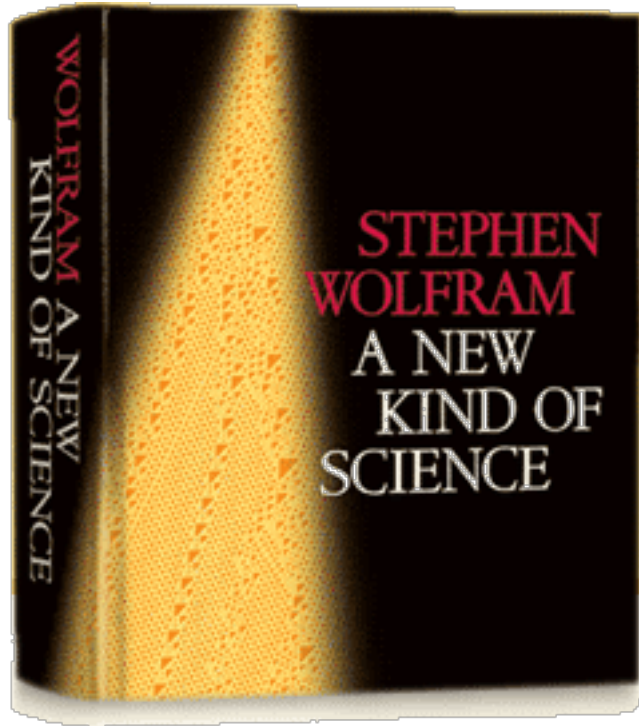




1D Cellular Automata



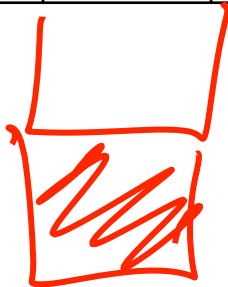


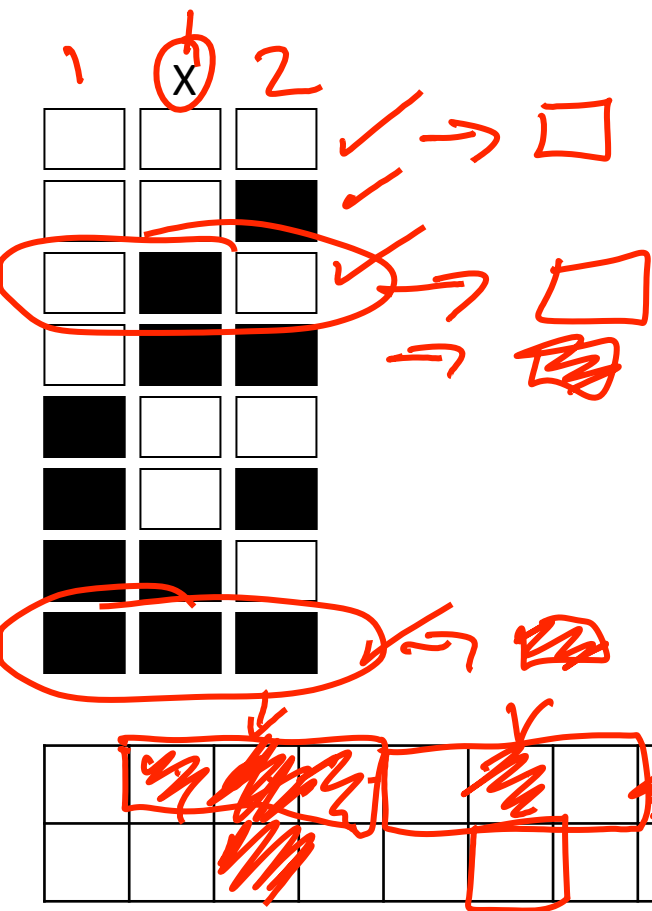
1D Cellular Automata

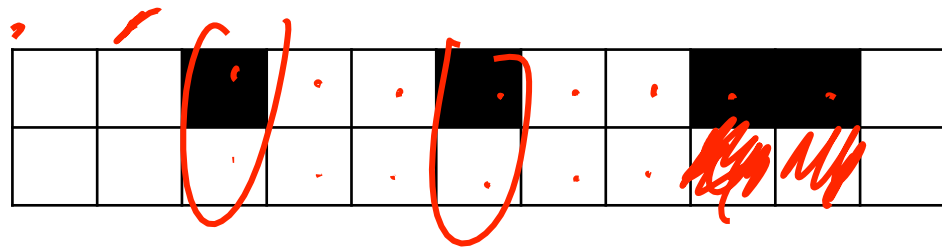
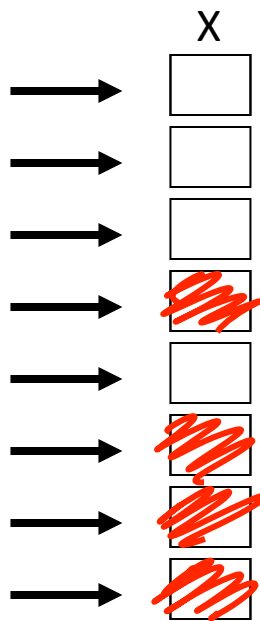
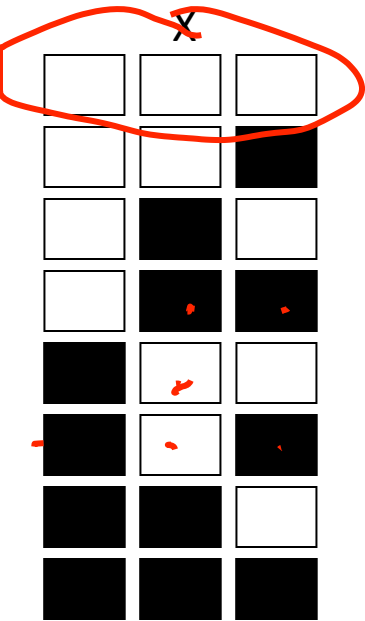


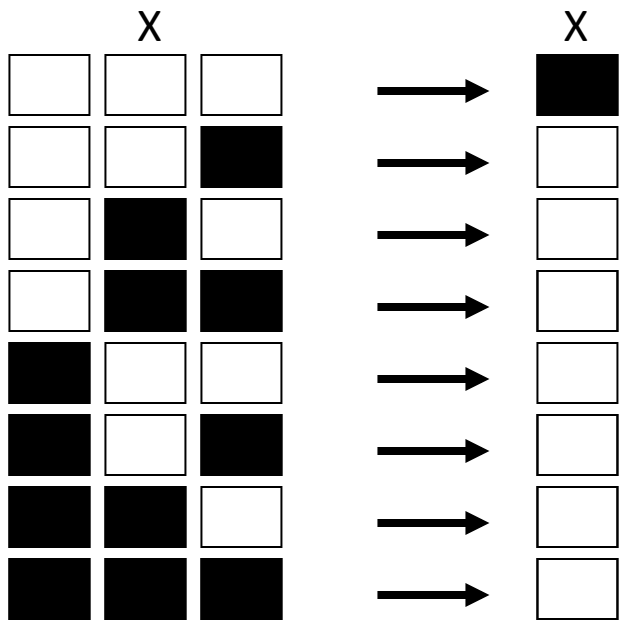
				
--	--	--	--	--

	1	1	2	
--	---	--------------	---	--



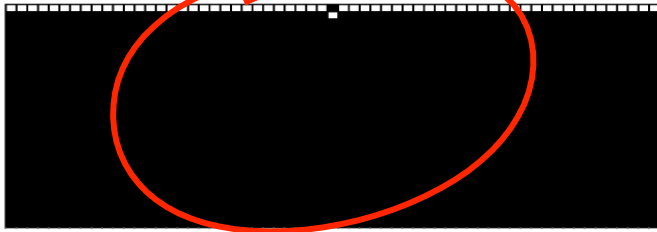




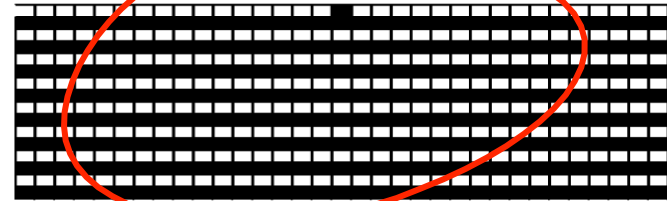


Four Classes of Behavior

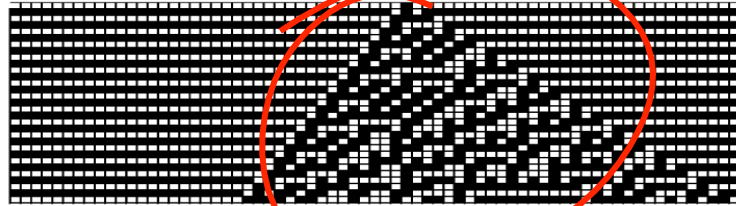
Class I: Rule 231



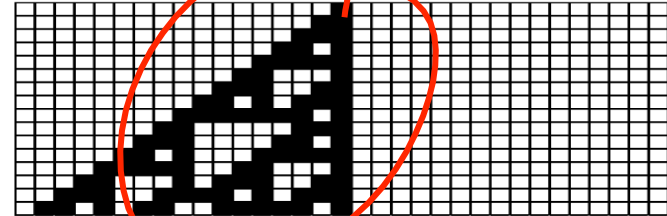
Class II: Rule 119



Class III: Rule 45



Class IV: Rule 110



Source: From Wolfram (2002, pp. 55-56)

	X	
☐	☐	☐
☐	☐	☒
☐	☒	☐
☐	☒	☒
☒	☐	☐
☒	☐	☒
☒	☒	☐
☒	☒	☒



X

☐
☐
☐
☐
☐
☐
☐
☐

2 ☒

2 ☒

2

2

2

2

2

2

$$\begin{array}{r}
 2^8 \\
 \hline
 256
 \end{array}$$

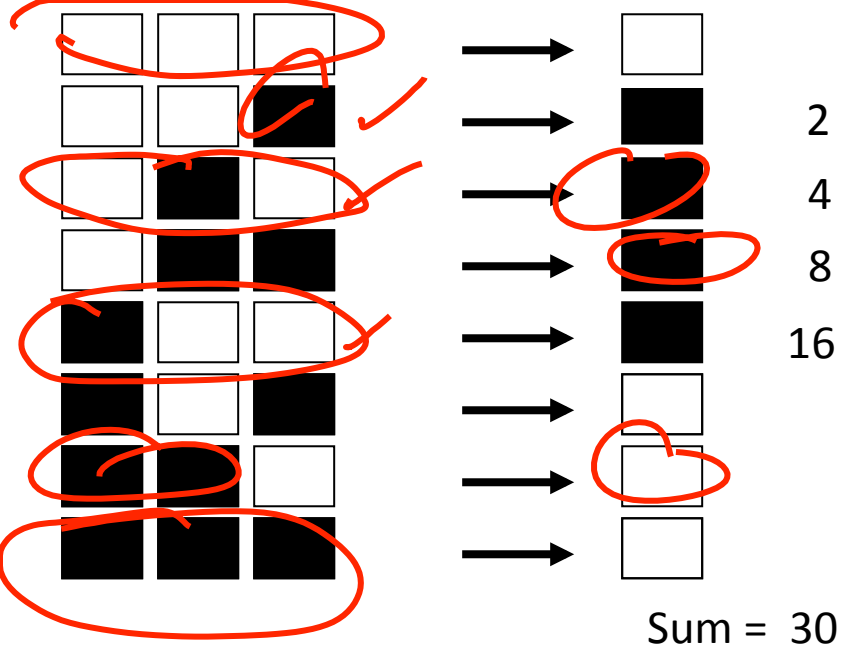
X		

X		
→		1
→		2
→		4
→		8
→		16
→		32
→		64
→		128
		255
		138

7

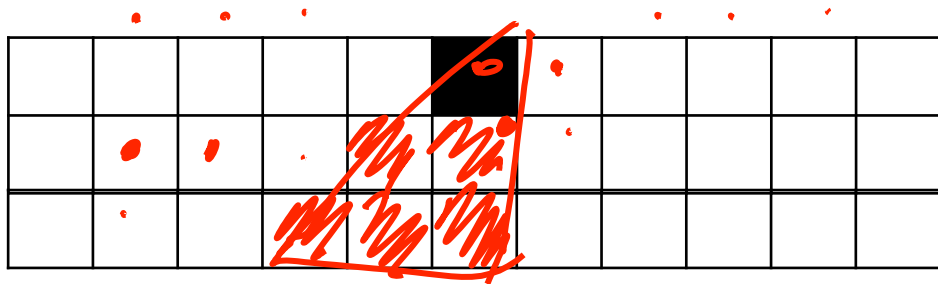
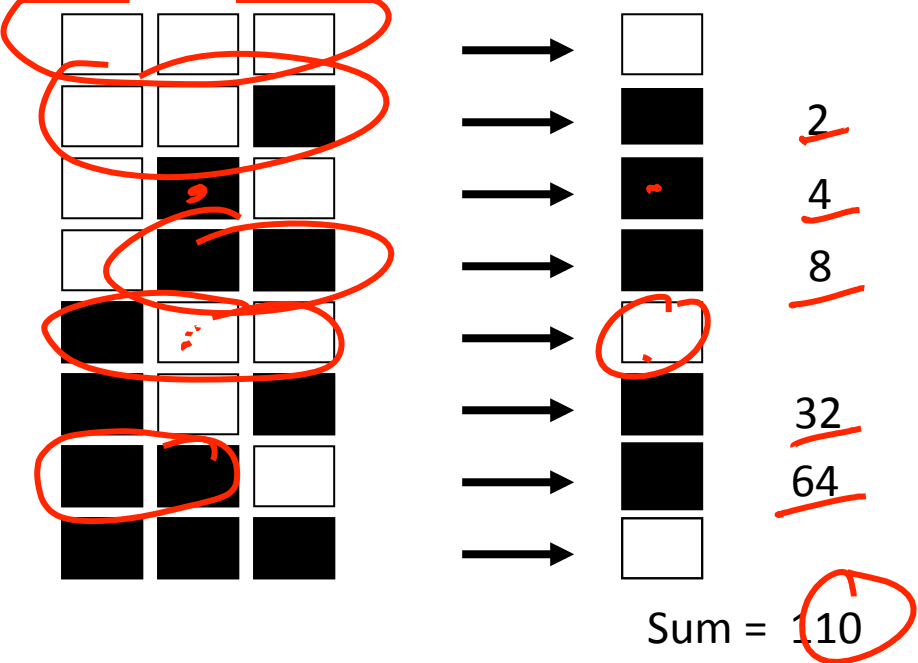
	X	

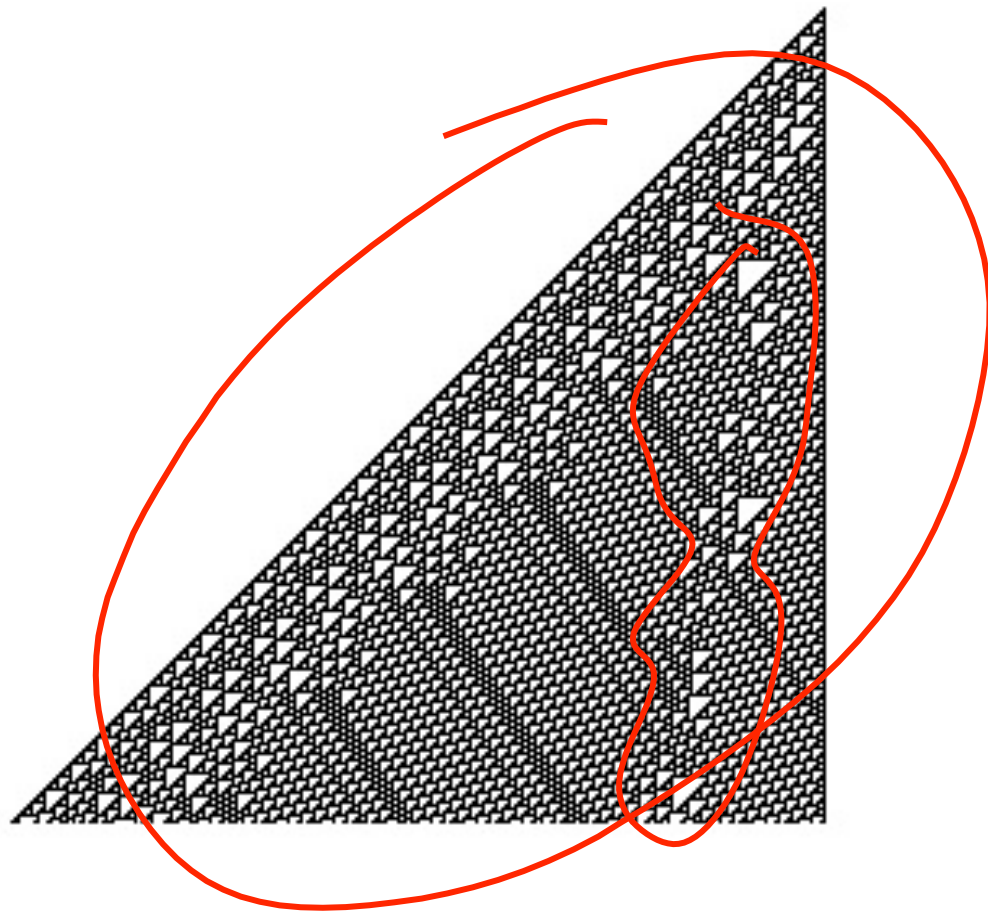
	X	
→		1
→		
→		
→		8
→		
→		
→		64
→		
		<u>73</u>

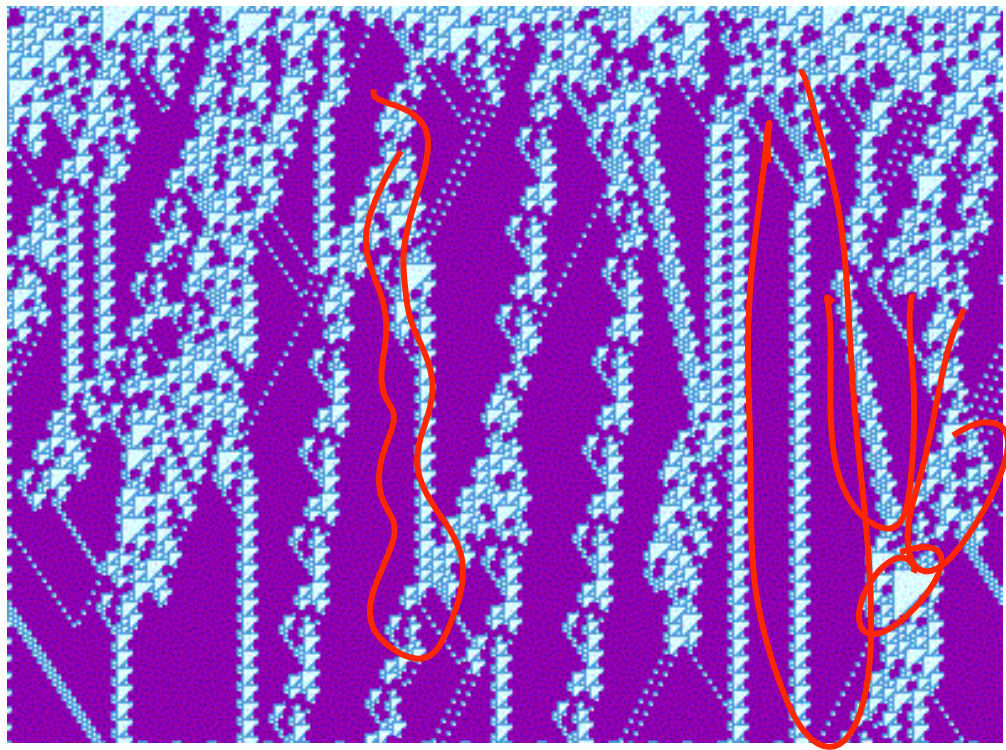


Netlogo



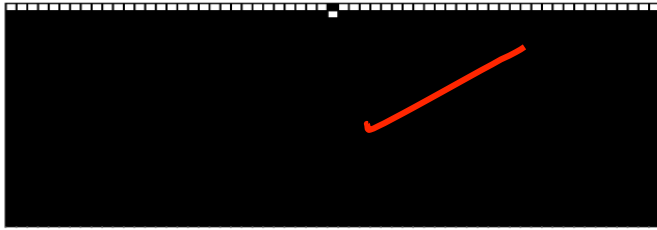






Four Classes of Behavior

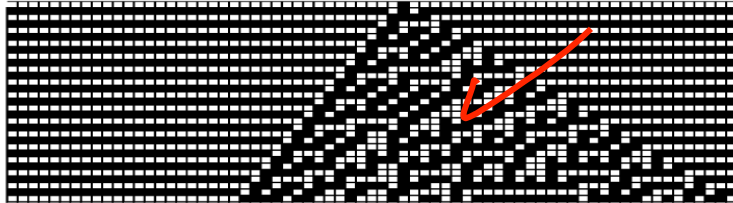
Class I: Rule 251



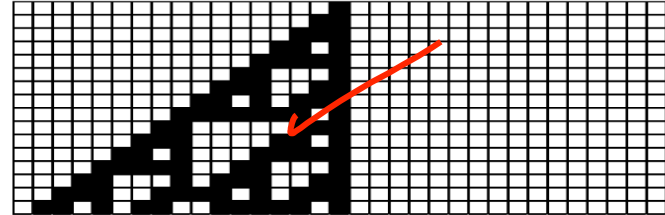
Class II: Rule 119



Class III: Rule 45

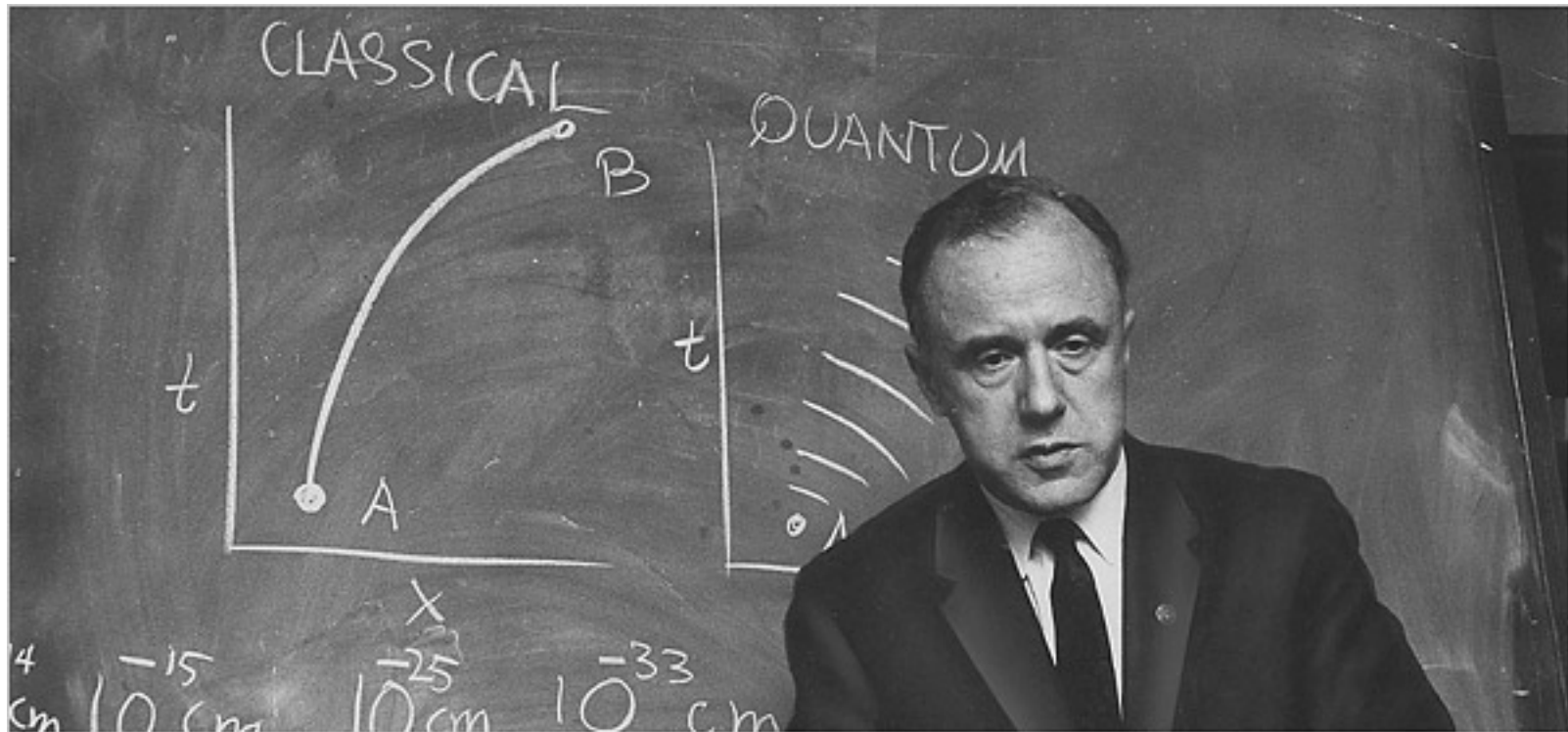


Class IV: Rule 110



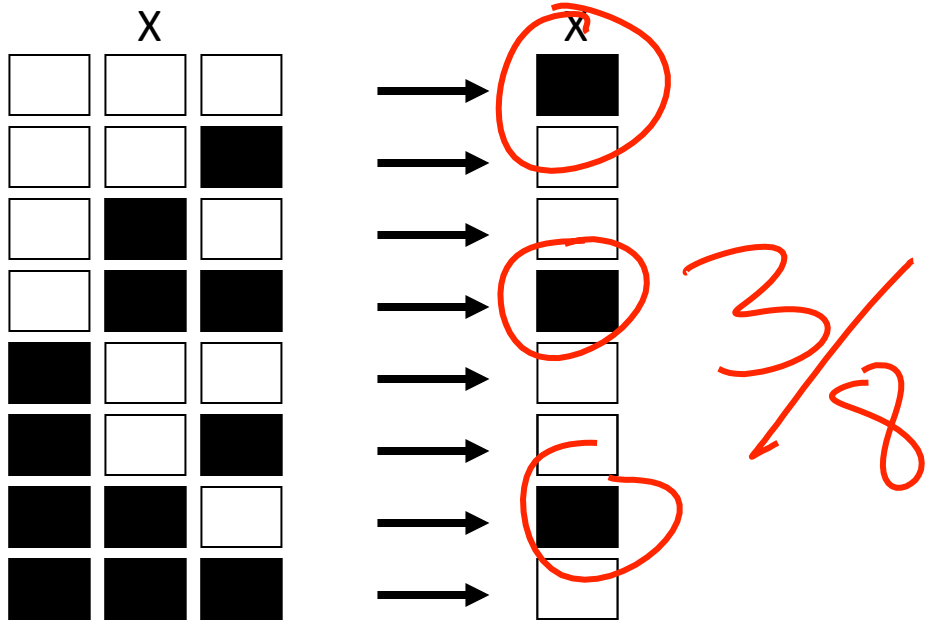
Source: From Wolfram (2002, pp. 55-56)

“It From Bit”



Langton's λ





Langton's λ



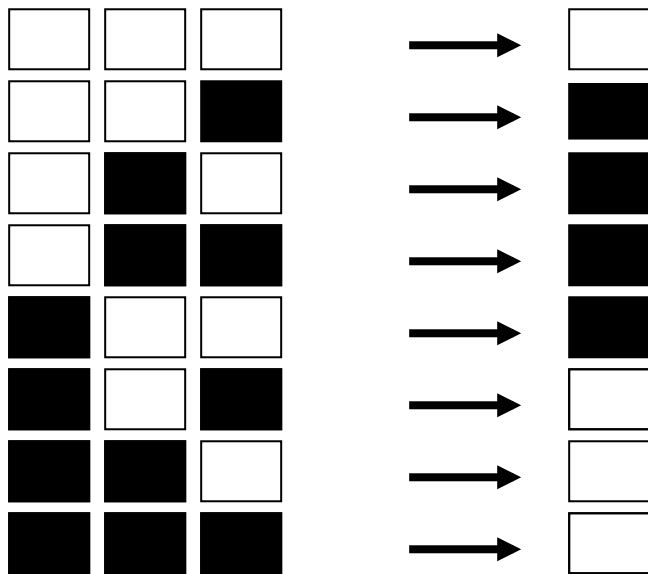
	X	



X

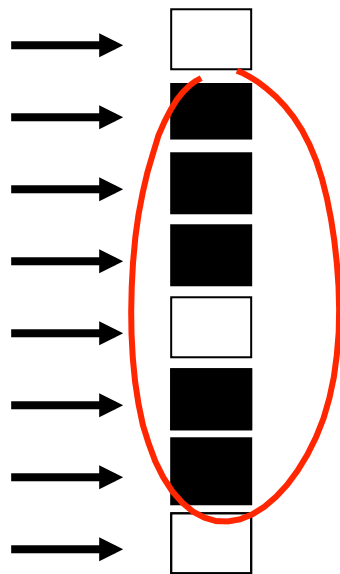
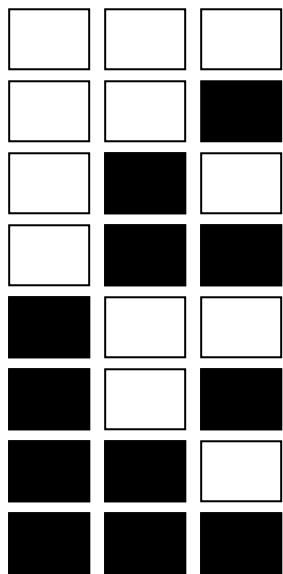
0/8





~~4/8~~

Rule
3D
chaotic



110

S/g

complex

chars

complet

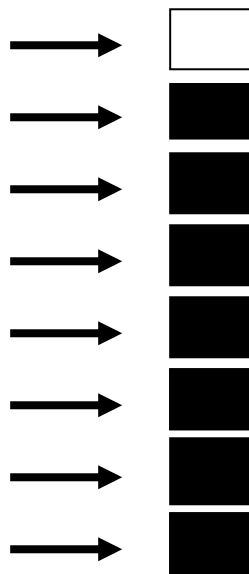
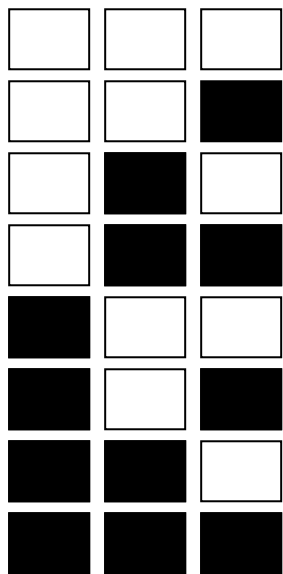
λ	ALL Rules	Class III	Class IV
0	1	0	0
1	8	0	0
2	28	2	0
3	56	4	1
4	70	20	4
5	56	4	1
6	38	2	0
7	8	0	0
8	1	0	0

256

32

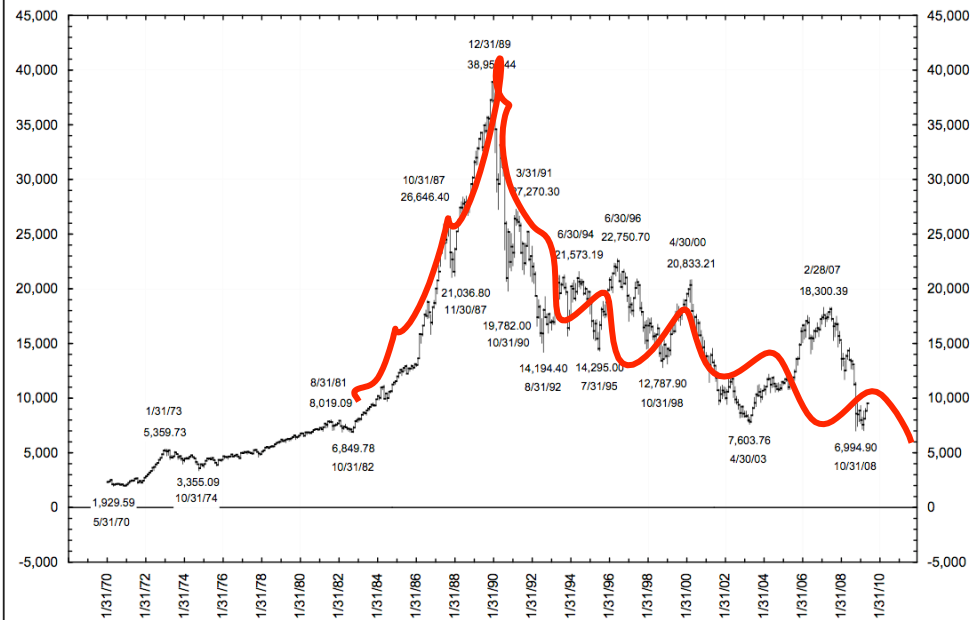
G

M



7/8

Nikkei 225
(Monthly)



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- Simple rules combine to form anything
- “it from bit”
- Complexity and randomness require interdependency



Model Thinking

Scott E Page

