Lessons of the Past, Tools of the Future

A Computational Decipherment of Linear B

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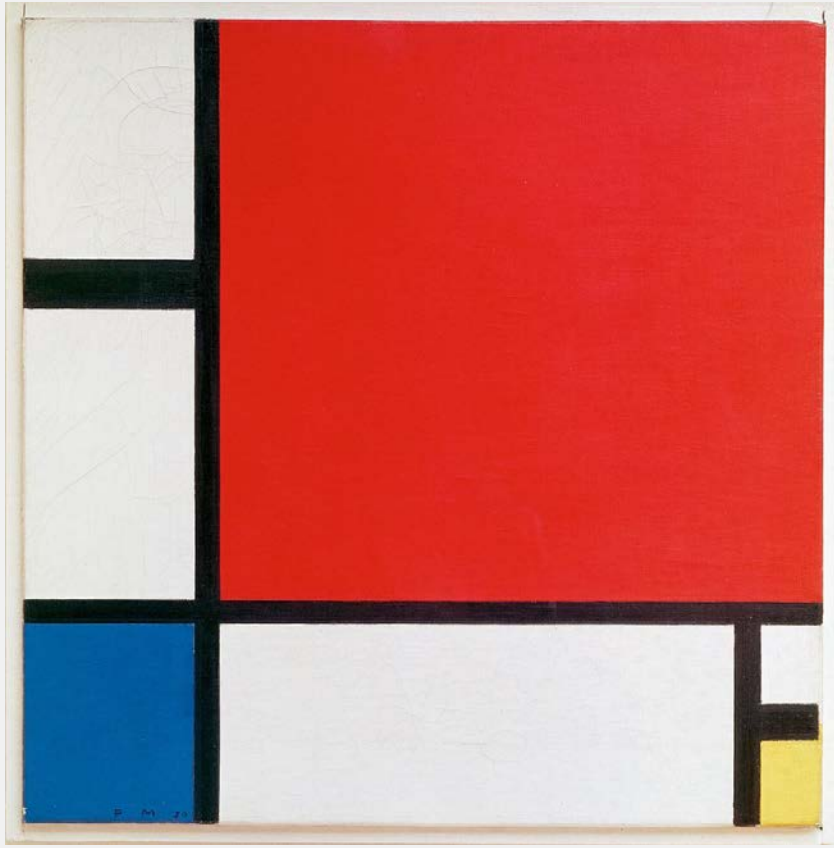
Creativity is Limitation



- Limitation: Follow the steps of the original decipherment
  - “Standing on the Shoulders of Giants”
- A different approach to a interdisciplinary project

Background

- Linear B was found on Crete and at select places on the mainland
- It is a syllabic language
- The language was used administratively
- Related languages
  - Linear A, Cypro-Minoan, Cretan Hieroglyphs, Classical Cypriot

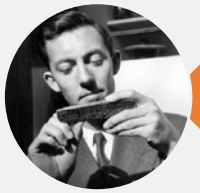
A Recipe for Decipherment

1) Correctly classify and transcribe tablets

Completed by Emmett L. Bennett Jr.

2) Find evidence of inflection

Completed by Alice Kober



3) Create a grid of characters

Completed by Michael Ventris

4) Begin assigning likely values to the grid

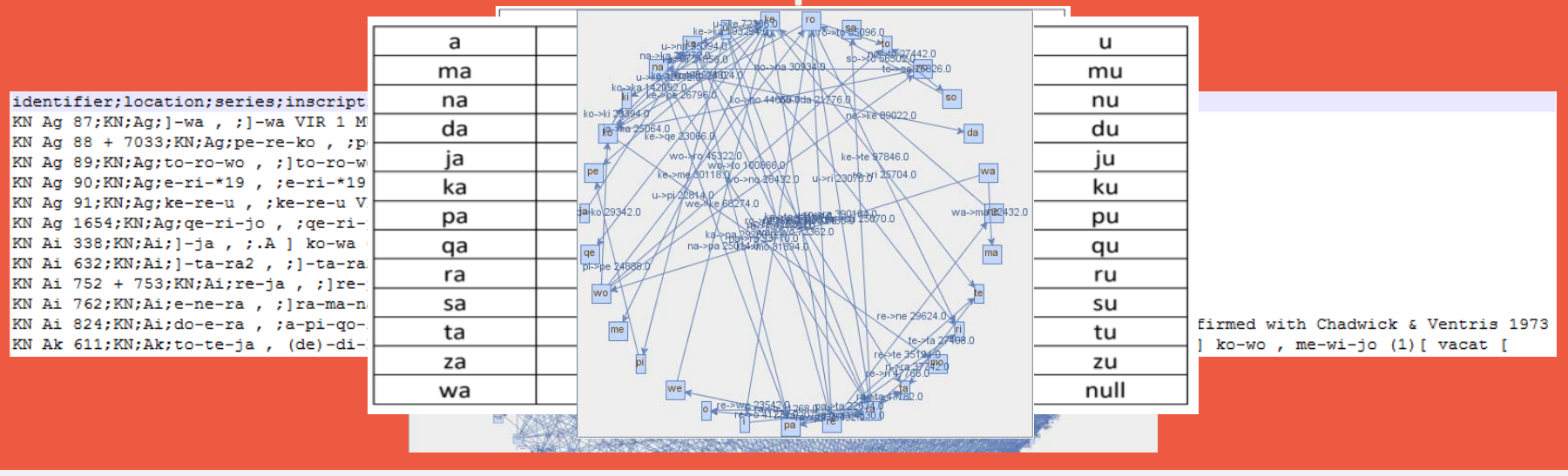
Completed by John Chadwick & Ventris

	A	E	I	O	U
VOWEL					
D					
J					
K					
M					
N					
P					
Q					
R					
S					
T					
W					
Z					

System flow

Every tablet → Find inflection → A graph showing shared vowels/ consonants → Only recurring patterns are preserved → Final grid of values

Output



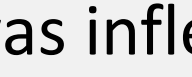
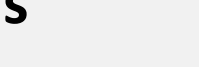
a		u
ma		mu
na		nu
da		du
ja		ju
ka		ku
pa		pu
qa		qu
ra		ru
sa		su
ta		tu
za		zu
wa		null

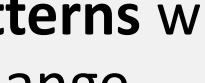
```
identifier;location;series;inscript
KN Ag 87;KN;Ag;]-wa , ;]-wa VIR 1 M
KN Ag 88 + 7033;KN;Ag;pe-re-ko , ;p
KN Ag 89;KN;Ag;to-ro-wo , ;]to-ro-w
KN Ag 90;KN;Ag;e-ri-*19 , ;e-ri-*19
KN Ag 91;KN;Ag;ke-re-u , ;ke-re-u V
KN Ag 1654;KN;Ag;qe-ri-jo , ;qe-ri-
KN Ai 338;KN;Ai;]-ja , ;.A ] ko-wa
KN Ai 632;KN;Ai;]-ta-ra2 , ;]-ta-ra
KN Ai 752 + 753;KN;Ai;re-ja , ;]re-
KN Ai 762;KN;Ai;e-ne-ra , ;]ra-ma-n
KN Ai 824;KN;Ai;do-e-ra , ;a-pi-qo-
KN Ak 611;KN;Ak;to-te-ja , (de)-di-
```

```
firmed with Chadwick & Ventris 1973
] ko-wo , me-wi-jo (1)[ vacat [
```

Finding Inflection: Original Work

- Kober originally found evidence that Linear B was inflected
- Kober's algorithm
  - Select **words which are followed by ideograms and numerals**
  - Find the same **word in different contexts**
  - Find **predictable patterns** where the word endings change

	Type A		Type B		
Case I					
Case II					
Case III					

	Type C	Type D	Type E
Case I			
Case II			
Case III			

Finding Inflection: Computational Approach

- A visual representation
- Loop through each word
  - Loop through each word
    - If the word is exactly the same – ignore
    - Else
      - Loop through the characters in word 1
        - Does this character match the character in word 2
          - Increase the similarity
        - Else – stop, these words are dissimilar

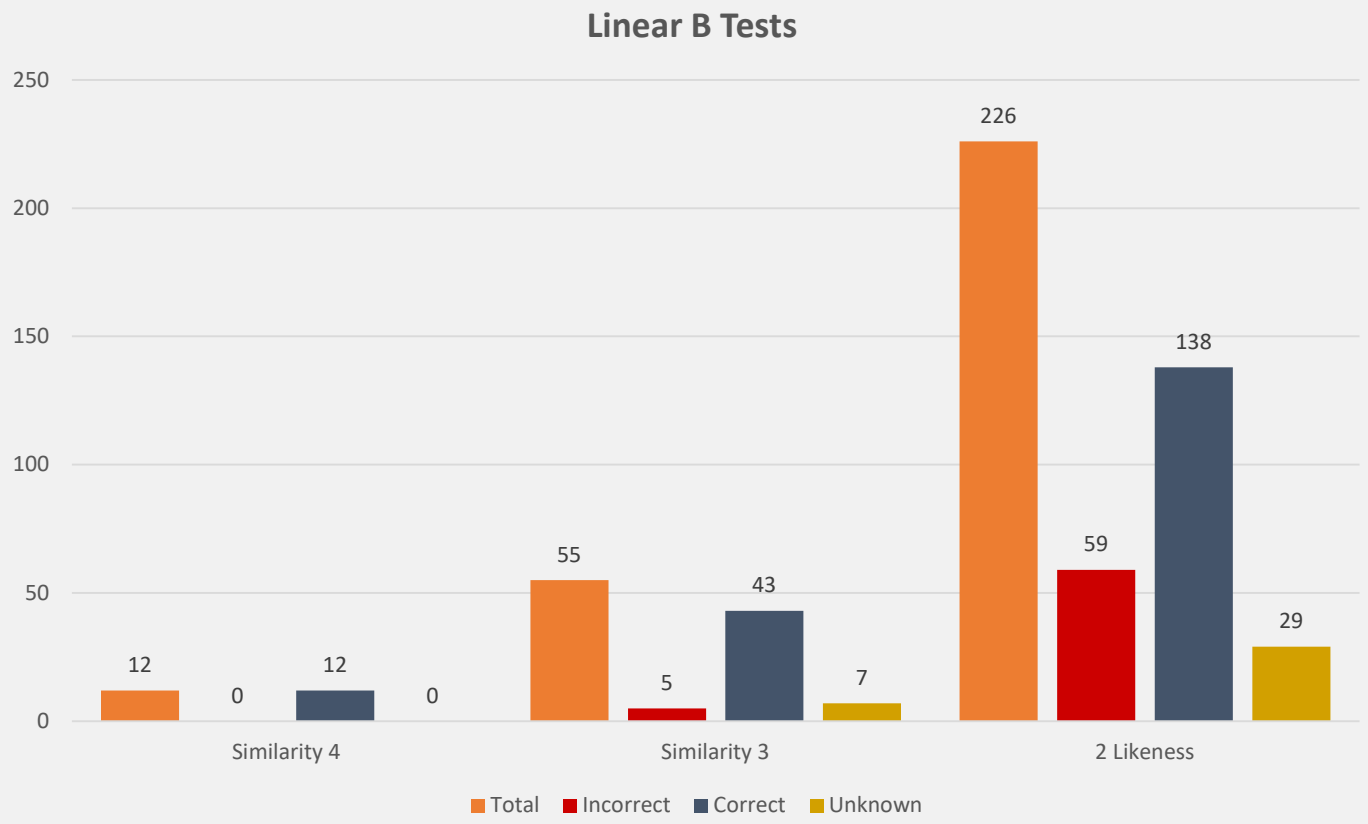
walk	[w,a,l,k]
talking	[t,a,l,k,i,n,g]
walking →	[w,a,l,k,i,n,g]
wanting	[w,a,n,t,i,n,g]
walked	[w,a,l,k,e,d]

Loop	Word 1	Word 2	Similarity
1 →	walk	walk	0
2	walk	talking	0
3 →	walk	walking	4
4	walk	wanting	2

Loop	walk	wanting	Similarity
1 →	w	w	1
2 →	a	a	2
3	l	n	2

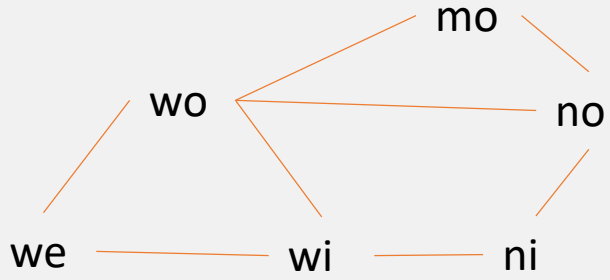
Finding Inflection: The Results

```
po-ti-ni-ja Confirmed? true
 -po-ti-ni-ja-we-jo
 -po-ti-ni-ja-we
 -po-ti-ni-ja-wi-jo
u-ru-pi-ja-jo Confirmed? false
 -u-ru-pi-ja-jo
a-ko-so-ta Confirmed? false
 -a-ko-so-ta
 -a-ko-so-ta-o
po-ro-u-te Confirmed? false
 -po-ro-u-te-u
 -po-ro-u-te-we
```



Creating the Connections: Original Work

- Kober showed how characters are connected
  - Computerise this process
- Predictable patterns, evidence of inflection
- Then this is plot on a graph

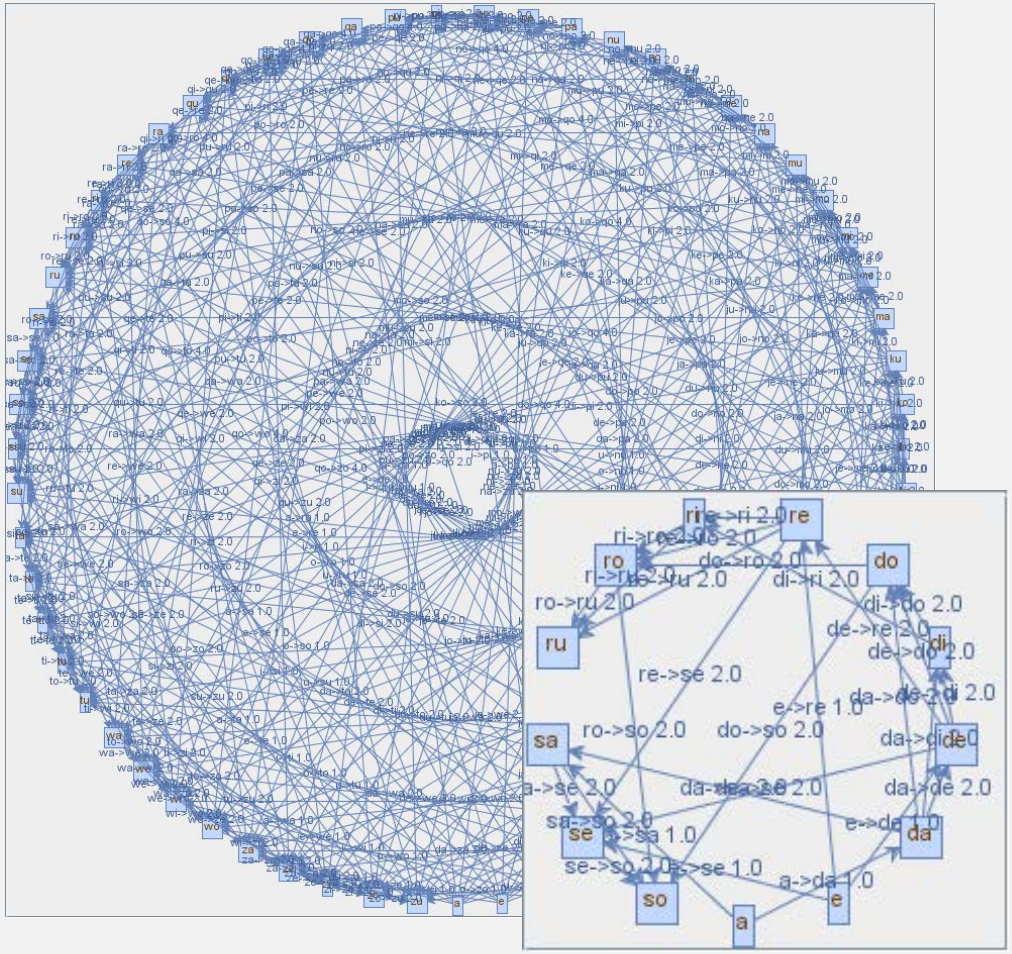


Ser-vu-s(a) -> Servus
Ser-vu-m(a) -> Servum
Ser-vi -> Servi

Same word – different case

First characters are the same, next character is the same, the next character likely shares a consonant

Creating the Connections: Results



- Graph
  - Node -> A Linear B character
  - Edge -> A shared vowel or consonant
  - Weight -> How often it appears
- Seed the graph with likely values
  - da, ma, mi, ni, so, do, su, du
- Plot onto a table

Final Grid

	a	e	i	o	u
M	ma	me	mi	mo	mu
N	na	ne	null	no	nu
D	da	de	di	do	du
J	ja	je	ni	jo	ju
K	ka	ke	ki	ko	ku
P	pa	pe	pi	po	pu
Q	qa	qe	qi	qo	qu
R	ra	re	ri	ro	ru
S	sa	se	si	so	su
T	ta	te	ti	to	tu
Z	za	ze	zi	zo	zu
W	wa	we	wi	wo	null

Conclusion

- It is possible to replicate the decipherment of Linear B computationally
  - Different approach that typical Machine Learning decipherments
- Working with limitations can encourage creative solutions
- Interdisciplinary projects are great sources of personal growth

Thank you for listening

Any Questions?

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www.somewebpage.com

https://github.com/greenpencil

My Linear B datasets are available and free for use
https://github.com/InsiderPhD/Linear-B-Dataset
My inflection algorithm is available and free for use
https://github.com/greenpencil/Java-Inflection-Algorithm