SYNCOPATION BY AUTOMATION

Fresh out of athletic ideas, DATATRON last month took a quarter-spin on its steel base and assailed the Arts. With a flash of lights seen 'round Tin Pan Alley, the computer turned composer in its off-hours -- spewing out "pop" tunes by the basketful before Mr. Petrillo could cry "thereoughtobealaw."

DATATRON not only became history's first electronic brain to write a song, but found itself a television personality also. The initial "datatune" picked for commercial release was given lyrics by Jack ("Hi, Neighbor") Owens, and premiered July 15 over L. A. station KABC-TV. Its title: "Pushbutton Bertha" -- a fitting commentary on this new electronic age.

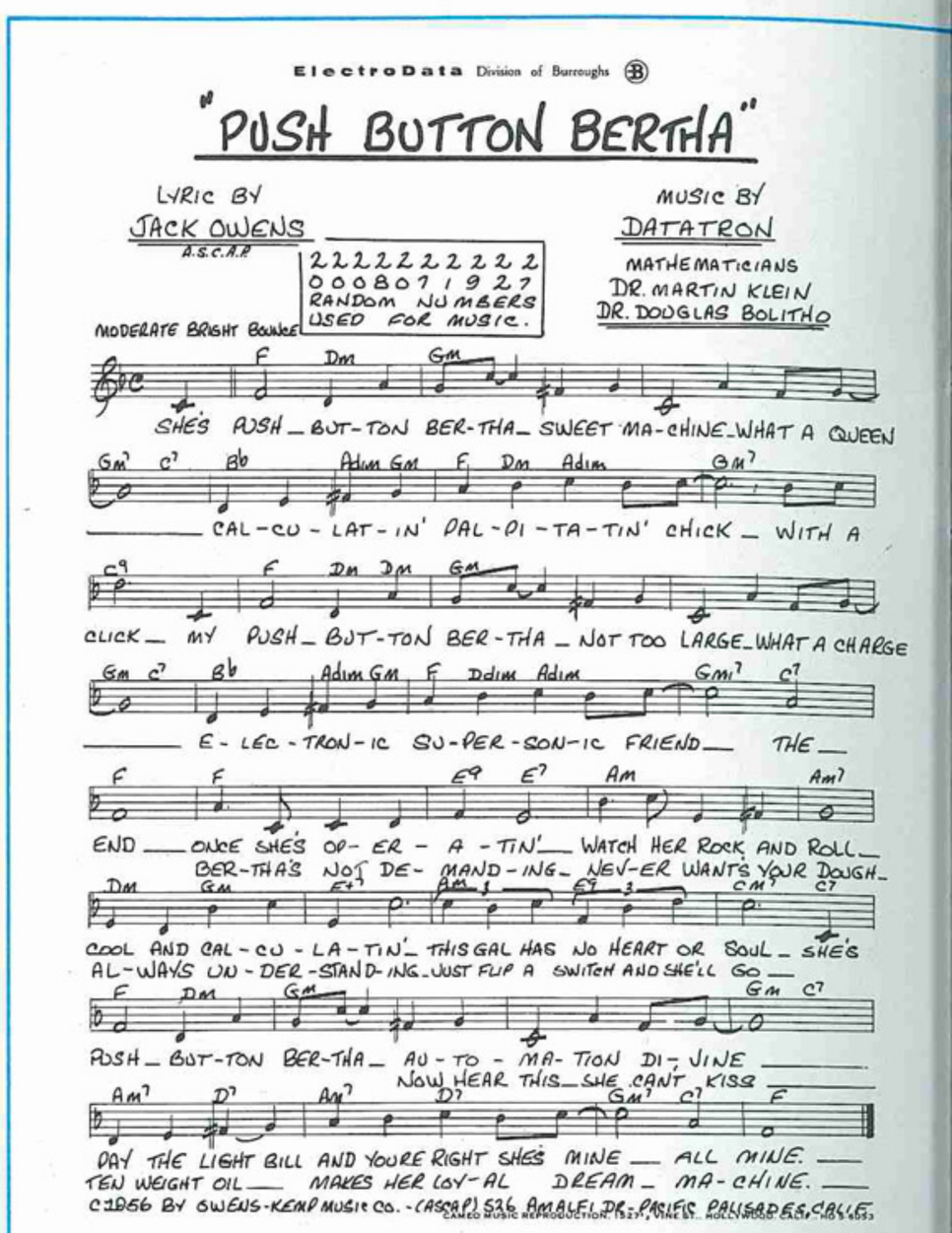
By itself, of course, DATATRON couldn't tell be-bop from Bali Hi. It came by its musical gifts through the collaboration of two imaginative engineers -- Douglas Bolitho of ElectroData, and Dr. Martin Klein of North American Aviation. Their strategy for putting machine to music hinged on an idea Mozart expounded long before anyone heard of flip-flops or magnetic drums: viz., melody-writing actually follows laws, like everything else.

Bolitho and Klein reasoned that if they substituted numbers for notes, DATATRON could be programmed to put songs together which obeyed these laws. American popular music is the most codified of all - its requirements (not inviolable, of course) include a 32-bar form; middle part beginning in the sub-dominant key; notes within an octave of each other, and so forth. It was not difficult to organize these rules into a routine giving DATATRON a short musical education.

The operator inspires DATATRON by first keying in a 10-digit random number. This causes the machine to generate and store 1,000 single digits, each representing one of the eight diatonic notes in the scale with two allowable accidentals. The program then motivates DATATRON to pick successive notes at random, testing each for melodic acceptability as it goes along. Finished melodies are automatically typed out as a series of letter values and rhythm symbols (see below).

A logical sequel to the program would allow the machine to orchestrate, pick its own rhythm, write four-part chorales, and perhaps even evaluate melodies for their "palatability." But the experiment in no sense threatens "machine replacement" of tunesmiths -- for computers, after all, have few aesthetics.

The best we can hope for is that when Tin Pan Alley runs out of inspiration, it might turn to DATATRON for a cadenza or two.



ElectroData Division of Burroughs

"PUSH BUTTON BERTHA"

LYRIC BY JACK OWENS A.S.C.A.P.

MUSIC BY DATATRON

MATHEMATICIANS DR. MARTIN KLEIN DR. DOUGLAS BOLITHO

2222222222 0008071927 RANDOM NUMBERS USED FOR MUSIC.

MODERATE BRIGHT BOUNCE

SHE'S PUSH-BUT-TON BER-THA- SWEET MA-CHINE-WHAT A QUEEN
CAL-CU-LAT-IN' PAL-PI-TA-TIN' CHICK- WITH A
CLICK- MY PUSH-BUT-TON BER-THA-NOT TOO LARGE-WHAT A CHARGE
E-LEC-TRON-IC SU-PER-SON-IC FRIEND- THE-
END- ONCE SHE'S OP-ER-A-TIN'- WATCH HER ROCK AND ROLL-
BER-THA'S NOT DE-MAND-ING- NEV-ER WANT'S YOUR DOUGH-
COOL AND CAL-CU-LA-TIN'- THIS GAL HAS NO HEART OR SOUL- SHE'S
AL-WAYS UN-DER-STAND-ING- JUST FLIP A SWITCH AND SHE'LL GO-
PUSH-BUT-TON BER-THA- AU-TO-MA-TION DI-VINE
NOW HEAR THIS- SHE CAN'T KISS
DAY THE LIGHT BILL AND YOU'RE RIGHT SHE'S MINE- ALL MINE.
TEN WEIGHT OIL- MAKES HER LOV-AL DREAM- MA-CHINE.

Douglas Bolitho, master of DATATRON melodies, listens closely as Jack Owens (seated at piano) and Dr. Martin Klein interpret another computer song.

basic melody requirements in the DATATRON *formula*

- First note may not be a minor second, a fourth, a flatted fifth, or a ninth.
- The absolute magnitude of the note sequence must not exceed six.
- An ascending flatted fifth progresses to a fifth and a descending fifth to a fourth; an ascending minor second progresses to a second and a descending minor second progresses to the tonic.
- There should not be more than five notes in ascension or descension without complimentary movement.
- The release begins on a sub-dominant major note.
- There should be between 35 and 60 notes in a popular melody.

stepwise description of routine for composing "pop" songs on DATATRON

1. The program (instructions) for this routine are input to the central computer photoelectrically by means of punched paper tape.
2. After executing a few "housekeeping" steps (such as reading the Flexowriter for printout) the computer signals the operator to input a ten-digit "radical" (or beginning number) by means of the manual keyboard.
3. Following introduction of the radical, the computer generates 1,000 single-digit random numbers and stores them in its memory. This takes approximately 30 seconds.
4. The computer now selects the first random number so generated and determines whether (according to the rules of melody-writing incorporated in the program) the music note so represented is acceptable as the beginning note of the melody.
   If so, this number is translated by a table look-up process and printed-out directly on the electric typewriter as an alphabetic character corresponding to the note. If not, the number is rejected and the computer selects the next random number and repeats this process until an acceptable number is found.
   For the first note of the melody, only the numbers 1,2,3,5,7, or 8 are acceptable. They represent the musical notes Middle C,D,E,G, B, or C above Middle C.
5. The computer next selects, translates and prints out the second through thirteenth notes. In the process, these notes are stored in a special place in memory.
6. Now the second through eleventh notes are repeated, providing restatement of the first phrase.
7. Note 14, which according to the rules must be Middle C, is printed out.
8. Note 15, which may be either an A or C above Middle C, is selected as above, translated, and printed out.
9. Notes 16 through 36 are likewise developed.
10. Notes 37 (which may be a C#,D,G, or B) and 38 (which may be a Middle C, or E) are determined and printed out.
11. Following this, notes 2 through 11 are again printed out, providing a second repeat of the initial melody line.
12. The computer will again stop, waiting for the operator to enter a new radical if desired.
13. As each note is printed out, the program determines (according to a predetermined rhythm pattern) which time value should be indicated for the note, and prints it out immediately following the note. For reference, a table of values is appended below.

TIME VALUE	PRINTED AS	RANDOM NUMBER	NOTES	PRINTED AS
♩	NO SYMBOL	0	MID. C#	C"
		1	MID. C	C
♩.	*	2	D	D
𝅗𝅥	**	3	E	E
		4	F	F
𝅗𝅥.	***	5	G	G
♪	8	6	A	A
		7	B	B
/		8	C above	C:
		9	F#	F"

"PUSHBUTTON BERTHA" as DATATRON wrote it.

/C / F* D A / G 8 C:8 C: F" G / C* A F8 G8 / G*** / D E F" G / A B C: B8 C:8 / C:* B8 C:8 / D* C / F* D A / G8 C:8 C: F" G / C* A F8 G8 / G*** / D E F" G / A B C: B8 C:8 / C:* A* / F*** / A** C8 C D / F E* / B** C:8 E F" / G*** /