of protocols to facilitate exchange of music, text, and video files in diverse formats. Originally developed by Electronic Arts for the Amiga microcomputer, IFF has been extended to other synthesizer-related environments. File segments are labelled to enable the user to determine whether he wants detailed information from them. One protocol (ILBM) supports raster graphics, another (8XVS) supports sound sampling, and a third (SMUS) supports sequencing information. Further information can be obtained from Jerry Morrison at Electronic Arts.

MIDI

A proposal to standardize MIDI (Musical Instrument Digital Interface) file formats has been made by Dave Oppenheim of Opcode Systems. At press time, a draft was being circulated to the MIDI Manufacturers Association and formal consideration was to be given at the meeting of the National Association of Music Manufacturers in Chicago (June 27 - 30, 1987). The standard would serve microcomputers with a MIDI interface.

Recent Events

MILAN

Luigi Finarelli and Goffredo Haus gave a presentation on "A Musical Database on CD-ROM" for a CD-ROM workshop sponsored jointly by the Italian Informatics Association (AICA) and the Department of Information Science of the University of Milan on **May** 20, 1986. Some examples of work previously done with the CNUCE system in Pisa were demonstrated.

OXFORD

A two-day conference on "Computers and Music Research" was held at the Computing Laboratory, Oxford University, on **July** 9 and 10, 1986. Representation systems, data structures, and methods of printing music were among the topics discussed. One practical result of the meeting was the establishment of the electronic "Music-Research Digest" initiated by Stephen Page, one of the organizers of the meeting. The 29 predominantly British participants represented diverse aspects of musical activity.

ESSEN

Dr. Helmut Schaffrath, chairman of the Study Group on Computer Retrieval of the International Council for Traditional Music, convened a three-day symposium (**October** 1 - 3, 1986) at the University of Essen, BRD, to discuss databases, automatic musical notation and analysis, and networks. A previous meeting in Helsinki had been held. The participants, who were from Denmark, France, Great Britain, Holland, Italy, and Germany, explored the Essen database of 4000 German folksongs and saw a demonstration of visual and sound materials stored on CD-ROMs and addressed by the German postal network (btx). [A substantial corpus of encoded folksongs has been deposited with the Oxford Text Archive.] A technical manual in German describing the encoding and format of the data is available at Essen University; an English translation is in progress. Dr. Schaffrath also moderates a continuing electronic discussion of computer projects in ethnomusicology. The electronic address is JMP100@DE0HRZ1A.EARNNET.

CHICAGO

Several areas of computer involvement were discussed at the conference on music bibliography organized by Kären Nagy and hosted by Northwestern University in Evanston, Illinois, on **October** 9 - 12, 1986. Among the papers given were those of John Howard (Harvard University) on "RISM Series A/II: Music Manuscript Bibliography and Electronic Data Processing," Michael Fling and Kathryn Talalay (Indiana University) on "Music Bibliographic Instruction on Microcomputers," Nicholas Temperley (University of Illinois) on "The Problem of Definitive Identification in the Indexing of Hymn Tunes," Michael Keller (Yale University) on "New Bibliographic, Literary, and Musical Tools: The Italian Music and Lyric Poetry of the Renaissance Project," and Arthur Wenk (Québec) on "Varieties of Musical Analysis: Building an Analytical Sieve." The conference was supported in part by the National Endowment for the Humanities.

ZURICH

A two-day workshop on "Music Notation by Computer" was held at the Institut für Informatik of the Eidgenössische Technische Hochschule in Zurich on **October** 17 and 18, 1986. Bruno Spörri of the Schweizerisches Zentrum für Computermusik organized the meeting with the help of several colleagues. There were five speakers (Donald Byrd, Armando Dal Molin, John Maxwell, Giovanni Müller, and Bernhard Päuler) and four systems demonstrations (by Etienne Darbellay, Christoph Schnell, Karl Steinmann, and Christopher Yavelow).

COLLEGE PARK, MARYLAND

George Houle, Professor of Music at Stanford University, gave as a keynote address at the Handel Symposium at the University of Maryland in late **October** a discourse on "Editing Handel: Performance, Scholarship, and Technology." His paper commented on ways in which techniques of printing music in the past encouraged the notion that a "definitive monument of each work" could be created from multiple sources and suggested that eighteenth-century music might be well served in the future by the flexibility offered by emerging technology.

LONDON

A "Review of Data Bases for Eighteenth-Century Sources" was one component of a research students' study day sponsored by the Royal Musical Association in London on **November** 28, 1986. The event, held at the Institute for Historical Research, Senate House (University of London), was organized by Michael Burden, Irena Cholij, and Simon Hughes. Its overall focus was on eighteenth-century English music.

The second annual conference of the Association for History and Computing was held at Westfield College, University of London, from **March** 20 to 22, 1987. Papers on database methods, academic word processing, and typesetting were included.

COLUMBIA, SOUTH CAROLINA

Papers on music projects were read by Michael Keller (Yale), Roger Dannenberg (Carnegie Mellon University), and Linda Sorisio (IBM, Los Angeles) at the Eighth International Conference on Computers and the Humanities, held at the University of South Carolina (Columbia, SC) on **April** 9 - 11, 1987.

LISBON

Barry Brook spoke about the uses of computers at a conference on major trends in musicology. The conference, sponsored by the Gulbenkian Foundation, was held in Lisbon in **April**.

NEW YORK

A seminar on "Music Publishing and New Technology" was given at the annual meeting of the Music Publishers Association in New York on **June** 3, 1987. One music printing program for the IBM PC, *The Note Processor*, was demonstrated.

Forthcoming Events

SOUTHAMPTON

A session on "Computers in Early Music Research" was scheduled to be given during the fifteenth annual conference on Medieval and Renaissance Music held at Southampton University (U.K.) from **July** 24 to 27, 1987.

BOLOGNA

"Databases and the Practice of Musicology" is the title of a study session organized by CCARH for the meeting of the International Musicological Society in Bologna, Italy, scheduled for **August** 27 - **September** 1, 1987. The session is designed to offer detailed descriptions of two large database projects currently underway as a basis for a broad consideration of ways in which the methods and products of scholarship are being extended. Eleven participants from five countries represent the viewpoints of research scholars, editors, publishers, and software designers. A one-day meeting on "Computer-Based Approaches to Musical Data and Analysis: an Exchange of Technical Information" and an open discussion of the aims of the RENARC project (see **Databases of Text**) will also occur during the IMS meeting.

NEW ORLEANS

Maureen Buja of Garland Press has organized a session called "Computers, Musicology, and Music Instruction: Current Projects" for the joint national meeting of the College Music Society and the American Musicological Society in New Orleans in **October** 1987. Participants include Ann Woodward (videodiscs), Julian Elloway (the Oxford Music Processor), Michael Keller (madrigal/lyric poetry project), and Giulio Ongaro (a database for archival research).

Online Communications

HUMANET

ScholarNet, based at North Carolina State University in Raleigh, North Carolina, offers a variety of telecommunications services in exchange for a one-time membership fee. Its humanities branch, HumaNet, will concentrate initially on materials for English, history, philosophy, and religion. Access to DIALOG databases and an online encyclopedia (not specifically identified) is provided by the service. Subscription requests should be addressed to General Videotex Corp., 3 Blackstone Street, Cambridge, MA 02139.

HUMANIST

HUMANIST is an electronic mail network for information concerning computing in the humanities. It is seeking affiliation with the Association for Computers and the Humanities and with the Association for Literary and Linguistic Computing. Enquiries should be addressed to George Brett (*ECSGHB@TICC.BITNET*). Those wishing to subscribe should contact Willard McCarty (*McCARTY@UTOREPAS.BITNET*).

MUSIC-RESEARCH DIGEST

Stephen Page initiated an electronic mail Music-Research Digest in **July** 1986. Installments appear approximately biweekly and cover a host of topics, ranging from casual enquiries to detailed questions of methodology. Administrative requests should be sent to *"Music-Research-Request@uk.ac.oxford.prg"*; contributions may be sent to *"Music--Research@uk.ac.oxford.prg."* Please note that the second part of the address must be reversed from most countries outside the United Kingdom (*e.g., "prg.oxford.ac.uk"*). Distribution in the United States is being provided by Brad Rubenstein (*"brad@ingres.berkeley.edu"* [Arpa] and *"...!ucbvax!ingres!bradr"* [UUCP]).

MUSICOMP

An ongoing "electronic conference" on music and computers (called *CRT:MUSICOMP*) was started at the University of Michigan in the autumn of 1986. Outside users are welcome to participate but must first establish an account to use the UM system. Enquiries may be addressed to Ms. Julie Amo, Business Office, Computing Center, 1075 Beale Avenue, Ann Arbor, MI 48109 (313-764-8001).

TELETAU

A library of roughly 800 encoded works together with software of various kinds is available from the TELETAU (formerly TAUMUS) system, which is operated from Pisa and Florence. The electronic addresses for TELETAU are *MUSIC3@ICNUCEVM .BITNET* and *CHERU@IFIIDG.BITNET.*

Current Technical Research

Optical Scanning

A significant amount of interest in optical scanning of music, a possibility rigorously explored around 1970, has arisen in the past year. Some of it appears to have been promoted by the marked increase in availability of inexpensive digitizing equipment. Image capture is only the first stage in a long series of processes required for intelligent recognition and data manipulation, which must be carefully distinguished from "dumb" replication of the digitization. In multi-user environments, interest in optical character recognition may occur in conjunction with research related to image processing, signal processing, or automatic transcription.

Nicholas Carter, a postgraduate at the University of Surrey (Guildford, UK), where image processing techniques have been highly developed for some time, is writing programs in 'C' to run on a Gould microcomputer in a UNIX environment. A Canon A3 laser scanner is used for image capture. Carter reports some success with pitch recognition. An article on "Acquisition, Representation, and Reconstruction of Printed Music by Computer: A Review" by Carter and his supervisors, R. A. Bacon and T. Messenger, is forthcoming in *Computers and the Humanities*.

Bernard Mont-Reynaud, who has devoted many years of research to automatic transcription of taped music, has been exploring optical scanning techniques on the Xerox system at the Center for Research in Music and Acoustics (CCRMA) at Stanford University. In its preliminary stages, his work focuses on screen manipulation of visual elements of musical notation. This requires differential manipulation (rotation, enhancement, diminution) of horizontal and vertical planes (see Illustration #47).

The Waseda University (Tokyo) team led by Prof. Samadu Ohteru has been developing competence in automatic recognition of printed music, and in its translation to and from Braille, for several years. [See Illustration #48 for a representative sample of the level of complexity with which this system can currently deal.] Score reading is one component of a series of tasks implemented in the course of robotics research and development. [See also **Facilities.**]

Henry Baird, a specialist in image matching software at AT&T Bell Laboratories in Murray Hill, NJ, has recently begun to work on optical recognition of music. Others reporting some involvement in optical scanning research include Brad Rubenstein (Sun Microsystems and UC Berkeley); Peter Preston-Thomas (IBM PC; University of Ottawa); Neil Martin (IBM PC; undergraduate project in computer science, Thames Polytechnic, London); and Alastair Clarke (IBM PC; University of Cardiff).

Automatic Transcription

A group headed by Professor Seiji Inokuchi in the Department of Control Engineering at Osaka University has been involved for several years with diverse projects involving automatic transcription. Their current focus is on computer performances that provide the variable qualities that distinguish human performance. The analysis of performed music and the use of modelling techniques are steps toward this goal. The work is carried out using an Apollo Domain DN570AX2 computer with a tablet scanning system. Professor Inokuchi is a coauthor of numerous publications concerning this research. Writings on automatic transcription of Japanese folksong have appeared in conference proceedings of engineering symposia held in Montréal (Seventh ICPR, 1984) and Tokyo (ICASSP, 1986). [On other Japanese work related to automatic transcription, see **Facilities: Tokyo.**]

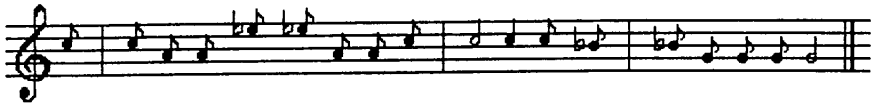
An extensive effort to transcribe Indian music is being made by an ISTAR (International Society for Traditional Arts Research) team with members in Holland, France, India, and elsewhere. A "melodic movement analyser" designed by Bernard Bel generates a graphic notation that Indian collaborators have praised. The graphs, or melograms, are converted into sequential lists of symbols. A number of different ways of representing the data have been developed. Melodic and rhythmic analyses are performed on the captured data. The ISTAR team includes Wim van der Meer of the Netherlands, B. Bel (France), J. Kippen (England), Joep Bor (The Netherlands), and P. Müller (Germany). An Apple // is the main piece of hardware involved. ISTAR publishes its own newsletter, in which extensive commentary can be found. For copies, write to Arcee Press, 5 Desh Bandhu Gupta Road, New Delhi 110055, India. For further information, write to Bernard Bel or Wim van der Meer.

Illustration 47

Optical Scanning: Fundamental Concepts

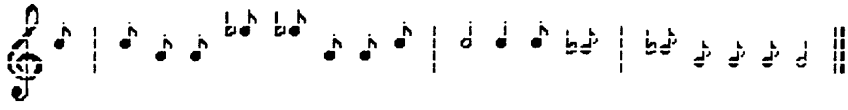
Bernard Mont-Reynaud: Screen manipulation of graphic elements.

(1) Original example.



(2) Simple vertical extraction.

(3) Residue from simple horizontal extraction.



(4) Object (eight-note) extraction.

(5) Rotation of vertical axis.

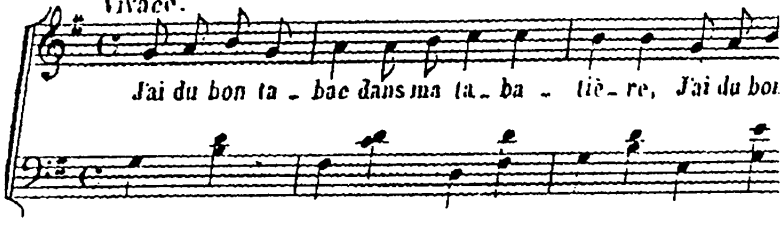


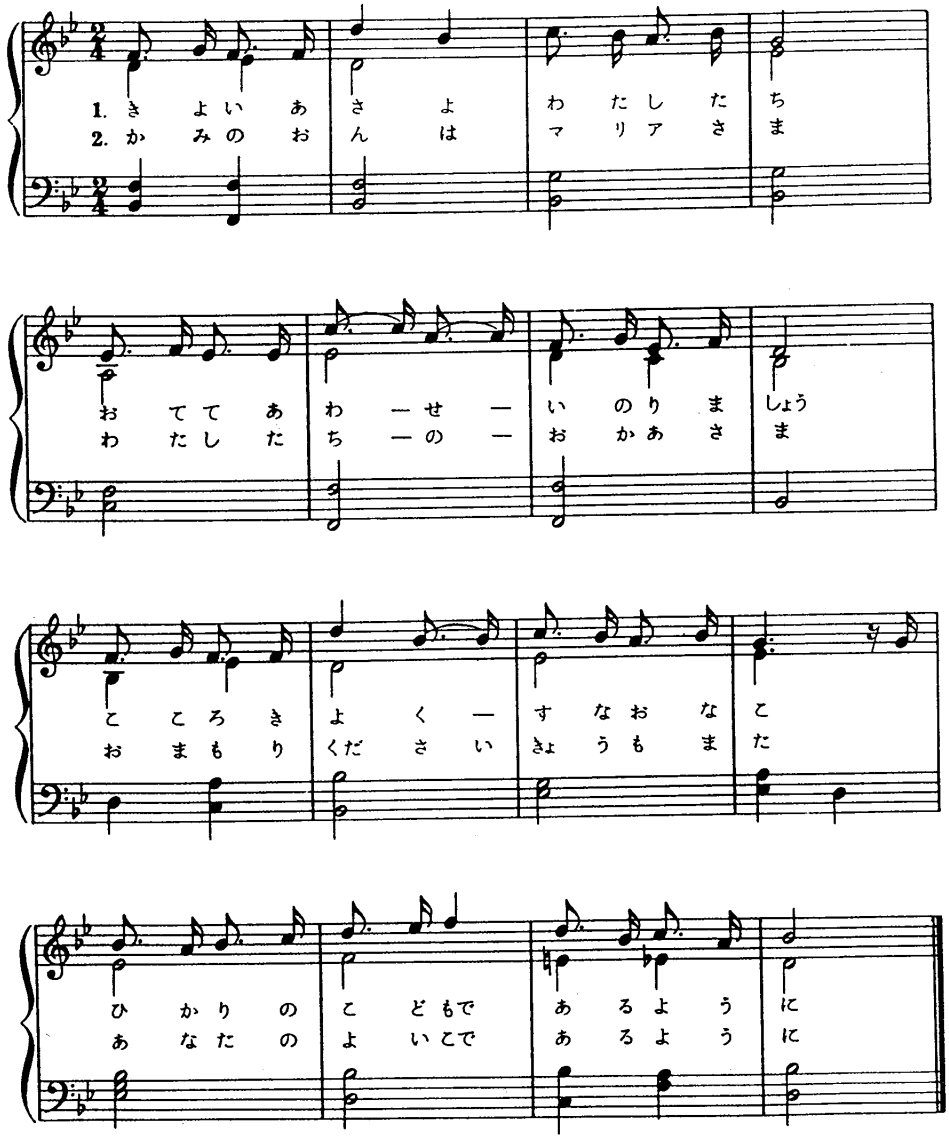
Illustration 48

Optical Scanning: Sample of Recognizable Music

Waseda University (Prof. Ohteru *et al*):

"Ochi no inori," the devotional song shown below, represents the level of notational complexity that can currently be accommodated by the group's Automated Score Recognition System.

2. あ さ の い の り



Other Areas

Computer studies of musical performance are being carried out in several places. Johan Sundberg and others in Stockholm have been attempting to map musically essential characteristics of musical performance using a Macintosh and MIDI synthesizers. Nicholas Cook, working at the University of Hong Kong, has been investigating performance nuance as a function of formal structure. His work is carried out with a Hewlett Packard Integral PC with custom-built devices and software.

THE MUSES (THEory of MUSic Expert Systems) project, an undertaking of the IBM Scientific Center in Los Angeles, is designed to develop tutorials in music theory appropriate for elementary harmony courses. Headed by Linda B. Sorisio, the project involves simultaneous use of sound and graphics in an "expert system" environment. Currently, it is based on a mainframe computer. Ms. Sorisio is planning to distribute a newsletter on the use of computers in music teaching at the university level.

Music is being examined as a model for a new system for representing events in time in exploratory research being carried out in Los Angeles area schools. Apple Computer is funding the project, which is headed by Apple Fellow Alan Kay. Kay is assisted by John Steinmetz, Ann Marion, and a number of musicians. The project is called Apple Vivarium.

Theses and Dissertations in Progress

* Clive Broadbent (Department of Music, Durham University) is attempting to develop a self-contained system for analytical tasks. Music encoding and printing are practical concerns of his work.

* Christine Buyle (Belgium) is writing a thesis on a computer implementation of a generative grammar for tonal music.

* Nicholas Carter (University of Guildford, Surrey) is seeking a general solution to the problem of automatic pattern recognition of printed music. His research is being conducted in a UNIX-based image processing context. [See **Current Technical Research.**]

* Alastair Clarke, a research student in the Department of Computing and Mathematics at the University of Cardiff, is working on computer typesetting of music and optical scanning.

* Walter Colombo (Mathematics, University of Milan) is developing a series of programs to facilitate harmonic analysis based on Schoenberg's theory of tonal regions.

* Shane Dunne was to write an undergraduate thesis in computer science at the University of Western Ontario (Canada) concerned with the development of a software tool to produce small amounts of musical material at very high resolution on a laser printer. An historical review of efforts to print music by computer is included.

* Luigi Finarelli (Computer Science, University of Milan) is developing a series of UNIX-based programs for elementary analysis procedures. His programs use TAUMUS encoding.

* Timothy Koozin (Music, University of Cincinnati) is doing a pitch-class set analysis of the works of Toru Takemitsu.

* Samuel McKinney completed a thesis on computer-assisted music analysis at the University of Brussels in 1986 and is now working towards a Ph.D. in music theory at the University of California at Santa Barbara. His completed study surveys the major studies of the past three decades, distinguishing statistical, linguistic, and artificial intelligence approaches.

* Bruce McLean (Engineering, SUNY Binghamton) intends to complete his thesis on a DARMS canonizer by August 1987. His canonizer was demonstrated in New York in May.

* N. G. Martin, in a B.Sc. Honors project in computer science (Thames Polytechnic), is investigating methods of identifying a subset of musical symbols in a digitized image of printed music. He is using an IBM PC with Turbo Pascal.

* Rosa Michaelson's M.Sc. thesis (Edinburgh, *c.*1984) considers diverse methods of music input and transcription. Related matters are also considered in the M.Sc. thesis of A. S. Keane (Artificial Intelligence, Edinburgh).

* Stephen Page (Computer Science and Music, Oxford University) is developing a "Query System for Music Information Retrieval." His approach favors description-oriented queries over special-purpose programs and operates on DARMS-encoded data.

* Alastair Pearce (Music, King's College, London) is developing an information retrieval package for use with DARMS-encoded music in connection with a thesis on "Computer Applications in Music."

* Brad Rubenstein (Computer Science, UC Berkeley) expects to complete his thesis on data management of musical information by the summer of 1987.

* Christoph Schnell's thesis (Computer Science, Zurich) was published in German in 1985 (see Bibliography). Parts of it are scheduled for publication in English.

Comprehensive Publications (Recent)

Musikometrika is the title of an intended series of publications "specially oriented towards cooperation between musicology and linguistics," according to a recent announcement. It will form a subseries of *Quantitative Linguistics*. These are some of the topics for inclusion: (1) structural units of musical language, including rule systems and principles of segmentation; (2) statistical and information-theoretical characteristics of specific repertories; (3) relationships between music and speech generally, between music and text in specific works, between vocal and instrumental music, and between composed and folk music; (4) structural and quantitative characteristics of mode, rhythm, and pitch; and (5) frequency vocabularies of musical texts. Enquiries and contributions may be sent to Dr. Moisei G. Boroda, State Conservatory, Griboedova 8, 380004 Tbilisi, USSR, or to the editors of *Quantitative Linguistics*.

Lelio Camilleri's article on "The Current State of Computer Assisted Research in Musicology in Italy" recently appeared in *Acta musicologica*, LXVIII/2. A revised and expanded version with the title "Computational Musicology in Italy: An Overview of Basic Concepts and Applications" is in preparation.

Sebastian Rahtz is the editor of *Information Technology in the Humanities*, newly published by Ellis Horwood [UK; distributed in North America by Halsted Press (John Wiley), ISBN 0-470-20852-X]. A chapter on music applications has been contributed by Alastair Pearce.

Alexander Brinkman has recently completed a book on *Pascal Programming for Music Research*. It covers standard topics in programming and also provides special consideration of such topics as "prime form/normal order algorithms," "spelling pitch structures," and "score processing." Its sample applications are drawn from musicological experience, so that "interpreting DARMS pitch code" provides an example of the use of an array and "interpreting DARMS duration codes" an example of a procedure for rational arithmetic. DARMS, MUSTRAN, and SCORE codes are summarized and a DARMS translator is given in an appendix.

Coda is an inexpensive catalogue of music software published by the Wenger Corp. (Owatonna, MN). Oriented mainly toward sound and instructional programs, it lists roughly 500 items. These are variously for Apple, IBM, Commodore, and Atari microcomputers.

A *MIDI Buyer's Guide* is published annually by *Keyboards, Computers, and Software Magazine*. Although the magazine is directed toward the popular music market, its list of software publishers (with addresses) and products (with prices) is quite comprehensive. It covers products sold in the U.S. for the Apple, Atari, Commodore, and IBM (compatible) microcomputers.

Resource List for Humanities Computing Information

Advances in Computing and the Humanities is an interdisciplinary series edited by Ephraim Nissan (Ben Gurion University) and published by JAI Press in Greenwich, CT. "Musical text processing" is one of its areas of interest.

An Association for History and Computing was formed in England over the months following a well attended conference at Westfield College, London, in March 1986. For details about the Association, please contact Dr. Peter Denley; for information about its newsletter, Bill Speck; and to propose a workshop, Nicholas Davidson. Manchester University Press (Oxford Road, Manchester M13 9PL, UK) has recently published in paperback *History and Computing*, a compendium of several dozen short articles giving an overview of the current range of computer uses in historical scholarship. It represents the proceedings of the inaugural meeting.

Oryx Press (Phoenix, AZ) is currently assembling an *Electronic Scholar's Resource Guide* under the general editorship of Joseph Raben. The guide, which will be available both electronically and in print, aims to cover all humanities disciplines. For further information, contact the editor at Paradigm Press.

Bits and Bytes Review is a new publication that presents extensive reviews of computer products and resources for the humanities. It is published nine times a year. The editor is John J. Hughes. The first issue, which appeared in October 1986, featured detailed, illustrated reviews of the IBYCUS Scholarly Computer, developed by the classicist David Woodley Packard for teaching and research involving ancient languages (Latin, Greek, Hebrew, Coptic), and Nota Bene software for academic word processing involving modern languages.

Humanities Research Tools in Machine-Readable Form

Oxford Text Archive

The Oxford Text Archive, which is maintained by the Oxford University Computing Service, holds machine readable copies of several hundred works and maintains a running list of information about texts in machine-readable form held at other sites around the world. Many texts (rated 'U') can be made available at a modest charge; some ('A') require permission from the depositor; some ('X') are restricted. A large number of the texts are of sources in ancient or non-Western languages. U-rated texts include thirteen plays (first quarto) and the sonnets of Shakespeare, three epic poems by Milton, and Chaucer's *Canterbury Tales*. A revised catalogue of holdings was issued in April 1987 and is available from Lou Burnard. Charges are approximately $7.50 per text plus $22 (UK) or $37 (elsewhere) per tape.

Oxford English Dictionary

Oxford University Press is preparing an electronic edition of the venerable *Oxford English Dictionary*. The new edition will be issued on two CD-ROMs that will be searchable with appropriate software. It will also form the basis of an ongoing databank.

English Drama

English drama is the focus of two large machine-encoded projects. *Records of Early English Drama* is, in the first instance, a computer-typeset series of archival studies intended to "locate, transcribe, and edit all surviving documentary evidence of drama, minstrelsy, and ceremonial in England until the official closing of the theaters in 1642." REED is an international collaboration based in Toronto. Efforts to make the completed series available in machine-readable form are being explored. Meanwhile, a plan to publish in computer-readable form the complete corpus of extant early English dramas themselves is receiving serious consideration at Oxford University. Each text would be available on a floppy disc with its own built-in dictionary.

Greek

The Thesaurus Linguae Graecae, a databank of 60 million words representing 8,400 works from Homer to A.D. 600, provides several services that could be of value to scholars who have occasion to search classical Greek texts. Specific texts may be ordered on tape (a minimum order is $100, but many single works are less than $5). Searches can be run in-house for $10 each, with a surcharge of $.10 a page for printing and documentation. The entire corpus of encoded material can be obtained under license on a CD-ROM; a five-year license is $300 for individuals and $500 for institutions, and additional fees may pertain in some situations. The TLG, on which development work continues, is housed at the University of California at Irvine and issues a periodic newsletter.

Latin

The newly formed Packard Humanities Institute in Los Altos, California, is preparing a database of classical Latin writings. These will be issued on a CD-ROM that can be searched by microcomputers having appropriate hardware and software capabilities. The first installment of data is expected to be available by December 1987.