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The Polycogs Program

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[Editor's note: In recent years, owing to the diversification of the available media, scholarly output has acquired increasingly diverse forms. The following is not an article in the strict sense, but the listing of a piece of software which will run under GWBasic, Turbo Basic and Quick Basic, and encodes the present understanding of the regular sound correspondences existing between the Polynesian languages. I suggest that anyone who has questions about this program or would like to request a disk copy should get in touch with Mr Jenkins at 70374.2766@CompuServe.COM.]

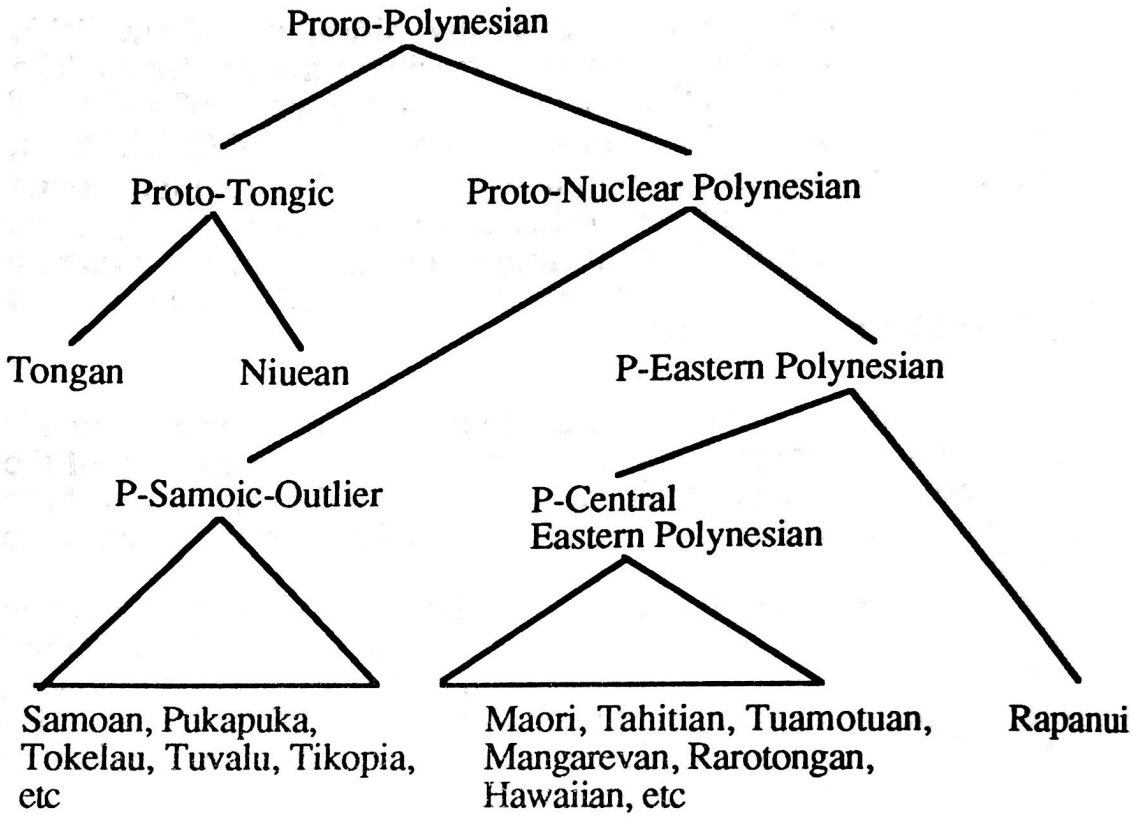
The purpose of the program is to produce cognates of Polynesian words by the application of regular sound changes. Enter a word in any of the main Polynesian languages and it will tell you what the cognates ought to be in the others. Irregularities arising from metathesis or other causes are not considered.

In general terms the program is based on phonological information compiled by Bruce Biggs (1978) and works from the standard phylogenetic tree published by Roger Green (1966), except that following Biggs it does not distinguish Marquesic from Tahitic subgroups or define Proto Samoic Outlier phonologically. Initial glottal stops are retained in Rapanui as described by Blixen (1972).

So that it can be used with a variety of word lists (notably POLLEX) the program accepts words written phonemically or in the standard orthography of the different languages. Where there is more than one standard abbreviation for the language e.g. ECE/TUV the program uses the one found in POLLEX, but may accept others.

The abbreviations : AIT, Aitutaki; AUS, Austral Islands; EAS, Easter Island or Rapanui; ECE, Ellice Islands or Tuvalu; EFU, East Futuna; EMA, Eastern Maori or Bay of Plenty; EUV, East Uvea; HAW, Hawai'i; MAE, Mae; MAO, Maori; MIA, Mangaia; MOR, Mooriori; MRA; Manahiki-Rangiora; MQN, Northern Marquesas; MQS, Southern Marquesas; MQT, Taipi Valley; MVA, Mangreva; NMA, North Auckland Naori; PEN, Penryn or Tongareva; PIL, Pileni; PLT, Taumako; PUK, Pukapuka; RAR, Rarotonga; REN, Rennell; RUR, Rurutu; SAC, Colloquial Samoan; SAM, Formal Samoan; SMA, South Island Maori; TAH, Tahiti; TUA, Tuamotu; TUP, Tupua'i or Tubuai; TIK, Tikopia; TOK, Tokrlau; TON, Tonga; WMA, Taranaki-Wanganui Maori; WUV, West Uvea; PPN Proto Polynesian; PTO Proto Tongan; PNP, Proto Nuclear Polynesian; PSO, Proto Samoic Outlier; PEP, Proto Eastern Polynesian; PCE, Proto Central Eastern Polynesian.

The Phylogenetic Tree:



(not all langages are included in this diagram)

Taking the Tahitian word 'vahine' as an example, first the Proto Central Eastern Polynesian form is reconstructed by making the necessary changes and the new word is stored as 'wahine'. Then the Proto Eastern Polynesian form is reconstructed and stored as 'faFine', since a medial h may derive from either *f or *s. The Proto Nuclear Polynesian and Proto Polynesian forms require no further changes and are likewise stored as 'faFine'. On reaching this point the program goes back down the tree reconstructing the cognates in the other Polynesian languages. Because some phonemes have been lost and others have merged during the history of the languages it is not possible to predict the precise form of the cognates in all languages and a range of reflexes is possible. This is dealt with as follows:

Symbol		Reflex
F	represents	f, wh, v, h or s
G	"	k or g (g = nasal velar)
H	"	s, h or zero

	"	n or g
N	"	r, l or zero
R	"	h, zero or '(' = glottal stop)
?		

Only when a Proto Polynesian word is input will all of the output be precise, and none of these symbols included.

Following Biggs the output is primarily phonemic with some phonetic details. An exception is PCE which appears phonetically rather than phonemically.

The word should be entered in lower case, the language in upper case. But the program deals with this automatically and it is not necessary to use the shift key.

The structure of the listing:

1-39 Introductory remarks and opening screen
50-59 Define vowels and consonants
100-190 Ensure that the word stores are empty
200-280 Accept the word
300-350 Standardise various ways of representing nasal velar, glottal stop and bilabial fricative.
400-450 Accept the language
500-514 Equate some unlisted languages with listed ones
600-650 Direct the program to the subroutine appropriate to the language
700-750 Ask for re-entry if the language is not recognised
2000-3790 Turn Central Eastern Polynesian languages to Proto Central Eastern Polynesian. Distinct reflexes of /*f/ become [hw], /*s/ become [hy], otherwise MAN, MOR and PEN cannot be handled correctly.
4000-4090 Turn phonetic [hw] and [hy] to phonemic /f/ and /s/ and [h] to an unspecified fricative designated F.
4200-4234 Reverse fa(a)F > wa(a)f. Biggs' rule CE/3
4250-4290 Reinstall possibly lost intervocalic glottal stops. Biggs CE/1
4400-4490 Reinstall possibly lost initial glottal stops. Biggs EP/1
5000-5190 Turn SAM and SAC to Proto Samoic Outlier.
5200-5290 Put an unspecified vowel between geminates in Tuvaluan.
5300-5590 Turn TOK, PIL, TIK and PUK to Proto Samoic Outlier.
5600-5650 Turn PSO to Proto Nuclear Polynesian.
6000-6090 Turn Tongan to Proto Tongan
6100-6190 These lines may be omitted. Niuean is not presently handled as input.
6200-6290 Turn Proto Tongan to Proto Polynesian. Biggs TO/1, TO/2.
6400-6890 Turn EUV, EFU and BEL to Proto Nuclear Polynesian directly rather than through PSO because they retain the glottal stop.
6900-6990 Turn PNP to Proto Polynesian. R represents *r or *l. Biggs NP/1
9600-9719 Are a subroutine to reverse vowel assimilation in Tongan and Mangarevan.

9850-9860 Are a subroutine to replace consonants which may have been lost between vowels.
10000-17790 Turn the Proto-Polynesian form to reflexes in the various by reversing the foregoing process.
18000-18410 Prints the output on the screen.
18900-18990 Subroutine for re-running the program.
19500-19810 Subroutines for changing the phonemes.

Examination of the listing will show that where PPN *f and *s are reflected in Central Eastern languages as glottal stop this is presumed to result frm the change of h to ' subsequent to the merger of *f and *s as h in all environments. This is not explicitly stated in Biggs' paper, but seems to be a reasonable inference from the data. Of more significance is the finding that the branching tree model is not a good explanation of the present distribution of phonemes among the Polynesian languages. It presumes that a great number of parallel changes, such as *f > h or ' > 0, are due to convergence rather than diffusion. Biggs found that the Tahitic and Marquesic subgroups cound not be defined phonologically, and nor could Samoic Outlier. In fact Central Eastern, Eastern, Nuclear and Tongic are not phonologically definable either, for each group contains members which present phonological features which are characteristic of adjacent groups. The pattern of overlapping areas could well be interpreted as evidence of contact rather than independent innovation.

As it stands the program has been found to run in GWBasic, Turbo Basic and Quick Basic, but the author would be pleased to hear of and help with any problems encountered with it, whether of a linguistic or technical nature. Improvements to the program are also welcome, and users should feel free to make them.

In addition to the Basic listing, a compiled version (Polycogs.exe) of the program is available from the author on receipt of a floppy disk of any size - or via e-mail to anyone capable of receiving binary code.

References

Biggs, B. 1978. 'The History of Polynesian Phonology'. (eds) *Second International Conference on Austronesian Linguistics, Proceedings*, ed. by S.A.Wurm and Lois Carrington, Fascicle 2, 691-715. Canberra: Australian National University

Blixen, O. 1975. 'La Oclusion Glotica del Pascuense', *Moana*, 1, 5:1-20.

Green, R.C. 1966. 'Linguistic Subgrouping with Polynesia: The Implications for Prehistoric Settlement', *JPS*, 75:6-38.

The listing

```
1 CLS : REM    Polycogs.BAS Version 1.0
2 REM Written by A.V.C.Jenkins, 29 Assisi Road, Salisbury, SP1 3QZ,
      England 3 REM CompuServe (CIS) ID: 70374,2766
5 DEF SEG = &H0
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```
7 DIM VL$(12)
8 CLS : KEY OFF
10 LOCATE 2, 2: PRINT "POLYCOGS Version 1.0 - by
       A.V.C.Jenkins, "
11 LOCATE 3, 2: PRINT " 29 Assisi Rd, Salisbury, SP1 3QZ, UK.
       CompuServe (CIS) ID: 70374,2766"
12 LOCATE 5, 2: PRINT "A program to give cognates of Polynesian
       words using information published"
14 LOCATE 6, 2: PRINT "in Biggs, B., 1978, 'The History of Polynesian
       Phonology', 2nd Int. Conf."
16 LOCATE 7, 2: PRINT "Aust. Ling.: Fasc. 2, pp 691-716, edited by
       S.A.Wurm and Lois Carrington."

20 LOCATE 9, 2: PRINT "Input from these languages (read down):"
26 LOCATE 10, 14: PRINT
       "AAEEEEEHMMMMMMMMMNPPPPRRRSSSTTTTTTWW
       PPPPPP"
27 LOCATE 11, 14: PRINT
       "IUACFMUAAAIORQQQVMEILUAEUAAMAUUIOOMU
       PTNSEC"
28 LOCATE 12, 14: PRINT
       "TSSEUAVWEOARANSTAANLTKRNRCMAHAPKKNAV
       NOPOPE"
30 LOCATE 14, 5: PRINT "Input reconstructed words in phonemes."
32 LOCATE 15, 5: PRINT "Input modern words orthographically in
       lower case letters."

34 LOCATE 16, 5: PRINT "Use (') or (q) for glottal stop. Use (g), (ng)
       or (9) for velar nasal."
39 LOCATE 17, 5: PRINT "The output is phonemic."

50 REM Functions to catch input errors
51 V$ = "aeiou"
52 DEF FNV% (V%) = INSTR(V$, S$) > 0
60 C$ = "mngptk'fshwlr"
61 DEF FNC% (C%) = INSTR(C$, S$) > 0
70 OK$ = V$ + C$ + " vyFGHN" + CHR$(232)
71 DEF FNOK% (OK%) = INSTR(OK$,S$) > 0

100 REM initialise languages and other string variables
110 W$ = "": L$ = "": Extra$ = ""
120 PPN$ = "": PTO$ = "": TON$ = "": NIU$ = ""
130 PNP$ = "": EUV$ = "": EFU$ = "": PUK$ = "": BEL$ = ""
140 PSO$ = "": SAM$ = "": SAC$ = "": ECE$ = "": TOK$ = "":
       PIL$ = "": TIK$ = ""
150 PEP$ = "": EAS$ = "": PRN$ = ""
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160 PCE$ = "": PCE3$ = "": RAR$ = "": MRA$ = "": MVA$ = "":
        TUP$ = ""
170 RUR$ = "": TAH$ = "": RAP$ = "": NMA$ = "": MAO$ = ""
180 SMA$ = "": EMA$ = "": WMA$ = "": MOR$ = ""
190 TUA$ = "": HAW$ = "": MQS$ = "": MQN$ = "": MQT$ = ""

200 REM Turn off caps lock
250 POKE &H417, &H0
260 LOCATE 20, 20: PRINT "Enter the word:"
270 LOCATE 20, 37: PRINT "__________"
280 LOCATE 20, 37: INPUT "", W$

300 REM clear up variant spellings in Pollex
310 A$ = W$
320 S$ = "ng": T$ = "g": GOSUB 19500
330 S$ = "9": T$ = "g": GOSUB 19500
340 S$ = "wh": T$ = CHR$(232): GOSUB 19500
350 S$ = "q": T$ = "'": GOSUB 19500
360 FOR I = 1 to LEN(A$)
361 S$ = MID$(A$,I,1)
362 IF INSTR(OK$,S$) > 0 GOTO 369
363 BEEP
364 LOCATE 21, 15: PRINT S$;" is not used in the Polynesian
        languages."
365 GOTO 270
369 NEXT I

400 REM turn on caps lock
410 POKE &H417, &H40
430 LOCATE 22, 15: PRINT "Enter the language as a 3-letter code:"
440 LOCATE 22, 54: PRINT "___"
450 LOCATE 22, 54: INPUT "", L$

500 IF L$ = "MAE" THEN LET L$ = "TIK"
501 IF L$ = "MFA" THEN LET L$ = "TIK"
502 IF L$ = "WUV" THEN LET L$ = "TIK"
503 IF L$ = "WEV" THEN LET L$ = "TIK"
504 IF L$ = "MIA" THEN LET L$ = "RAR"
505 IF L$ = "AIT" THEN LET L$ = "RAR"
506 IF L$ = "AUS" THEN LET L$ = "TUP"
507 IF L$ = "TUV" THEN LET L$ = "ECE"
508 IF L$ = "MAN" THEN LET L$ = "NMA"
509 IF L$ = "MAB" THEN LET L$ = "EMA"
510 IF L$ = "MAS" THEN LET L$ = "SMA"
511 IF L$ = "MTW" THEN LET L$ = "WMA"
512 IF L$ = "TUB" THEN LET L$ = "TUP"
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550 IF L$ = "PN" THEN LET L$ = "PPN"
551 IF L$ = "NP" THEN LET L$ = "PNP"
552 IF L$ = "SO" THEN LET L$ = "PSO"
553 IF L$ = "EP" THEN LET L$ = "PEP"
554 IF L$ = "CE" THEN LET L$ = "PCE"

610     IF L$ = "RAR" THEN GOSUB 2000
611     IF L$ = "MRA" THEN GOSUB 2100
612     IF L$ = "MVA" THEN GOSUB 2200
613     IF L$ = "TUP" THEN GOSUB 2300
614     IF L$ = "RUR" THEN GOSUB 2400
615     IF L$ = "TAH" THEN GOSUB 2500
616     IF L$ = "RAP" THEN GOSUB 2600
617     IF L$ = "NMA" THEN GOSUB 2700
618     IF L$ = "MAO" THEN GOSUB 2800
619     IF L$ = "SMA" THEN GOSUB 2900
620     IF L$ = "EMA" THEN GOSUB 3000
621     IF L$ = "WMA" THEN GOSUB 3100
622     IF L$ = "MOR" THEN GOSUB 3200
623     IF L$ = "TUA" THEN GOSUB 3300
624     IF L$ = "HAW" THEN GOSUB 3400
625     IF L$ = "MQS" THEN GOSUB 3500
626     IF L$ = "MQN" THEN GOSUB 3600
627     IF L$ = "MQT" THEN GOSUB 3700
628     IF L$ = "PCE" THEN GOSUB 4000
629     IF L$ = "PEN" THEN GOSUB 4100
630     IF L$ = "PCE3" THEN GOSUB 4200
631     IF L$ = "EAS" THEN GOSUB 4300
632     IF L$ = "PEP" THEN GOSUB 4400
634     IF L$ = "SAC" THEN GOSUB 5000
635     IF L$ = "SAM" THEN GOSUB 5100
636     IF L$ = "ECE" THEN GOSUB 5200
637     IF L$ = "TOK" THEN GOSUB 5300
638     IF L$ = "PIL" THEN GOSUB 5400
639     IF L$ = "TIK" THEN GOSUB 5500
640     IF L$ = "PUK" THEN GOSUB 5600
641     IF L$ = "PSO" THEN GOSUB 5700
642     IF L$ = "TON" THEN GOSUB 6000
643     IF L$ = "NIU" THEN RH$ = "handled": GOTO 700
644     IF L$ = "PTO" THEN GOSUB 6200
645     IF L$ = "EUV" THEN GOSUB 6400
646     IF L$ = "EFU" THEN GOSUB 6500
648     IF L$ = "REN" THEN GOSUB 6800
649     IF L$ = "PNP" THEN GOSUB 6900
650     IF L$ = "PPN" GOTO 10000
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690 RH$ = "recognised"
700 BEEP
710 LOCATE 24, 15
720 PRINT L$; " is not "; RH$; " by this program. ";
750 GOTO 430

2000 REM Cook Islands
2010 REM RAR,MIA,AKI, RAP is the same
2050 S$ = """: T$ = "F": GOSUB 19500
2060 S$ = "v": T$ = "w": GOSUB 19500
2090 PCE$ = A$: L$ = "PCE": RETURN

2100 REM Manihiki-Rakahanga
2120 S$ = "h": T$ = "F": GOSUB 19500
2190 PCE$ = A$: L$ = "PCE": RETURN

2200 REM Mangareva
2240 S$ = """: T$ = "F": GOSUB 19500
2250 S$ = "v": T$ = "w": GOSUB 19500
2260 GOSUB 9600
2270 IF N >= 3 THEN GOSUB 9700
2290 PCE$ = A$: L$ = "PCE": RETURN

2300 REM Tubuai
2320 S$ = """: T$ = "G": GOSUB 19500
2340 S$ = "h": T$ = "F": GOSUB 19500
2360 S$ = "v": T$ = "w": GOSUB 19500
2390 PCE$ = A$: L$ = "PCE": RETURN

2400 REM Rurutu
2420 S$ = """: T$ = "-": GOSUB 19500
2430 Extra$ = "- = any of F or G"
2470 S$ = "v": T$ = "w": GOSUB 19500
2490 PCE$ = A$: L$ = "PCE": RETURN

2500 REM Tahiti
2520 S$ = """: T$ = "G": GOSUB 19500
2540 S$ = "f": T$ = "hw": GOSUB 19500
2570 S$ = "v": T$ = "w": GOSUB 19500
2590 PCE$ = A$: L$ = "PCE": RETURN

2600 REM Rapa
2620 S$ = """: T$ = "F": GOSUB 19500
2650 S$ = "v": T$ = "w": GOSUB 19500
2690 PCE$ = A$: L$ = "PCE": RETURN
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2700 REM North Aukland Maori
2710 S$ = "hw": T$ = CHR$(232): GOSUB 19500
2720 S$ = "h": T$ = "F": GOSUB 19500
2730 S$ = CHR$(232): T$ = "hw": GOSUB 19500
2790 PCE$ = A$: L$ = "PCE": RETURN

2800 REM Maori
2850 S$ = CHR$(232): T$ = "hw": GOSUB 19500
2890 PCE$ = A$: L$ = "PCE": RETURN

2900 REM South Island Maori
2920 S$ = "k": T$ = "G": GOSUB 19500
2930 S$ = "h": T$ = "F": GOSUB 19500
2990 PCE$ = A$: L$ = "PCE": RETURN

3000 REM Bay of Plenty Maori
3020 S$ = "n": T$ = "N": GOSUB 19500
3050 S$ = "h": T$ = "F": GOSUB 19500
3060 S$ = CHR$(232): T$ = "hw": GOSUB 19500
3090 PCE$ = A$: L$ = "PCE": RETURN

3100 REM Taranaki Wanganui Maori
3110 S$ = "'w": T$ = CHR$(232): GOSUB 19500
3120 S$ = "'": T$ = "h": GOSUB 19500
3150 S$ = "h": T$ = "F": GOSUB 19500
3160 S$ = CHR$(232): T$ = "hw": GOSUB 19500
3190 PCE$ = A$: L$ = "PCE": GOTO 4000

3200 REM Mooriori
3210 S$ = "hw": T$ = CHR$(232): GOSUB 19500
3220 S$ = "h": T$ = "F": GOSUB 19500
3230 S$ = CHR$(232): T$ = "hw": GOSUB 19500
3240 S$ = "k": T$ = "G": GOSUB 19500
3290 PCE$ = A$: L$ = "PCE": RETURN

3300 REM Tuamotu
3320 S$ = "f": T$ = "hw": GOSUB 19500
3350 S$ = "v": T$ = "w": GOSUB 19500
3390 PCE$ = A$: L$ = "PCE": RETURN

3400 REM Hawai'i
3410 S$ = "k": T$ = "t": GOSUB 19500
3420 S$ = "'": T$ = "k": GOSUB 19500
3430 S$ = "h": T$ = "F": GOSUB 19500
3450 S$ = "l": T$ = "r": GOSUB 19500
3460 S$ = "n": T$ = "N": GOSUB 19500
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3490 PCE$ = A$: L$ = "PCE": RETURN

3500 REM Marquesas Islands
3510 REM South Marquesas
3520 S$ = "": T$ = "-": GOSUB 19500
3530 Extra$ = "- = k/ or r/l"
3540 S$ = "n": T$ = "N": GOSUB 19500
3550 S$ = "f": T$ = "hw": GOSUB 19500
3570 S$ = "v": T$ = "w": GOSUB 19500
3590 PCE$ = A$: L$ = "PCE": RETURN

3600 REM North Marquesas
3620 S$ = "k": T$ = "g": GOSUB 19500
3630 S$ = "h": T$ = "F": GOSUB 19500
3650 S$ = "v": T$ = "w": GOSUB 19500
3660 S$ = "": T$ = "r": GOSUB 19500
3690 PCE$ = A$: L$ = "PCE": RETURN

3700 REM Taipi
3720 S$ = "h": T$ = "F": GOSUB 19500
3740 S$ = "v": T$ = "w": GOSUB 19500
3750 S$ = "": T$ = "r": GOSUB 19500
3790 PCE$ = A$: L$ = "PCE": RETURN

4000 REM Central Eastern Polynesian
4010 S$ = "hw": T$ = "f": GOSUB 19500
4050 S$ = "hy": T$ = "s": GOSUB 19500
4060 S$ = "h": T$ = "F": GOSUB 19500
4090 PCE3$ = A$: L$ = "PCE3": RETURN

4100 REM Penryn
4120 S$ = "v": T$ = "w": GOSUB 19500
4130 S$ = "h": T$ = "f": GOSUB 19500
4190 PCE3$ = A$: L$ = "PCE3"

4200 REM glottal stops and initial /w/ routines
4210 A$ = PCE3$
4230 S$ = LEFT$(A$, 3)
4231 IF S$ = "waF" THEN T$ = "faF": GOSUB 19550
4233 S$ = LEFT$(A$, 4)
4234 IF S$ = "waaF" THEN T$ = "faaF": GOSUB 19550
4250 I$ = "?"
4260 GOSUB 9850
4290 PEP$ = A$: L$ = "PEP": RETURN
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4300 REM Easter Island
4320 S$ = "h": T$ = "F": GOSUB 19500
4340 S$ = "v": T$ = "w": GOSUB 19500
4390 PEP$ = A$: L$ = "PEP": RETURN

4400 REM Proto East Polynesian
4420 IF LEFT$(A$, 1) = "a" THEN LET A$ = "?" + A$
4421 IF LEFT$(A$, 1) = "e" THEN LET A$ = "?" + A$
4422 IF LEFT$(A$, 1) = "i" THEN LET A$ = "?" + A$
4423 IF LEFT$(A$, 1) = "o" THEN LET A$ = "?" + A$
4424 IF LEFT$(A$, 1) = "u" THEN LET A$ = "?" + A$
4430 S$ = "r": T$ = "l": GOSUB 19500
4490 PNP$ = A$: L$ = "PNP": RETURN

5000 REM Samoan (colloquial)
5020 S$ = "k": T$ = "t": GOSUB 19500
5030 S$ = "g": T$ = "N": GOSUB 19500
5090 SAM$ = A$: L$ = "SAM": RETURN

5100 REM Samoan (formal)
5120 S$ = "'": T$ = "k": GOSUB 19500
5190 PSO$ = A$: L$ = "PSO": RETURN

5200 REM Tuvalu
5220 S$ = "h": T$ = "s": GOSUB 19500
5230 S$ = "v": T$ = "w": GOSUB 19500
5240 IF LEFT$(A$, 1) <> MID$(A$, 2, 1) GOTO 5290
5250 IF INSTR(C$, (LEFT$(A$, 1))) = 0 GOTO 5290
5260 A$ = LEFT$(A$, 1) + "V" + RIGHT$(A$, LEN(A$) - 1)
5270 Extra$ = "V = a vowel"
5290 PSO$ = A$: L$ = "PSO": RETURN

5300 REM Tokelauan
5320 S$ = "hw": T$ = "f": GOSUB 19500
5330 S$ = "hy": T$ = "s": GOSUB 19500
5350 S$ = "hi": T$ = "hyi": GOSUB 19500
5360 S$ = "he": T$ = "hye": GOSUB 19500
5390 PSO$ = A$: L$ = "PSO": RETURN

5400 REM Pileni (Taumako)
5420 S$ = "si": T$ = "ti": GOSUB 19500
5430 S$ = "h": T$ = "s": GOSUB 19500
5440 S$ = "v": T$ = "w": GOSUB 19500
5490 PSO$ = A$: L$ = "PSO": RETURN

5500 REM Tikopia
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5530 S$ = "r": T$ = "l": GOSUB 19500
5540 S$ = "v": T$ = "w": GOSUB 19500
5590 PSO$ = A$: L$ = "PSO": RETURN

5600 REM Pukapuka
5630 S$ = "w": T$ = "f": GOSUB 19500
5640 S$ = "y": T$ = "s": GOSUB 19500
5690 PSO$ = A$: L$ = "PSO": RETURN

5700 REM Proto Samoic Outlier
5710 I$ = "?"
5720 GOSUB 9850
5730 IF LEFT$(A$, 1) = "a" THEN LET A$ = "?" + A$
5731 IF LEFT$(A$, 1) = "e" THEN LET A$ = "?" + A$
5732 IF LEFT$(A$, 1) = "i" THEN LET A$ = "?" + A$
5733 IF LEFT$(A$, 1) = "o" THEN LET A$ = "?" + A$
5734 IF LEFT$(A$, 1) = "u" THEN LET A$ = "?" + A$
5740 S$ = "v": T$ = "w": GOSUB 19500
5750 PNP$ = A$: L$ = "PNP": RETURN

6000 REM Tongan
6010 S$ = "ng": T$ = "g": GOSUB 19500
6020 S$ = "si": T$ = "ti": GOSUB 19500
6030 S$ = "j": T$ = "t": GOSUB 19500
6070 GOSUB 9600: 'sort out vowel assimilation
6080 IF N >= 3 THEN GOSUB 9700
6090 PTO$ = A$: L$ = "PTO": RETURN

6100 REM Niue
6110 S$ = "ng": T$ = "g": GOSUB 19500
6120 S$ = "si": T$ = "ti": GOSUB 19500
6190 PTO$ = A$: L$ = "PTO": RETURN

6200 REM Proto-Tongan
6210 S$ = "h": T$ = "H": GOSUB 19500
6250 I$ = "R": GOSUB 9850
6260 IF LEFT$(A$, 1) = "a" THEN LET A$ = "R" + A$
6261 IF LEFT$(A$, 1) = "e" THEN LET A$ = "R" + A$
6262 IF LEFT$(A$, 1) = "i" THEN LET A$ = "R" + A$
6263 IF LEFT$(A$, 1) = "o" THEN LET A$ = "R" + A$
6264 IF LEFT$(A$, 1) = "u" THEN LET A$ = "R" + A$
6290 PPN$ = A$: L$ = "PPN": RETURN

6400 REM East Uvea
6420 S$ = "h": T$ = "s": GOSUB 19500
6490 PNP$ = A$: L$ = "PNP": RETURN
```

```
6500 REM East Futuna
6590 PNP$ = A$: L$ = "PNP": RETURN

6800 REM Bellona/Rennell
6820 S$ = "h": T$ = "f": GOSUB 19500
6830 S$ = "ng": T$ = "X": GOSUB 19500
6840 S$ = "g": T$ = "l": GOSUB 19500
6850 S$ = "X": T$ = "g": GOSUB 19500
6860 S$ = "b": T$ = "w": GOSUB 19500
6890 PNP$ = A$: L$ = "PNP": RETURN

6900 REM PNP
6910 S$ = "l": T$ = "R": GOSUB 19500
6920 IF INSTR(V$, LEFT$(A$, 1)) > 0 THEN LET A$ = "H" + A$
6990 PPN$ = A$: L$ = "PPN": RETURN

9000 REM sound changes

9600 REM count vowels for TON, MVA, ECE
9601 N = 0
9602 FOR I = 1 TO LEN(A$)
9604 S$ = MID$(A$, I, 1)
9605 IF INSTR(V$, S$) = 0 THEN 9608
9606 N = N + 1
9607 VL$(N) = S$
9608 NEXT I
9609 RETURN
9700 REM vowel change in TON, MVA
9701 Tonga$ = "Vowel assimilation has been assumed."
9702 FOR I = 1 TO N - 2
9703 S$ = VL$(I): REM is the first vowel "e" or "o"?
9704 IF VL$(I) = "e" AND VL$(I + 1) = "i" THEN T$ = "a": GOSUB
        19550: Extra$ = Tonga$
9706 IF VL$(I) = "o" AND VL$(I + 1) = "u" THEN T$ = "a": GOSUB
        19550: Extra$ = Tonga$
9718 NEXT I
9719 RETURN
9850 REM SUBROUTINE TO ADD "?" or "R" BETWEEN VOWELS
9851 I = 2
9852 P1$ = MID$(A$, I - 1, 1)
9853 P2$ = MID$(A$, I, 1)
9854 IF INSTR(V$, P1$) = 0 THEN 9859
9855 LET V1$ = P1$
9856 IF INSTR(V$, P2$) = 0 THEN 9859
9857 LET V2$ = P2$
```

```
9858 S$ = V1$ + V2$: T$ = V1$ + I$ + V2$: GOSUB 19500
9859 I = I + 1: IF I <= LEN(A$) GOTO 9852
9860 RETURN

10000 REM OUTPUT BEGINS HERE
10900 IF PPN$ = "" THEN LET PPN$ = A$
11000 REM Proto-Tongan
11005 A$ = PPN$
11010 S$ = "s": T$ = "h": GOSUB 19500
11020 S$ = "r": T$ = "": GOSUB 19500
11030 S$ = "H": T$ = "h": GOSUB 19500
11090 IF PTO$ = "" THEN LET PTO$ = A$
11100 REM Tongan
11110 A$ = PTO$
11120 S$ = "ti": T$ = "si": GOSUB 19500
11130 GOSUB 19600
11140 IF N >= 3 THEN GOSUB 19700
11190 TON$ = A$
11200 REM Niue
11210 A$ = PTO$
11220 S$ = "'": T$ = "": GOSUB 19500
11230 S$ = "ti": T$ = "si": GOSUB 19500
11290 NIU$ = A$
11300 REM PNP
11305 A$ = PPN$
11310 S$ = "h": T$ = "": GOSUB 19500
11330 S$ = "r ": T$ = "l ": GOSUB 19500
11390 IF PNP$ = "" THEN LET PNP$ = A$
11400 REM East Uvea
11410 A$ = PNP$
11420 S$ = "s": T$ = "h": GOSUB 19500
11490 EUV$ = A$
11500 REM East Futuna
11510 A$ = PNP$
11590 EFU$ = A$
11600 REM Pukapuka
11610 A$ = PNP$
11620 S$ = "'": T$ = "": GOSUB 19500
11630 S$ = "f": T$ = "w": GOSUB 19500
11640 S$ = "s": T$ = CHR$(233) + "y": GOSUB 19500
11690 PUK$ = A$
11800 REM Bellona/Rennell
11810 A$ = PNP$
11820 S$ = "f": T$ = "h": GOSUB 19500
11830 S$ = "l": T$ = "g": GOSUB 19500
11840 S$ = "w": T$ = CHR$(225): GOSUB 19500
```

```
11890 BEL$ = A$
12000 REM Proto Samoic Outlier
12010 A$ = PNP$
12020 S$ = "": T$ = "": GOSUB 19500
12030 S$ = "w": T$ = "v": GOSUB 19500
12040 IF PSO$ = "" THEN LET PSO$ = A$
12100 REM Samoan (formal)
12110 A$ = PSO$
12120 S$ = "k": T$ = "": GOSUB 19500
12190 SAM$ = A$
12200 REM Samoan (colloquial)
12210 A$ = SAM$
12220 S$ = "t": T$ = "k": GOSUB 19500
12230 S$ = "n": T$ = "g": GOSUB 19500
12290 SAC$ = A$
12300 REM Tuvalu
12310 A$ = PSO$
12320 S$ = "s": T$ = "h": GOSUB 19500
12330 S$ = "w": T$ = "v": GOSUB 19500
12340 GOSUB 19600
12350 IF N >= 3 THEN GOSUB 19800
12390 ECE$ = A$
12400 REM Tokelauan
12410 A$ = PSO$
12420 S$ = "f": T$ = "hw": GOSUB 19500
12430 S$ = "s": T$ = "hy": GOSUB 19500
12450 S$ = "hyi": T$ = "hi": GOSUB 19500
12460 S$ = "hye": T$ = "he": GOSUB 19500
12490 TOK$ = A$
12500 REM Pileni (Taumako)
12510 A$ = PSO$
12520 S$ = "s": T$ = "h": GOSUB 19500
12530 S$ = "w": T$ = "v": GOSUB 19500
12540 S$ = "ti": T$ = "si": GOSUB 19500
12590 PIL$ = A$
12600 REM Tikopia
12610 A$ = PSO$
12630 S$ = "l": T$ = "r": GOSUB 19500
12640 S$ = "w": T$ = "v": GOSUB 19500
12690 TIK$ = A$
14000 REM Proto East Polynesian
14010 A$ = PNP$
14030 S$ = "l": T$ = "r": GOSUB 19500
14090 IF PEP$ = "" THEN LET PEP$ = A$
14100 REM Easter Island
14110 A$ = PEP$
```

```
14120 S$ = "F": T$ = "h": GOSUB 19500
14130 S$ = "s": T$ = "h": GOSUB 19500
14140 S$ = "f": T$ = "h": GOSUB 19500
14150 S$ = "w": T$ = CHR$(225): GOSUB 19500
14190 IF EAS$ = "" THEN LET EAS$ = A$
15000 REM Central Eastern Polynesian
15010 A$ = PEP$
15020 S$ = "?": T$ = "": GOSUB 19500
15025 S$ = "'": T$ = "": GOSUB 19500
15030 S$ = LEFT$(A$, 3)
15031 IF S$ = "faf" THEN T$ = "waf": GOSUB 19550
15032 IF S$ = "fas" THEN T$ = "was": GOSUB 19550
15033 IF S$ = "faF" THEN T$ = "waF": GOSUB 19550
15034 S$ = LEFT$(A$, 4)
15035 IF S$ = "faaf" THEN T$ = "waaf": GOSUB 19550
15036 IF S$ = "faas" THEN T$ = "waas": GOSUB 19550
15037 IF S$ = "faaF" THEN T$ = "waaF": GOSUB 19550
15090 IF PCE3$ = "" THEN LET PCE3$ = A$
15100 REM Penryn
15110 S$ = "f": T$ = "h": GOSUB 19500
15120 S$ = "w": T$ = "v": GOSUB 19500
15190 PRN$ = A$
15200 A$ = PCE3$
15210 S$ = "f": T$ = "hw": GOSUB 19500
15211 S$ = "hwu": T$ = "hu": GOSUB 19500
15212 S$ = "hwo": T$ = "ho": GOSUB 19500
15220 S$ = "ahw": T$ = "ah": GOSUB 19500
15221 S$ = "ehw": T$ = "eh": GOSUB 19500
15222 S$ = "ihw": T$ = "ih": GOSUB 19500
15223 S$ = "ohw": T$ = "oh": GOSUB 19500
15224 S$ = "uhw": T$ = "uh": GOSUB 19500
15225 S$ = "Vhw": T$ = "Vh": GOSUB 19500
15232 S$ = "Fo": T$ = "ho": GOSUB 19500
15240 S$ = "aF": T$ = "ah": GOSUB 19500
15241 S$ = "eF": T$ = "eh": GOSUB 19500
15242 S$ = "iF": T$ = "ih": GOSUB 19500
15243 S$ = "oF": T$ = "oh": GOSUB 19500
15244 S$ = "uF": T$ = "uh": GOSUB 19500
15245 S$ = "VF": T$ = "Vh": GOSUB 19500
15250 S$ = "s": T$ = "hy": GOSUB 19500
15251 S$ = "hyi": T$ = "hi": GOSUB 19500
15252 S$ = "hye": T$ = "he": GOSUB 19500
15260 S$ = "H": T$ = "?": GOSUB 19500
15290 IF PCE$ = "" THEN LET PCE$ = A$
16000 REM Cook Islands
16010 REM RAR,MIA,AKI, RAP is the same
```

```
16020 A$ = PCE$
16030 S$ = "hw": T$ = "h": GOSUB 19500
16040 S$ = "hy": T$ = "h": GOSUB 19500
16045 S$ = "F": T$ = "h": GOSUB 19500
16050 S$ = "h": T$ = "'": GOSUB 19500
16060 S$ = "w": T$ = "v": GOSUB 19500
16090 RAR$ = A$
16100 REM Manihiki-Rakahanga
16110 A$ = PCE$
16120 S$ = "hw": T$ = "h": GOSUB 19500
16130 S$ = "hy": T$ = "h": GOSUB 19500
16140 S$ = "F": T$ = "h": GOSUB 19500
16190 MRA$ = A$
16200 REM Mangareva
16210 A$ = PCE$
16220 S$ = "hw": T$ = "h": GOSUB 19500
16230 S$ = "hy": T$ = "h": GOSUB 19500
16235 S$ = "F": T$ = "h": GOSUB 19500
16240 S$ = "h": T$ = "'": GOSUB 19500
16250 S$ = "w": T$ = "v": GOSUB 19500
16260 GOSUB 19600
16270 IF N >= 3 THEN GOSUB 19700
16290 MVA$ = A$
16300 REM Tubuai
16310 A$ = PCE$
16320 S$ = "k": T$ = "'": GOSUB 19500
16330 S$ = "g": T$ = "'": GOSUB 19500
16340 S$ = "hw": T$ = "h": GOSUB 19500
16350 S$ = "hy": T$ = "h": GOSUB 19500
16355 S$ = "F": T$ = "h": GOSUB 19500
16360 S$ = "w": T$ = "v": GOSUB 19500
16390 TUP$ = A$
16400 REM Rurutu
16410 A$ = PCE$
16420 S$ = "k": T$ = "'": GOSUB 19500
16430 S$ = "g": T$ = "'": GOSUB 19500
16440 S$ = "hw": T$ = "h": GOSUB 19500
16450 S$ = "hy": T$ = "h": GOSUB 19500
16455 S$ = "F": T$ = "h": GOSUB 19500
16460 S$ = "h": T$ = "'": GOSUB 19500
16470 S$ = "w": T$ = "v": GOSUB 19500
16490 RUR$ = A$
16500 REM Tahiti
16510 A$ = PCE$
16520 S$ = "k": T$ = "'": GOSUB 19500
16530 S$ = "g": T$ = "'": GOSUB 19500
```

```
16540 S$ = "hw": T$ = "f": GOSUB 19500
16550 S$ = "hy": T$ = "h": GOSUB 19500
16560 S$ = "w": T$ = "v": GOSUB 19500
16590 TAH$ = A$
16600 REM Rapa
16610 A$ = PCE$
16620 S$ = "hw": T$ = "h": GOSUB 19500
16630 S$ = "hy": T$ = "h": GOSUB 19500
16535 S$ = "F": T$ = "h": GOSUB 19500
16640 S$ = "h": T$ = "'": GOSUB 19500
16650 S$ = "w": T$ = "v": GOSUB 19500
16690 RAP$ = A$
16700 REM North Aukland Maori
16710 A$ = PCE$
16790 NMA$ = A$
16800 REM Maori
16810 A$ = PCE$
16820 S$ = "hw": T$ = CHR$(232): GOSUB 19500
16830 S$ = "hy": T$ = "h": GOSUB 19500
16890 MAO$ = A$
16900 REM South Island Maori
16910 A$ = PCE$
16920 S$ = "g": T$ = "k": GOSUB 19500
16930 S$ = "hw": T$ = "h": GOSUB 19500
16940 S$ = "hy": T$ = "h": GOSUB 19500
16950 S$ = "F": T$ = "h": GOSUB 19500
16990 SMA$ = A$
17000 REM Bay of Plenty Maori
17010 A$ = PCE$
17020 S$ = "g": T$ = "n": GOSUB 19500
17030 S$ = "hw": T$ = CHR$(232): GOSUB 19500
17050 S$ = "hy": T$ = "h": GOSUB 19500
17090 EMA$ = A$
17100 REM Taranaki Wanganui Maori
17110 A$ = PCE$
17150 S$ = "hy": T$ = "h": GOSUB 19500
17160 S$ = "h": T$ = "'": GOSUB 19500
17190 WMA$ = A$
17200 REM Mooriori
17210 A$ = PCE$
17220 S$ = "g": T$ = "k": GOSUB 19500
17290 MOR$ = A$
17300 REM Tuamotu
17310 A$ = PCE$
17320 S$ = "hw": T$ = "f": GOSUB 19500
17340 S$ = "hy": T$ = "h": GOSUB 19500
```

```
17350 S$ = "w": T$ = "v": GOSUB 19500
17390 TUA$ = A$
17400 REM Hawai'i
17410 A$ = PCE$
17420 S$ = "k": T$ = "": GOSUB 19500
17430 S$ = "hw": T$ = "h": GOSUB 19500
17440 S$ = "hy": T$ = "h": GOSUB 19500
17445 S$ = "F": T$ = "h": GOSUB 19500
17450 S$ = "r": T$ = "l": GOSUB 19500
17460 S$ = "g": T$ = "n": GOSUB 19500
17465 S$ = "N": T$ = "n": GOSUB 19500
17470 S$ = "t": T$ = "k": GOSUB 19500
17490 HAW$ = A$
17500 REM Marquesas Islands
17510 REM South Marquesas
17520 A$ = PCE$
17530 S$ = "k": T$ = "": GOSUB 19500
17540 S$ = "g": T$ = "n": GOSUB 19500
17545 S$ = "N": T$ = "n": GOSUB 19500
17550 S$ = "hw": T$ = "f": GOSUB 19500
17560 S$ = "hy": T$ = "h": GOSUB 19500
17570 S$ = "w": T$ = "v": GOSUB 19500
17580 S$ = "r": T$ = "": GOSUB 19500
17590 MQS$ = A$
17600 REM North Marquesas
17610 A$ = PCE$
17620 S$ = "g": T$ = "k": GOSUB 19500
17630 S$ = "hw": T$ = "h": GOSUB 19500
17640 S$ = "hy": T$ = "h": GOSUB 19500
17645 S$ = "F": T$ = "h": GOSUB 19500
17650 S$ = "w": T$ = "v": GOSUB 19500
17660 S$ = "r": T$ = "": GOSUB 19500
17690 MQN$ = A$
17700 REM Taipi
17710 A$ = PCE$
17720 S$ = "hw": T$ = "h": GOSUB 19500
17730 S$ = "hy": T$ = "h": GOSUB 19500
17735 S$ = "F": T$ = "h": GOSUB 19500
17740 S$ = "w": T$ = "v": GOSUB 19500
17750 S$ = "r": T$ = "": GOSUB 19500
17790 MQT$ = A$
18000 REM Output routine
18010 CLS
18020 LOCATE 2, 30: PRINT "PPN "; PPN$
18030 LOCATE 3, 30: PRINT "PTO "; PTO$
18040 LOCATE 4, 10: PRINT "TON "; TON$
```

```
18050 LOCATE 4, 50: PRINT "NIU "; NIU$
18060 LOCATE 5, 30: PRINT "PNP "; PNP$
18070 LOCATE 6, 10: PRINT "EUV "; EUV$
18080 LOCATE 6, 50: PRINT "EFU "; EFU$
18090 LOCATE 7, 50: PRINT "BEL "; BEL$
18100 LOCATE 7, 10: PRINT "SAM "; SAM$
18110 LOCATE 8, 10: PRINT "SAC "; SAC$
18120 LOCATE 8, 50: PRINT "PUK "; PUK$
18130 LOCATE 9, 10: PRINT "ECE "; ECE$
18140 LOCATE 9, 50: PRINT "TOK "; TOK$
18150 LOCATE 10, 10: PRINT "PIL "; PIL$
18160 LOCATE 10, 50: PRINT "TIK "; TIK$
18170 LOCATE 11, 30: PRINT "PEP "; PEP$
18180 LOCATE 12, 10: PRINT "EAS "; EAS$
18190 LOCATE 12, 50: PRINT "PEN "; PRN$
18200 LOCATE 13, 30: PRINT "PCE "; PCE$
18210 LOCATE 14, 10: PRINT "RAR "; RAR$
18220 LOCATE 14, 50: PRINT "MRA "; MRA$
18230 LOCATE 15, 10: PRINT "TAH "; TAH$
18240 LOCATE 15, 50: PRINT "TUA "; TUA$
18250 LOCATE 16, 10: PRINT "TUP "; TUP$
18260 LOCATE 16, 50: PRINT "RUR "; RUR$
18270 LOCATE 17, 10: PRINT "RAP "; RAP$
18280 LOCATE 17, 50: PRINT "MVA "; MVA$
18300 LOCATE 18, 10: PRINT "HAW "; HAW$
18310 LOCATE 18, 50: PRINT "MQS "; MQS$
18320 LOCATE 19, 10: PRINT "MQN "; MQN$
18330 LOCATE 19, 50: PRINT "MQT "; MQT$
18340 LOCATE 20, 10: PRINT "NMA "; NMA$
18350 LOCATE 20, 50: PRINT "MAO "; MAO$
18360 LOCATE 21, 10: PRINT "SMA "; SMA$
18370 LOCATE 21, 50: PRINT "EMA "; EMA$
18380 LOCATE 22, 10: PRINT "WMA "; WMA$
18390 LOCATE 22, 50: PRINT "MOR "; MOR$
18400 LOCATE 23, 5: PRINT "F = f/wh/v/h/s; G = k/g; H = s/h/0; N =
        n/g; R = r/l/0; ? = '/h/0"
18410 LOCATE 24, 5: PRINT Extra$
18900 REM ROUTINE TO RE-RUN PROGRAM
18910 POKE &H417, &H0
18920 LOCATE 25, 20: PRINT "Press Q to Quit, any other key to run
        again";
18930 Q$ = INKEY$: IF Q$ = "" THEN 18920
18940 IF Q$ = "q" THEN 18990
18950 IF Q$ = "Q" THEN 18990
18960 GOTO 8
18990 CLS : END
```

```
19000 REM sound changes
19500 REM complete String replacement routine 19501 A1% = 1
19502 A% = INSTR(A1%, A$, S$)
19503 IF A% = 0 THEN 19506
19504 A$ = LEFT$(A$, A% - 1) + T$ + MID$(A$, A% + LEN(S$))
19505 A1% = A% + LEN(T$): GOTO 19501
19506 RETURN
19550 REM partial string replacement routine
19552 A% = INSTR(A1%, A$, S$)
19554 A$ = LEFT$(A$, A% - 1) + T$ + MID$(A$, A% + LEN(S$))
19556 RETURN
19600 REM count vowels for TON, MVA, ECE 19601 N = 0
19602 FOR I = 1 TO LEN(A$)
19604 S$ = MID$(A$, I, 1)
19605 IF INSTR(V$, S$) = 0 THEN 19608
19606 N = N + 1
19607 VL$(N) = S$
19608 NEXT I
19609 RETURN
19700 REM vowel change in TON, MVA
19701 FOR I = 1 TO N - 2
19702 IF VL$(I) <> "a" THEN 19719
19703 S$ = VL$(I): REM is there an "a" in the word?
19704 IF VL$(I + 1) = "i" THEN T$ = "e": GOSUB 19550
19706 IF VL$(I + 1) = "u" THEN T$ = "o": GOSUB 19550
19718 NEXT I
19719 RETURN
19800 REM Vowel loss in ECE
19801 FOR I = 1 TO N - 2
19802 P = INSTR(A$, VL$(I))
19803 IF P < 2 THEN 19809
19804 C1$ = MID$(A$, P - 1, 1)
19805 C2$ = MID$(A$, P + 1, 1)
19806 IF C1$ <> C2$ THEN 19809
19807 IF INSTR(C$, C1$) = 0 THEN 19809
19808 S$ = VL$(I): T$ = "": GOSUB 19550
19809 NEXT I
19810 RETURN
```