

Primer  
≡

① What is Universal Automatism?

② What is a Computation?

③ What is the dialectic triad in the

④ What does it mean to say a computation

⑤ " Q emulates P?

⑥ Wolfram's 4 classes

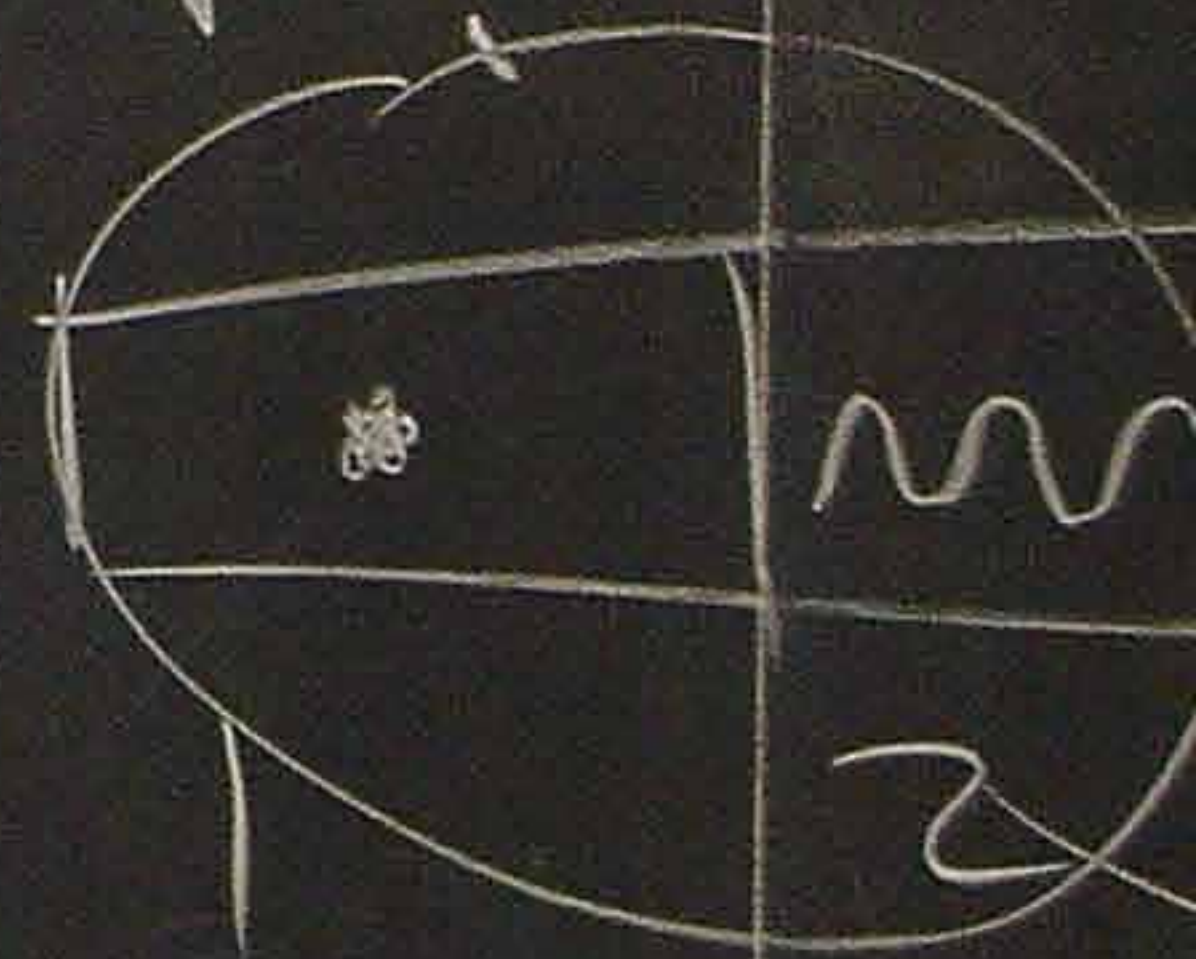
⑫ Von

⑬ Li

⑭ Bel

Bus

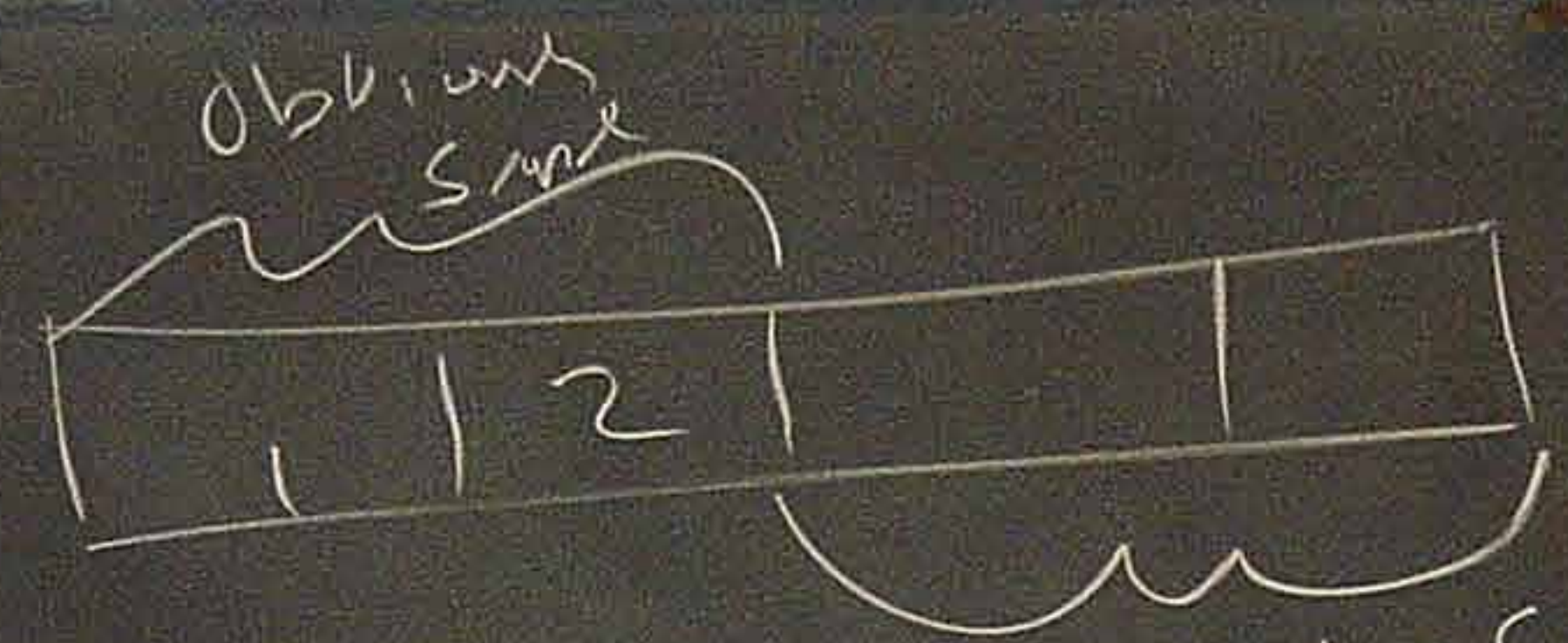
P





7

PCE



8

PCU

Most natural, easy, complex

can simulate each other  
All are universal.

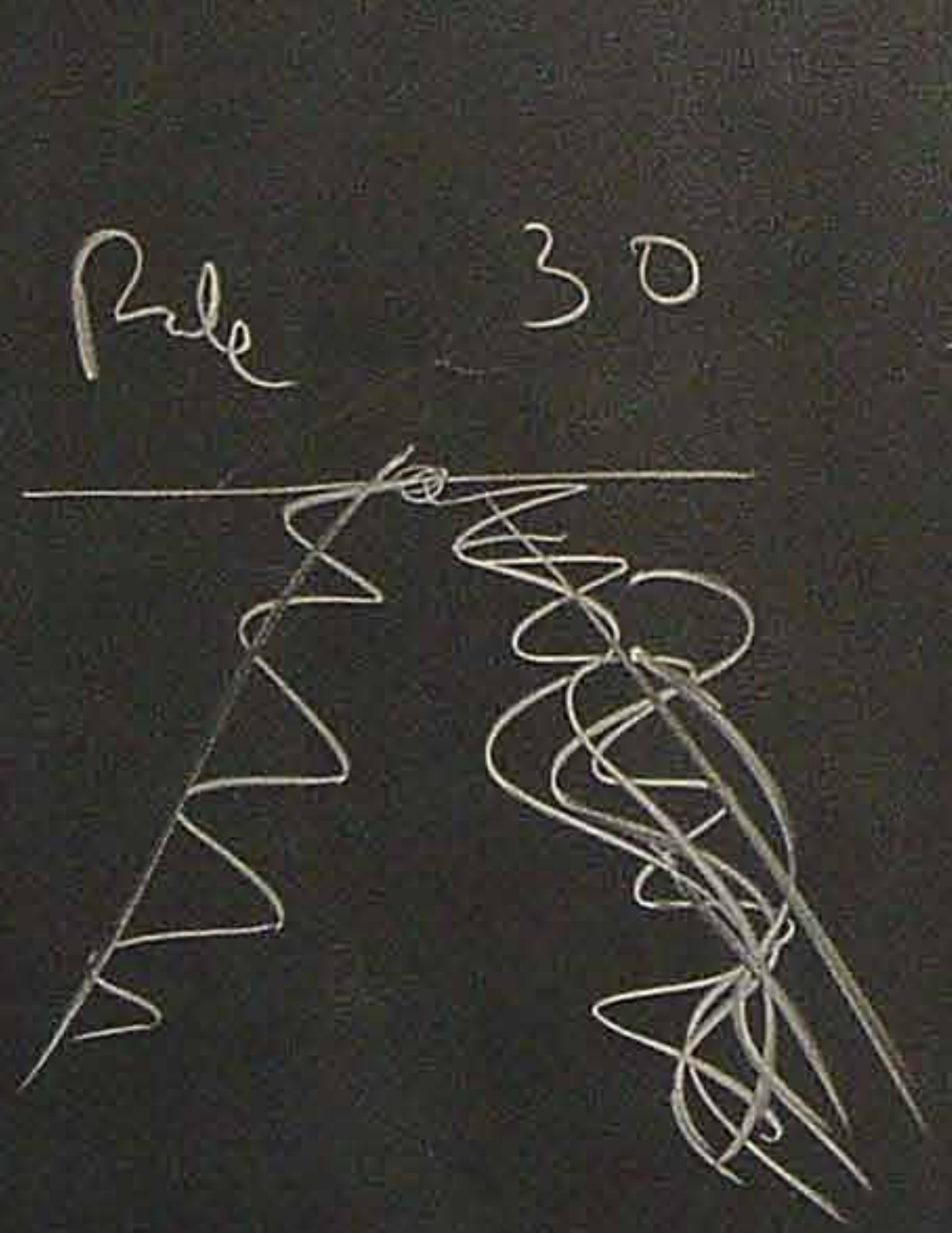
computation are  
unpredictable

Problems

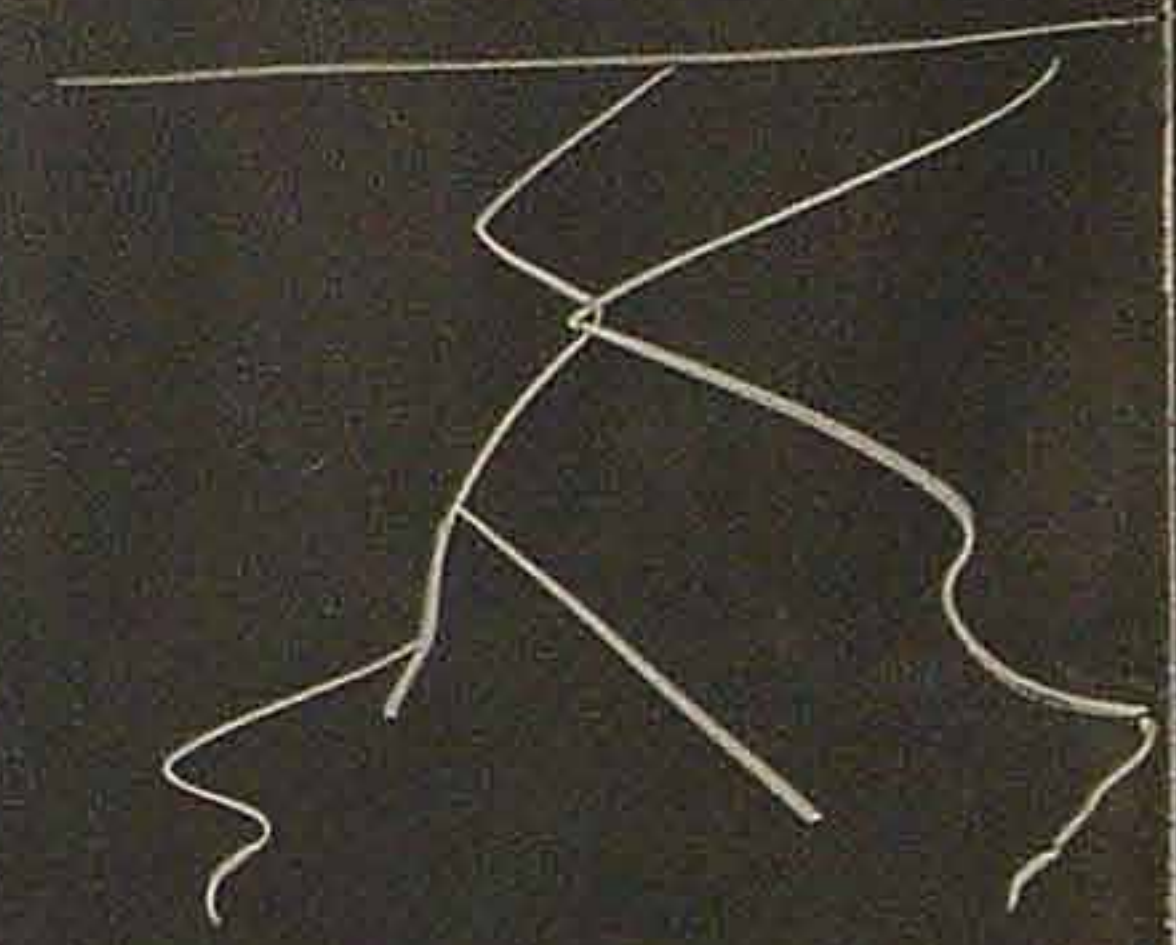
9

P is Universal?

10



rule 110

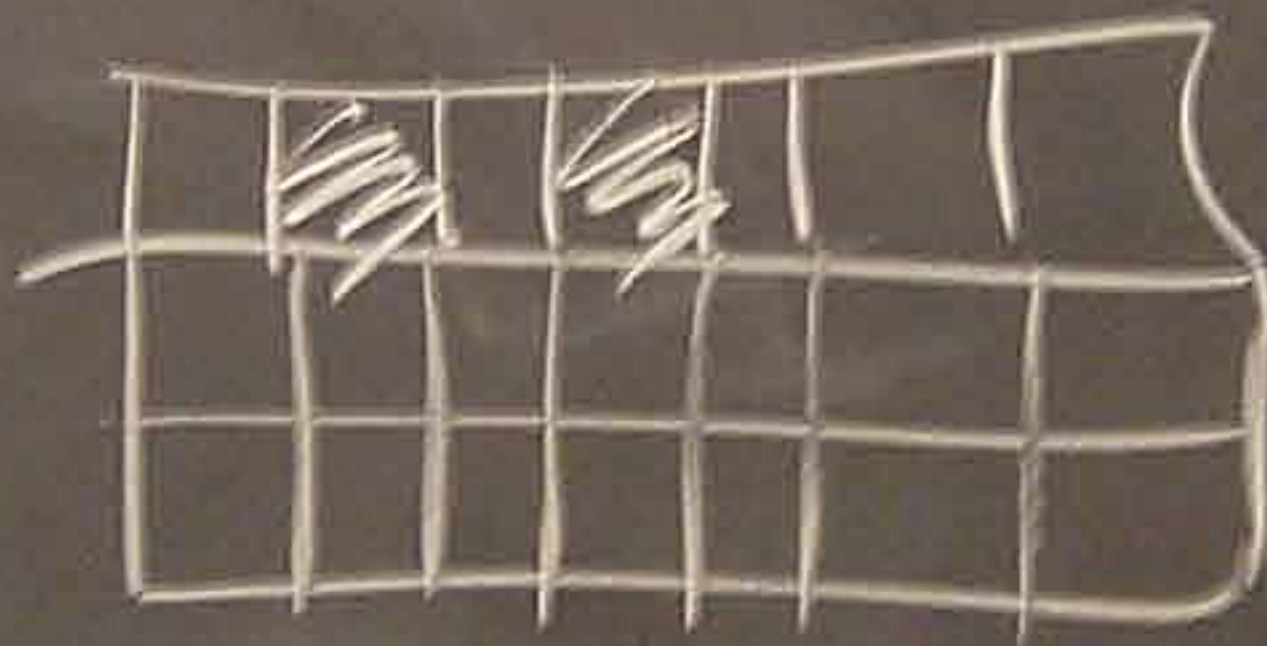




⑫ Von Neumann + "Stored program".

⑬ Life, Vote, Brain,  
Rule 30, Rule 110

⑭ Belusov-Zhabotinski  
Rules.



Book's Title?

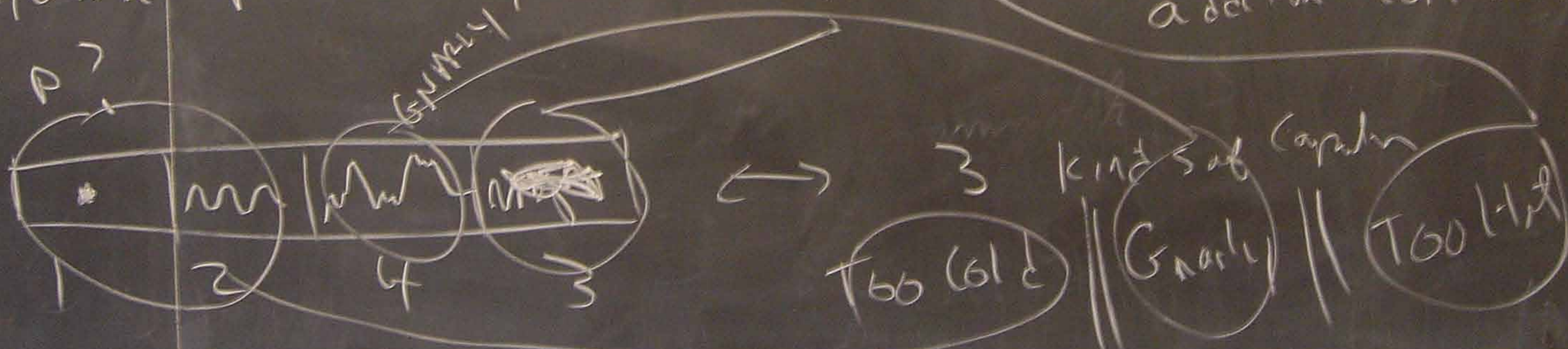
P is unpredictable?

⑪ Doing arithmetic by  
counting your fingers  
by ones

CAN WE PREDICT?

BY

addition (continued)





(15) Analog vs. Discrete

(16) Continuous Values CAs  
CA Architecture (P-89)

(17) Wose Rule

$$N_{t+1} C = C + \lambda (\text{Neighborhood Average} - \text{Old } C)$$

Hot Rule

$$N_{t+1} C = (1-\alpha) C + \alpha \text{Neighborhood Knowledge}$$

(18) This can be

(19) A C

- Old C



(18) How can we say Birkhoff is deterministic? Extra inputs  
Inputs never the same -

(19) A computer is "chaotic" if sensitive to variations in input

(20) Intrinsic Randomness? [Unpredictable] Exactly fixed single input

(21) How to make sense of non-determinism of QM?

- a) Many Universes
- b) Future affects Past.
- c) Smaller stuff

behind theory

- Old ( )

had theory



|| (21) Evolution as Search in a Fitness Landscape.

(22)

Life = Self Rep + Morphogenesis + Homeostasis  
Life → Ecology + Evolution

(23)

DNA is a "twelve parameter"

(24)

Reaction = Diffusion Rule?

(Activation-Inhibition)

(25)

Turing Patterns: Data, Strips  
Chalk Pop. Size Logistic Map

(26)

genome, variation, Selection

(27)