Behold the Mould!

What it models

This cellular automaton models the growth of *Penicillium* fungi (commonly known as bread mould) on a slice of raisin bread. Factors such as humidity, temperature, and light can be set to gradually increase to produce the most ideal condition for bread mould growth. Depending on the bread's surrounding environment, mould will grow at varying rates. The mould will overtake healthy sections of bread and do its best to consume its host.

What users can tweak

Users are able to choose the size of the bread, width of its crust (crust being a darker tan colour than the healthy bread cells), and the colour of the mould from a preset list (or utilize the rainbow function). Users can change the number of raisins on a slice of bread and their configuration. Finally, since mould thrives in warm, moist and dark spaces, users are also able to adjust the starting values of the temperature, humidity, and light in the surrounding area to slow or quicken the rate of mould growth. Users can choose to have these factors increase as the simulation runs.

States of a cell

Since mould colour can be changed by the user, I will assume the user has chosen red. Regardless of what colour is chosen at the beginning, all healthy cells are tan coloured and all raisin cells are purple. A cell that has mould growth on it will appear red.

Evolution rules

At the beginning of the simulation, there is a user-chosen number of mould and raisin cells as well as healthy cells. Due to the fact that this model allows changes in temperature and humidity, cells die and reproduce at an accelerated rate. They do not affect the evolution rules.

 The evolution rules are as follows:

- If a healthy cell has 2 or more mouldy neighbours, it will become mouldy

- If a mouldy cell has 2 or more raisin neighbours, it will become a healthy cell due to developed immunity to mould
- If a raisin has more than 2 raisin neighbours, it will become a mouldy cell
- If a cell is not affected by these rules, it stays the same as it was in the previous generation

Sample evolution

Generation 1

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Generation 2

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Cells 1-5: Unaffected
Cell 6: Becomes mouldy since it has three mouldy neighbours
Cell 7: Becomes mouldy since it has four mouldy neighbours
Cell 8: Becomes mouldy since it has three mouldy neighbours
Cells 9-12: Unaffected
Cell 13: Becomes healthy since it has two raisin neighbours
Cells 14-16: Unaffected
Cells 17-18: Become mouldy since they have two mouldy neighbours
Cell 19-20: Becomes mouldy since it has three raisin neighbours
Cell 21:-25: Unaffected