Making music with MIDI - 2:

MIDI SOFTWARE

Having looked at the hardware side of the MIDI system in the first of these articles, we now look at the software that's needed to make everything work. As well as looking at sequencers and what they do, Tom Moffat also describes how he produced some sample MIDI music files, which you can download from the *EA* Computer Bulletin Board.

by TOM MOFFAT

Last time we looked at how MIDI instruments work and what goes into a MIDI keyboard synthesiser or module. We only briefly mentioned that a computer can take the place of a musician playing a MIDI keyboard. This month we'll concentrate on the computer side of things, with special emphasis on some of the software schemes that can turn an innocent looking MIDI gadget into a sixteen piece band.

There's nothing new about automatic-playing bands, you know. I had a rave about some of the old-time mechanical marvels in a Moffat's Madhouse column back in 1992; among them the Nickelodeons in the USA and the Robot Dance Orchestra that lives in Sydney. With a lot of fid-

dling about with the computer and the 128 General MIDI instruments I was able to produce some reasonable 'player bands' based on these old mechanical musical instruments, as described later.

The basic MIDI computer music program is called a SEQUENCER. All it does is send MIDI commands to a synth or module or SoundBlaster card. The commands, usually two or three bytes long, first tell the MIDI device what instrument to use. Then they specify what notes to turn on and what notes to turn off, all in sequence.

The scheme is very simple and straightforward, really. Let's look closely at the structure of a MIDI command; three bytes, expressed in hexa-

decimal (numbers with base 16 instead of the usual base 10, for the uninitiated). To turn a note on, the command is: **9x yy zz**. The '9' means note on; x is a hex digit between 0 and F (0 and 15 decimal) specifying which channel the command is for — in other words, which instrument channel is to play the note.

The yy parameter is a hex number between 0 and 7F (0 and 127 decimal) which tells the instrument which note to play. A range of 128 notes is plenty to cover from the lowest to the highest on any instrument, considering a piano only has 88 notes. The zz parameter specifies how strongly the note is to be played.

To send a note-off command, you simply substitute an 8 for the 9. How long the note is to play for is set by a simple time delay between note-on and note-off. For instance, to make the instrument assigned to channel 2 play the F note in the second octave on the keyboard, with moderate volume, you would turn it on with **92 35 50**. Next do a time delay for the length of the note, and then send **82 35 50** to turn the note off.

Should you want to play an F major chord, you would turn on the F, and then an A, and then a C. With all three playing you would do a time delay for the length of the chord, and then send note off commands for F, A, and C. With no delays between the three note-on's, they happen so fast that for all practical purposes they are simultaneous.

There are other commands, to do such things as select a new instrument on a given channel or to adjust things like overall volume or reverberation, but they all follow the same general format. Simple, huh?

Of course the MIDI user never sees these commands as such. Instead the
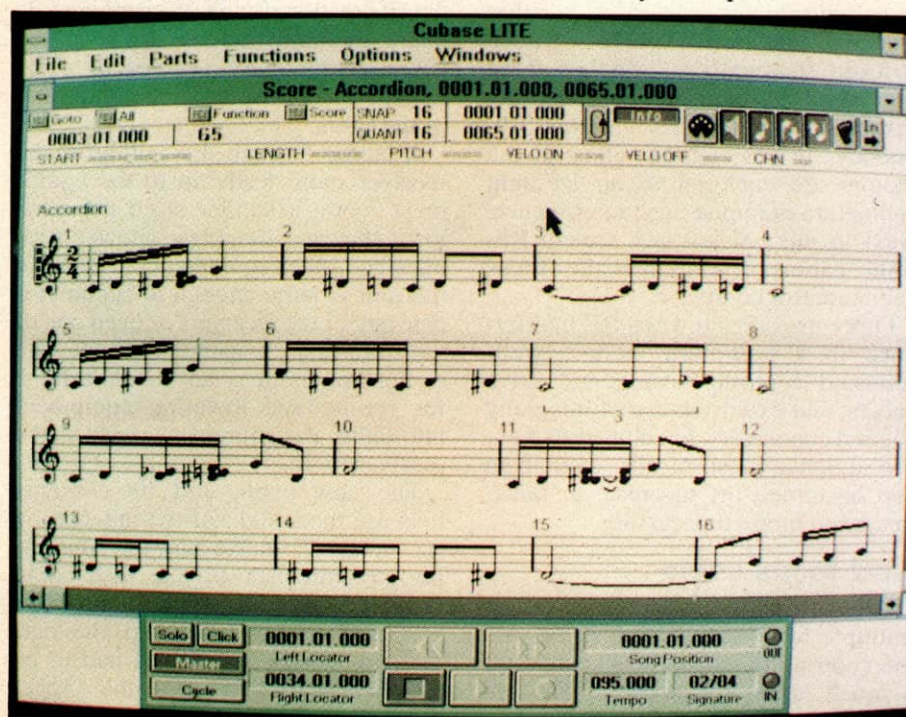
The notation editor in Cubase Lite, showing the accordion part for "Persian Rug". Notice the dud notes; the fourth note is actually three accidentally struck together. These can be fixed by the editor.

user loads the song to be played (usually from a file of type .MID). To set it playing there is often some kind of icon display on the screen representing the control panel of a cassette recorder — play, stop, rewind, and fast forward. An example of this control panel is the Media Player that comes as part of Windows.

The 'cassette player' becomes more interesting when it has a record button. Then you can 'roll the tape', go over to your keyboard, and play a song into the computer. When you are finished you can hit rewind, and then play, and marvel in wonderment as you hear your creation played back just as you recorded it — sour notes and all.

As the next step up, let's turn the simple cassette recorder into a 16-track Ampex studio recorder. We're now entering the realm of specialised MIDI music composing programs, such as Cubase and MIDI Workshop.

With this type of program you can lay down one track of music, say using the piano, and then spool back to the start. Next you can lay down another track, say a clarinet (played on the synth keyboard, of course), while listening to the piano part being replayed. Then you can play both of these back as you record a third track, maybe a guitar.

You can keep going over and over this recording, adding a new track each time, until you've got a 16-piece band, all performed by yourself.

Such a rough-and-ready performance is bound to have its share of dud notes in it, so you can now invoke a SCORE EDITOR to go through it track by track, editing out your mistakes and cheating in every other way possible. What you see on the screen is a score in proper music notation, and you can work with the notes just like you would with letters in a word processor — insert, delete, copy, cut, paste, etc.

This of course assumes you know how to read music. I have spent many years playing in bands in pubs, totally unable to read a note.

So the first time I tried one of these score editors and a sheet of music popped up on the screen, I just sat there and stared at it. I had a fair idea of the tune it was trying to represent, since I had just recorded the tune on the keyboard myself.

So I eventually took the bull by the horns and started deleting notes and adding notes and playing back individual measures, just to see what it sounded like. The upshot of all this fiddling
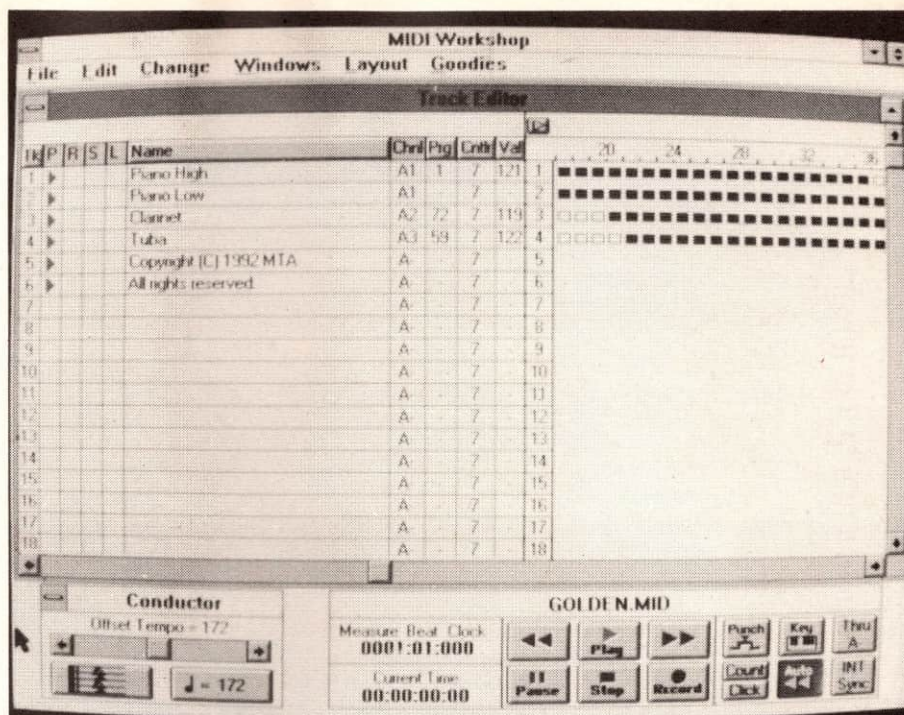
The track editor in Midi workshop. Each dark block is a measure containing some music. Light blocks are empty measures. Note "cassette recorder" controls at bottom of the display.

is that I am slowly learning to read and write music notation, by osmosis; it just sort of sinks in as I gain more experience with the editor.

As with a word processor, you can cut, copy and paste whole passages of music, much like with a whole paragraph of text. You can even cut or copy something from one of the 16 tracks and paste it to another track, making a second instrument play exactly what the first one played. This opens all kinds of possibilities of starting with a simple solo or duet tune as a MIDI file and turning it into a whizz-bang jazz band production.

Most MIDI programs make allowances for people who don't read music, but still want to edit note-by-note. Here each note is displayed as a horizontal stripe, its position up or down the screen representing the note's pitch, and the stripe's length representing note duration. This is exactly the way music for a pianola is recorded on a roll, so this feature is known as a 'piano roll editor'. You can use the mouse to move the stripes up or down the screen (select different notes) or lengthen or shorten the stripes.

Learning by doing

There is another class of sequencer which is read-only; it can't record or rearrange tracks. But it can play music normal, fast, or slowly; it can select a

passage of music and play it over and over, and it can even show which notes are being played, on an image of a piano keyboard.

These programs are designed to teach you to play music, by imitating the playing of an expert musician who has recorded a MIDI file. So as well as learning to play the notes and the timing, you learn the style as well — something that just can't be expressed on paper with standard music notation.

I've been playing around with a couple of programs from PG Music of Canada. New Orleans Pianist contains a special sequencer program and a collection of 66 MIDI piano performances, in styles such as Boogie, Blues, R&B, Ragtime, and Gospel. Composers of this stuff include such memorable old timers as Jelly Roll Morton and Professor Longhair (one of my all time favourites).

The performances are recorded on a very highest quality, full sized MIDI keyboard, by five pianists most of us in Australia have probably never heard of, since they are Canadian. Most of them appear fairly young, and their playing is just out of this world. Some of the songs are actually composed by the pianists themselves; a fellow named David Torkanowsky has turned out some great stuff.

The other program, Jazz Pianist, contains a similar sequencer and 71

MIDI Software
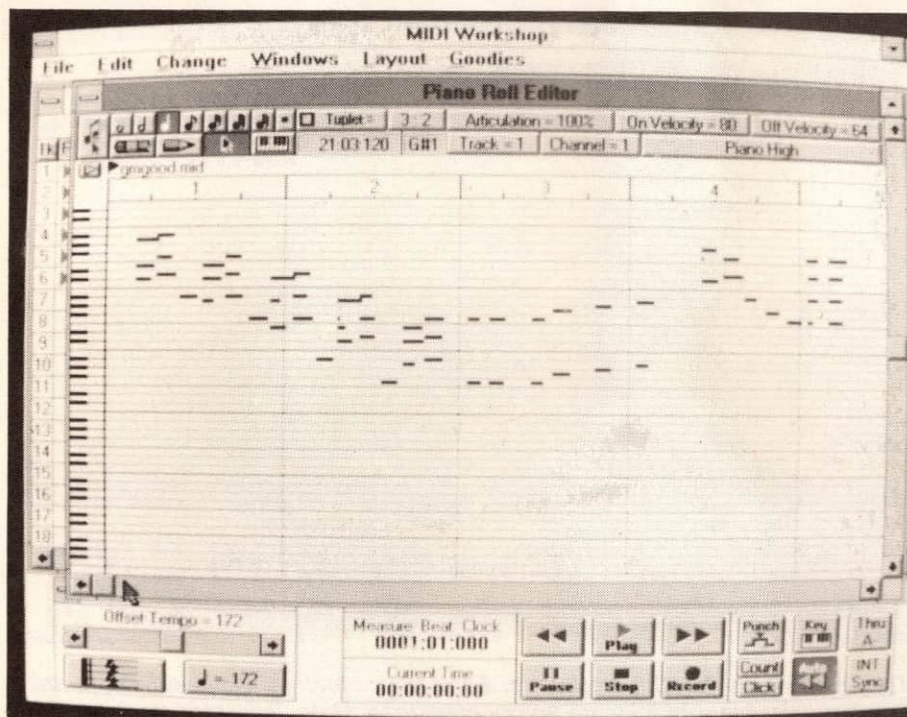
The piano roll editor in Midi Workshop. Notice the keyboard display on the left showing which 'holes' in the roll affect which notes. The music can be edited by direct manipulation of the length and position of the 'holes'.

MIDI files. Styles presented are not way out 'modern' stuff; they are more in the vein of stride piano, ballads, and cocktail piano.

In fact the program boots up ready to play that hoary old number from the film *Casablanca* — 'As Time Goes By'. (You remember, where Humphrey Bogart gazes into Ingrid Bergman's eyes and says "Play it again, Sam", or something similar). The version in Jazz Pianist is quite a bit nicer than the one in Casablanca.

Jazz Pianist also features some 'trio' type tunes, in which bass and drums are added to the piano performance.

While you first play a MIDI file to get the feel of the tune, both programs display a panel containing a photo of either the composer or the performer of that tune (that's how we know they are young) and a bit of blurb about the history of the tune. You can also call up different screens to get more detailed biographies of any of the composers or performers. There's even a music trivia game.

You are meant to learn by copying what you hear, and by watching what keys are pressed on the keyboard display across the top of the screen. It is also possible to call up a music notation display as the tune is being

played, and the Jazz Pianist program even displays the names of the chords being used.

I have worked out my own method of using these programs. When first starting to learn a song, I listen to it a few times and then work out a fairly simple version, played in the same key as the MIDI file. If you're really a wimp you can make the program transpose any of its songs into the key of C, but that's considered bad form...

Once I've got a simple version of the song down pat, I then try to pick up some of the style of the original by selecting bits and playing them over and over, trying to echo them on the keyboard. This is time consuming, but it gets you there in the end.

Some of the pianists' tricks are rather unique; in one ragtime piece from New Orleans Pianist, the trainee player is instructed to whack the lower end of the keyboard with the left elbow. The student is warned that this shouldn't be attempted during performances in pubs while the owner is watching, or the pianist might not be playing there any longer.

Both these programs are jolly good fun, and a good way to do something useful with your keyboard (you've got to justify all that money somehow...

piano lessons?). I understand they are available from music shops in Australia for around $59 each. There's a further program, which I haven't seen, which teaches guitar using the same methods.

Computer stuff

Atari, Commodore Amiga, Macintosh, and IBM-PC computers are the ones favoured for music production. Many years ago (maybe even pre-MIDI), I remember seeing an Atari computer in a Hobart music store hooked to some kind of synthesizer and a C-Itoh printer for printing out music scores. That amazing (and expensive) setup was probably a lot less sophisticated than the SoundBlaster systems being given away with IBM-PC compatibles purchased today.

Macintosh seems to be preferred by professional musicians, who see the computer as a necessary tool rather than an item of interest itself. Those who use the IBM-PC for music probably had the computer first, and then got interested in its music capabilities via the included SoundBlaster.

As well, the PC seems to reign supreme in the really high-end music and/or multimedia applications. Just a couple of weeks ago I saw a demo by a guy who produced radio commercials for a living. His 'studio' was a Yamaha MIDI module and an IBM-PC which could edit sound digitised onto a hard disk, as well as MIDI music tracks, all at the same time. It's the same sort of stuff we used to do with two tape recorders back in my own radio days. The new method is much easier, and much more precise.

It should be pointed out here that music software running on the PC under Windows can be a little troublesome. This is because the software must output a constant data stream to the MIDI device under very tight timing constraints. At the same time the computer must carry the heavy burden of Windows, which is demanding its attention in all directions to the detriment of the task at hand — making music.

You'll know you've got Windows problems if the music tempo seems to stumble occasionally. The solution is to disable most of Windows' functionality by starting it in the standard mode instead of '386 Enhanced' mode. This is done by starting Windows with the command 'WIN /S' instead of just 'WIN' or 'WIN /3'.

If your computer automatically

comes up in Windows when switched on, then you'll have to totally exit Windows back to the dreaded MS-DOS command line and restart it with WIN /S. It's a pity music software doesn't come in DOS versions in the first place; it would be a lot less clumsy.

Practically music

Before we go any further, I must advise you that we are now delving into what may be a 'first' in magazine publishing — an article you can listen to as well as read. Here we will discuss some practical examples of MIDI production, many of them attempts at reproducing the sound of the early mechanical music machines.

Each song mentioned has been put into a computer archive file 'TOMSMIDI.ZIP' which you can download from the *Electronics Australia* computer bulletin board, phone number (02) 353-0627. You can play these as you read about them if you have at least a SoundBlaster-type card and something like the Windows Media Player. OK? now load 'PERSIAN.MID' and press play.

PERSIAN.MID: This is the old song about 'On my Persian Rug...' in a version played by the Cheap Suit Serenaders. This interesting band is led by cartoonist Robert Crumb, who draws those 'Keep on Truckin' figures as well as little bubble-headed characters in various states of stoned-ness.

'Persian' is an example of playing an instrument onto an individual track while listening to the others playing back, as described above. Instruments are accordian, fiddle, banjo, piano, drums, and a bowed cello used as a bass. Persian Rug has long been a favourite of the Burglar's Dog band I play with, so I already knew the accordian part.

Trouble is, trying to play an accordian part with chord buttons, onto a piano keyboard without chord buttons, ain't easy. It's even more fun trying to play fiddle, banjo, cello, or drums, when you don't in real life play any of those instruments. The original Cheap Suit Serenaders version doesn't have a piano, but I decided to bang a few chords into it anyway just to fill out the sound. This was improvised on the fly, one take only.

The MIDI file presented herewith is exactly as recorded without any editing at all, since I didn't know how to edit at that stage...

It was my first go at MIDI recording, produced over half an hour

or so, and rough as guts. Your own first attempt will probably be much better.

ENTRTAIN.MID: Scott Joplin's 'The Entertainer'. This is an example of a Reproducing Piano, in which the intensity (touch) of the notes is recorded as well as the pitch. The result is a pianola deluxe.

However the song sounds rather mechanical, with absolutely perfect timing and tempo and very little 'feel'. I suspect this recording was never actually played by a musician, rather it was 'sequenced' by someone manually entering the notes into a score editor, possibly copying them laboriously from the sheet music. Still, The Entertainer sounds pretty good, especially on that Bosendorfer concert grand piano in the Korg. The file came from the Internet.

NICKELOD.MID: This is my attempt at reproducing the sound of a Nickelodeon, the predecessor of the juke box. You'd put an American five-cent piece (a nickel) into a slot and the machine would burst into a frenzy of ragtime piano, accompanied by things like a violin, mandolin, and drums, all played by mechanical and pneumatic means.

The machine I was trying to emulate was the one in the arcade in Manitou Springs, Colorado, that I raved about in the Madhouse column mentioned

above. I visited that same arcade during a journey back to the USA in December 94. The arcade, the pub, and many of the old games were still intact. But alas the Nickelodeon was gone. So its sound had to be reproduced from a 40 year old memory...

I started with another traditional four-section piano rag, STLOUIS. MID, from the Internet. As with The Entertainer above, this was presented as two MIDI tracks, one for the melody and the other for the accompaniment. It was obviously laid down in two stages, and from the sound of it, a live musician was involved. To turn this St Louis Rag into a nickelodeon piece, I added a violin and drums to the piano. I also wanted to include a mandolin, but I could find nothing in the General MIDI scheme of things that came close to a mandolin, so I gave it a banjo instead.

Each of the four sections of the rag is played twice. In each case I let the piano go on its own for the first time through, and then brought in one of the added instruments for the second playing. In section one of the rag, I stole the violin part by cutting it out of the piano melody track and then pasting it into the violin track. This meant the violin was then trying to play several notes at a time, piano style. It didn't sound very violin-ish, so I used the score editor to go through
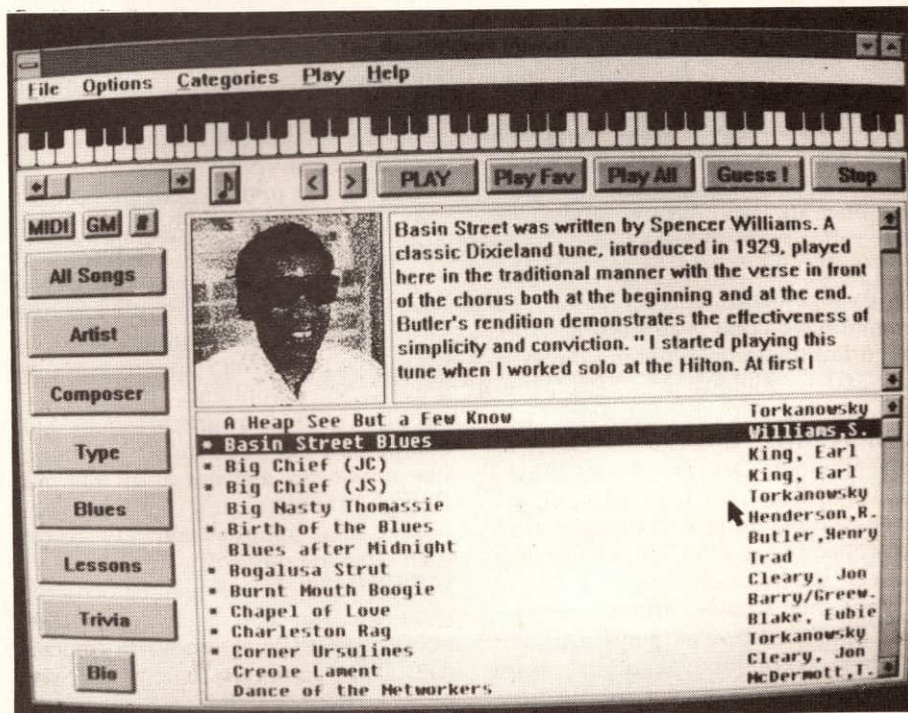
New Orleans Pianist, ready to play Basin Street Blues. Note the panel containing a photo of the composer and information about the song, and the piano keyboard at the top. The keys light up as they are played by either the computer or the student musician.

the violin part note by note, cutting multiple notes to leave only singles. Trying to figure out which ones to cut and which to leave was an interesting exercise, for a non-reader of music.

In section two of the rag, the banjo gets to solo in the second half. This was done by the same procedure as above, stealing the corresponding piano melody track and hacking it. This time I let the banjo player keep the occasional multiple notes, and even one strum.

By section three I had decided these newcomer instruments had had enough solos, so the violin was made to play a counter-melody along with the piano melody. Consequently this was original work on my part, a keyboard job. Fairly slow, so not real hard to play. And I thought it sounded rather nice in the end...

Finally to section four, and the grand finale. Another counter-melody from the violin, this time joined by the banjo, as well as both piano parts. I decided to give the banjo a little bluegrass-style picking to do, and I must admit it was all too fast for me to play properly on the keyboard. No problem — just slow the song down to halftempo during the recording and then replay it normally.

The last step was to add the drums, all in one go, for the full length of the song. It needed bass drum, a snare, a cymbal, a woodblock, and a mighty cymbal crash at the end. This was more than my feeble fingers to cope with, so I enlisted the help of my son Steven. We rolled the 'tape' and then after the intro he played the bass and snare, and I handled the cymbals and woodblock. This is called family togetherness. I later learned that I could have done it all myself on the one drum track, overdubbing the cymbals and woodblock over the existing bass and snare.

ROBOT.MID: This is a simulation of that fabulous Decamp Robot Dance Orchestra that lives in Sydney. It was made in Belgium in 1950, maybe as an early attempt at putting musicians out of work by modern technology.

Three big wooden robots are presented on a stage, one playing drums, another saxophone, and the third accordian. The drummer rotates from drum to drum as he beats out the time, the sax player stands up every time he plays and sits down again during his rests, and the accordian player seems
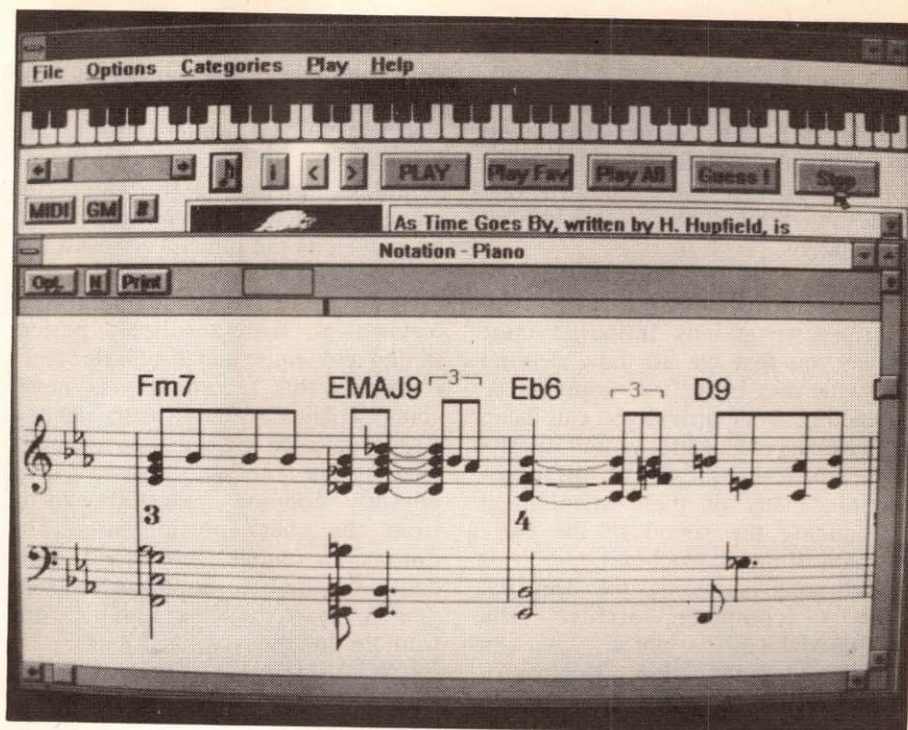
"Play it again, Sam" — the Jazz Pianist program, rendering As Time Goes By. The notation display shows the third and fourth measures. The tune is played in E-flat, and appropriate chord names are displayed. The score can also be printed out.

to have about 20 fingers on his right hand and none on his left. But boy, can he play that right-hand keyboard!

The basis of the Robot Orchestra seems to be the innards of an elderly Hammond Organ, played by punched paper cards all joined together in a fanfold configuration. The cards also control the robots' movements. The drums and accordion actually work, but it appears that the saxophone sound is generated within the Hammond organ, probably as an 'oboe' voice.

Our version of the Robot Orchestra's 'My Blue Heaven' was based on a cassette recording of the instrument. It uses a General MIDI Hammond Organ (not the rotating speaker model), the GM drum kit, an accordian, and an oboe played in very low register to emulate a saxophone. In the first attempt I tried a proper tenor sax instrument, but it sounded too much like a real sax and not at all like the Robot Orchestra. It's very easy to change these things as you play around with the computer software.

ICECREAM.MID: A simulation of the icecream van that visits our beach house at Port Cygnet on warm summer days. The van plays one song over and over — 'Let Me Call You Sweetheart', on an electronic gadget which is emulated by MIDI instrument 80, an ocarina. In the recording you hear the icecream van coming along the road with

seagulls (MIDI instrument 124, birds) in the background. You can also hear the refrigeration unit's compressor going (MIDI instrument 126, a helicopter effect).

When the driver sees some kids, he stops the van and the music stops too — but not before the last note is played terribly flat, possibly because the voltage from the alternator droops. The compressor keeps running as the man serves the icecream. Then the music starts and he is away again. This MIDI file is a real summertime nostalgia piece.

STJAMES.MID: Saint James Infirmary, from "New Orleans Pianist". This is an excellent recording, played down and dirty and very moody. It's full of feel and has excellent dynamics. It sounds like one of those things the pianist never plays the same way twice; it changes with his feelings at the time. The tune retains the dirge texture all the way through, and finishes the last couple of bars with a few notes from the Funeral March. If only I could play like that!

Well, I hope that little lot inspires you. I've got a feeling it's going to embarrass me — as I said, some of my own MIDI playing is a little rough. But if I practice, and if you practice, maybe we'll all be good muso's eventually — courtesy of computers and the wonderful world of MIDI. Have fun! ❖