



# "Mesolithic Capitalism": Language Games, Meaning and State Machines

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#### Introduction

- Marx & Engel's materialism
  - matter in motion
- opposed to mechanical materialism
  - based on mid 19<sup>th</sup> century concept of machine
  - "mindless" automata
  - follow fixed sequence of actions
  - e.g. clockwork
- MM can't account for development/progress



The creation of heaven and the stars, late 12th century, Monreale Cathedral, Sicily https://www.mediastorehouse.com/p/497/creation-heaven-creation-heaven-stars-

12345507.jpg

#### Introduction

- materialist dialectic
  - logic + dialects
- logic
  - how things are
  - propositional calculus
  - after Aristotle

#### dialectics

- how things change
- after Hegel
  - though more like Socrates/Aristotle? - KK



#### Zytglogge, Bern, 15<sup>th</sup> century

https://thumbs.dreamstime.com/b/astronomical-dial-zytglogge-medieval-clock-tower-bernastronomical-dial-zytglogge-medieval-clock-tower-landmark-115998893.jpg

#### Language & dialectics

- language is an interpreted symbol system
  - lexemes/symbols + syntax/grammar + semantics
  - for communication
  - not concerned here with representation/medium
- what does the interpretation?



Cave Beck, The Universal Character, 1657 [GJM]

#### Language & dialectics

- 19th century logic & dialectics couldn't directly account for language
  - dynamism
  - interaction
- Engels (1876) *The Part Played by Labour in the Transition from Ape to Man* 
  - Lamarckian
  - brain changes driven by hand use and language



Photographically reduced from Diagrams of the natural size (szonyt that of the Gibbon, which was twice as large as nature), denses by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

#### T. H. Huxley, Evidence as to Man's Place in Nature, 1863

https://upload.wikimedia.org/wikipedia/commons/thumb/f/f0/Huxley\_-\_Mans\_Place\_in\_Nature.png/375px-Huxley\_-\_Mans\_Place\_in\_Nature.png

#### Language & dialectics

- Soviet Union
  - ideological opposition to formalism
  - after Engels in Anti-Duhring & Dialectics of Nature
  - formal linguistics equated with mechanical materialism
- Stalin (1930s)
  - Menshevising Idealism
  - suppression of theoretical approaches characterizable as formalist
  - including formal logic & linguistics



Kempelen, Mechanical Turk, 1770 https://en.wikipedia.org/wiki/File:Tuerkischer\_schachspieler\_windisch4.jpg

#### Language and dialectics

- Marr linguistics school dominant
  - Japhetic Theory
  - language reflects class society
- computers/cybernetics based on formal logic, so anathema
- post WW2, Soviet military needed computers to design nuclear weapons



Camille Flammarion, L'atmosphère : météorologie populaire, 1888

https://upload.wikimedia.org/wikipedia/commons/thumb/8/87/Flammarion.jpg/450px-Flammarion.jpg

#### Language and dialectics

- Stalin (1950) rehabilitated formal linguistics
  - language goes beyond class
  - semantics important
    - less than unity of language and thought...
  - effect was to rehabilitate formalism
- opposition to formalism damaged Soviet mathematics & computing
  - Marxists haven't confronted this
- Badiou (1968) Concept of Model
  - materialist conceptualisation of formal logic
  - formal semantics is static



https://www.wilsonquarterly.com/stories/the-peculiar-history-ofcomputers-in-the-soviet-union/

#### Language is dynamic

- Vygotsky (1934) Language and Thought
  - language is socially constructed
- Wittgenstein (1953) *Philosophical Investigations* 
  - interaction involves rule following
  - language game
- Minsky (1986) Mind in Society
  - meaning constructed in embodied interaction



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#### Language game

- "Mesolithic capitalism"
- very simple world & language
- Marx's simple reproduction schema
- single commodity economy



Mesolithic Life, Pat Haynes, for Tarradale Through Time https://s3-eu-west-1.amazonaws.com/s3.spanglefish.com/s/37882/pictures/middens/vbig/mesopic.jpg

#### Scenario

- seashore with shellfish
- consumption
  - 1 person eats 1 shellfish per day
- capitalist owns seashore
- rocks are currency
- employment
  - payment: 1 shellfish → 1 rock
- sale
  - cost: 1 shellfish → 2 rocks
- 100% profit



### Employment

- capitalist: get me shellfish!
- worker: pay me rocks!
- capitalist: OK!
- worker: OK!



#### Exchange

- workers goes to shore and gets shellfish
- capitalist: give me shellfish!
- worker: give me rocks!
- capitalist: OK!
- worker: OK!



#### Sale

- worker gives capitalists shellfish
- capitalist gives workers rocks
- worker is hungry
- worker: sell me shellfish!
- capitalist: pay me rocks!
- worker: OK!
- capitalist: OK!



#### Consumption

- worker gives capitalist rocks
- capitalist gives worker shellfish
- worker eats shellfish
- capitalist eats shellfish



### Employment...

- capitalist has eaten and has rocks
- worker has eaten and has nothing
- new shellfish grow
- cycle continues



#### Model

• actors must share same model of world in their brains



#### Model

note that model includes actors themselves sharing model



#### Interaction 1

world state, and actor models & dispositions, must remain mutually consistent



#### Interaction 1

interpreting/generating mechanisms in actors' brains must behave consistently





#### Dynamic model

• model in actors brains must be dynamic, to reflect a dynamic world



#### Interaction 2

- during interaction:
  - world changes, and...
  - model in actors' brains change, and...
  - actors' dispositions change



#### Interaction 2

- all driven by:
  - world's current state
  - actors' current dispositions
  - what utterances are legitimate in those dispositions
- how to account for these in a unitary framework?



#### MC language

- to interact, actors must share same language capacity
  - consistent ability to generate and interpret meaningful utterances
- syntax



#### MC meaning

- meanings of utterances refer to how world is and how it might be
- things
  - shellfish & rocks
  - where
    - on sea shore
    - with worker
    - with capitalist



#### MC meaning

- actors
  - worker & capitalist
  - actions
    - get, give & take things
    - generate/say & hear/interpret utterances
- how to account for what actors do?
- state of world
  - dispositions of things and actors



#### Actor properties

- inputs
  - what actors hear
- outputs
  - what actors say
- actions
  - what actors do
  - could treat actions as outputs
- tabulate how these change in interaction



#### State transitions: worker

state	input	output	action
1a Employment	get me shellfish!	pay me rocks!	
1b	OK!	OK!	collects shellfish
2a Exchange	give me shellfish!	give me rocks!	
2b	OK!	OK!	gives shellfish/gets rocks
3a Sale		sell me shellfish!	
3b	pay me rocks!	ОК!	
3c	OK!		gives rocks/gets shellfish
4 Consumption			consumes shellfish

#### State transitions: capitalist

state	input	output	action
1a Employment		get me shellfish!	
1b	pay me rocks!	ОК!	
1c	ОК!		
2a Exchange		give me shellfish!	
2b	give me rocks!	ОК!	
2c	ОК!		gives rocks/gets shellfish
3a Sale	sell me shellfish!	pay me rocks!	
3b	OK!	OK!	gives shellfish/gets rocks
4 Consumption			consumes shellfish

#### Actor properties

- could account for motivations
- natural
  - both need to eat
- social relations
  - capitalist doesn't want to work
  - worker has to work
  - capitalist needs worker to work
  - how did social relations come about...?
  - how can social relations change...?
- social relations in language use not language



#### State transitions: world

state	shore	worker	capitalist	W speech	C speech
1	4 shellfish	0 rocks 0 shellfish	2 rocks 0 shellfish	pay me rocks!/OK!	get me shellfish!/OK!
2	2 shellfish	0 rocks 2 shellfish	2 rocks 0 shellfish	give me rocks!/OK!	give me shellfish!/OK!
3	2 shellfish	2 rocks 0 shellfish	0 rocks 2 shellfish	sell me shellfish!/OK!	pay me rocks!/OK!
4	2 shellfish	0 rocks 1 shellfish	2 rocks 1 shellfish		

#### State transitions: world

- worker and capitalist require consistent knowledge of
  - who has what
    - verify empirically
  - who needs what
    - learnt
  - rules of interaction
    - learnt
- how are the rules maintained?
  - custom + tradition + law + coercion
- how can rules change...?



#### Interpreting mechanism

- what sort of machine can interpret and change world?
  - only humans?
- 19<sup>th</sup> century self-acting machines follow pre-determined sequences
- sophisticated automata e.g. writing/musical in Neuchatel
  - modifiable but pre set sequences



Jaquet-Droz automata, 1764-70 https://upload.wikimedia.org/wikipedia/commons/thumb/8/83/Automates-Jaquet-Droz-p1030472.jpg/330px-Automates-Jaquet-Droz-p1039472.jpg

#### Interpreting mechanism

- fake automata with human controllers
  - e.g. Maskyklene's mechanical whist player
- Marx & Engels understandably sceptical of potential of self-acting mechanisms
  - ultimately, machines controlled by humans
  - architect or bee ...?



Psycho whist player, Maskelyne, 1875 http://cyberneticzoo.com/not-quite-robots/1875-psycho-the-whist-playingautomaton-maskelyne-clarke-british/

#### Machine classes

- 19<sup>th</sup> century automata lacked modifiable memory
  - couldn't inspect own state
- mid-20<sup>th</sup> century computability theory
- classify interpreting machines by
  - type of memory
  - complexity of language they can manipulate
    - after Chomsky
    - influenced by A. A. Markov
- hierarchy
  - memory capability
  - language complexity



Figure 11 The egress

Lu Kuan Yuk, Taoist Yoga : Alchemy And Immortality, Samuel Wiser Inc, 1973 https://pt.slideshare.net/SecretTed/lu-kuan-yu-taoist-yogaalchemy-and-immortality/10

#### Machine classes

- finite state machines (FSM) type 3
  - no memory
  - input causes output and transition to new state
  - simple machines e.g. traffic lights = FSM + timer
- push down automata type 2
  - FSM + potentially unbounded stack of values
  - push values onto stack top
  - inspect stack top
  - pop values off stack top
  - used for mechanical parsing e.g. programming languages



Road sign, Harare, Zimbabwe [GJM]

#### Machine classes

- linear bounded type 1
  - FSM + bounded memory
  - inspect & change memory
  - corresponds to actual computer or brain
- Turing machine type 0
  - FSM + potentially unbounded memory
  - inspect & change memory
  - corresponds to idealised computer or brain



https://www.historyextra.com/period/victorian/victorian-phrenology-explain-what-queen-victoria/

## Church-Turing hypothesis

- model of computation
  - formalism + semantics/interpretation
- CT hypothesis
  - all models of computation are equivalent to Turing machines
  - includes computers, programming languages, brains...
- Turing complete (TC) model/language
- use TC languages to express semantics
  - define a translation to a TC language, or...
  - construct an interpreter in a TC language



Pilot ACE, National Physical Laboratory, UK, 1950 http://boxchronicles.com/pilot-ace/

## Church-Turing hypothesis

- TC semantics standard for programming languages
- still problematic for human languages
  - need explicit model of world...!
- TC languages can model themselves
  - don't need to step outside system to account for self-awareness
- actualised models necessarily partial
  - actual memory necessarily bounded



Punch 1957 Volume 232 p251

#### Conclusions

- dialectics doesn't explain world
- a way of analysing world
  - problem decomposition
  - not all problems decompose to binary opposites
  - laws of dialectics as Computational Thinking
- classical logic alone can't account for interaction
- towards
  - a materialism based on world as interacting state machines
  - a politics of interpreting the world in changing it



https://64.media.tumblr.com/8e06f46a 019cad69bea0466dafb02e20/tumblr\_n 5fdbeF1rm1rrq6yfo1\_500.png

#### Conclusions



Punch 1959 Volume 239 p176

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