MINECRAFT FOR MICROFLUIDICS

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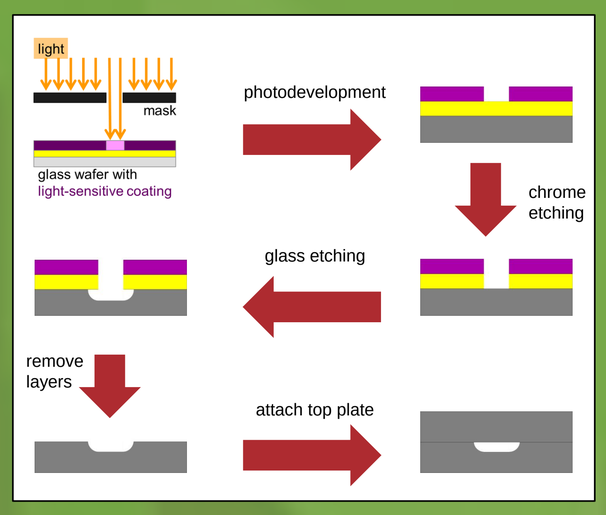
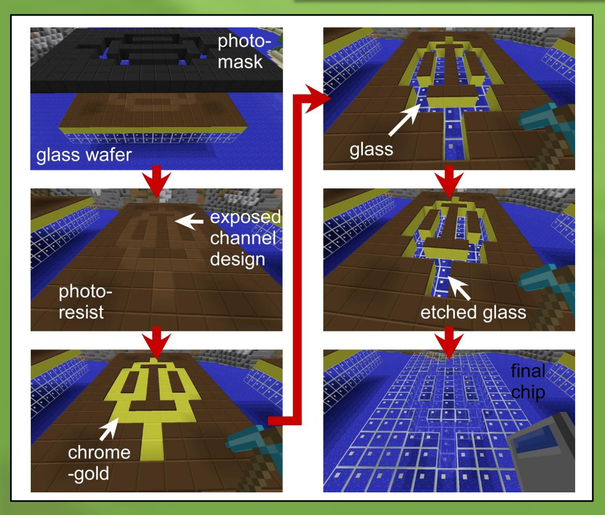
The ability to educate and inspire enthusiasm in STEM subjects is important for bringing potential future researchers to the area. An excellent way of introducing new concepts is to employ visual, hands-on activities that can entertain an audience whilst instructing them on the fundamentals [1,2]. We are exploring the use of the videogame,* Minecraft*, as an educational tool for teaching and inspiring younger generations to undertake careers in science and lab-on-a-chip. A handful of examples are shown.

FABRICATION

Photolithography & wet etching

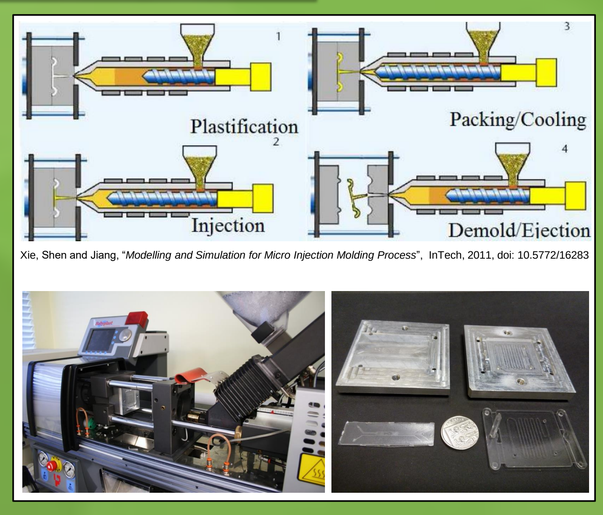


→ multistep process for fabrication of glass microfluidic devices



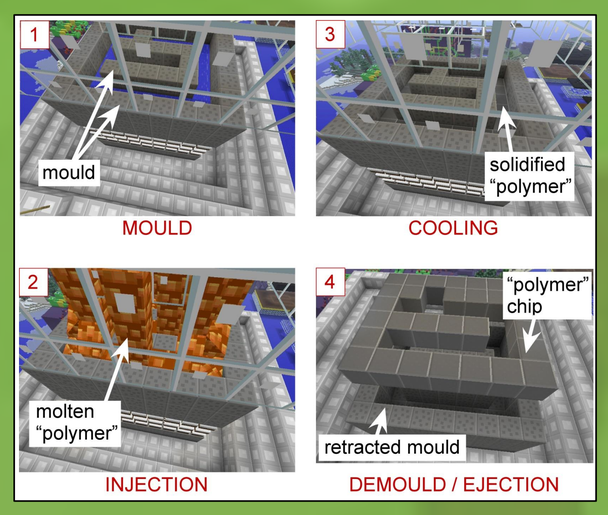
→ in **Minecraft**, sunlight acts as the UV source for photolithography

Injection moulding



Xie, Shen and Jiang, "*Modelling and Simulation for Micro Injection Molding Process*", InTech, 2011, doi: 10.5772/16283

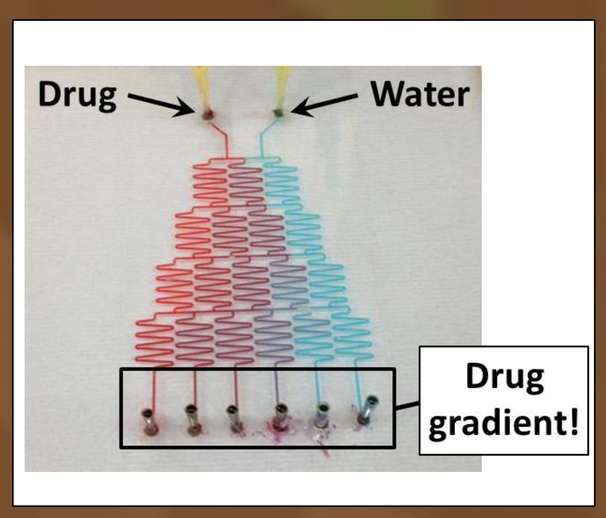
→ molten polymer is injected into a mould to make plastic devices



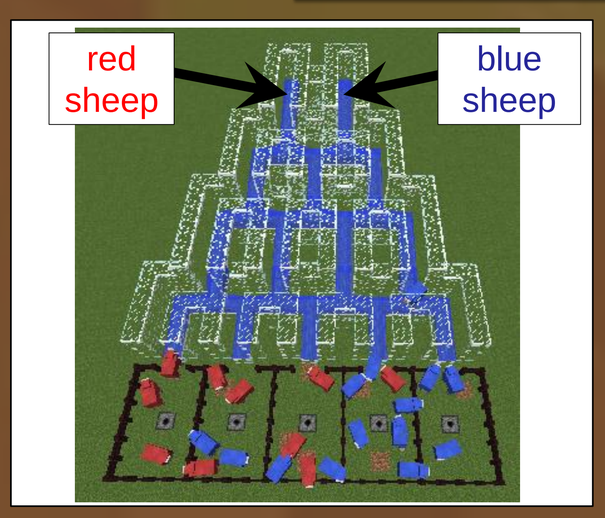
→ in **Minecraft**, lava acts as molten "polymer" to make stone devices

OPERATIONS

Gradient generation

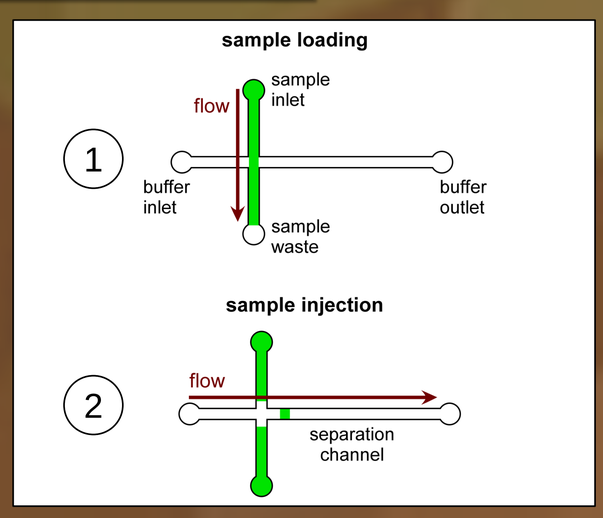


→ branching channels can be used to generate gradient for drug studies

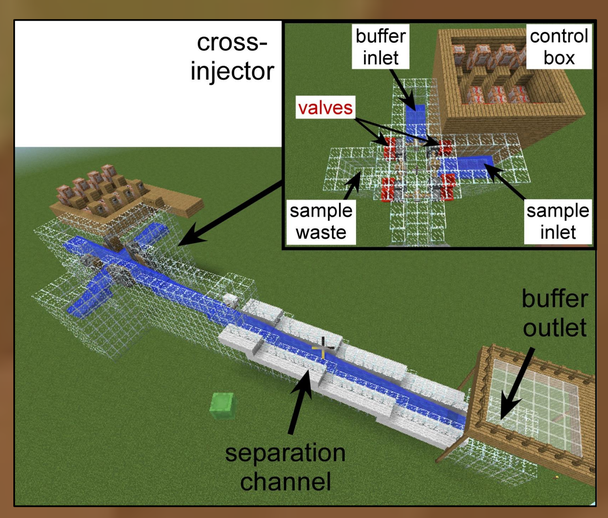


→ in **Minecraft**, a gradient of **red** and **blue** sheep can be formed in flow

Cross-injections



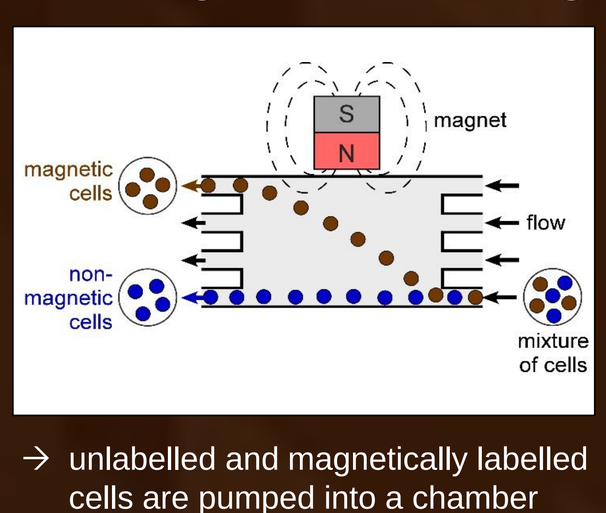
→ standard method in microfluidic chromatography/electrophoresis



→ in **Minecraft**, valves can be used to perform cross-injections

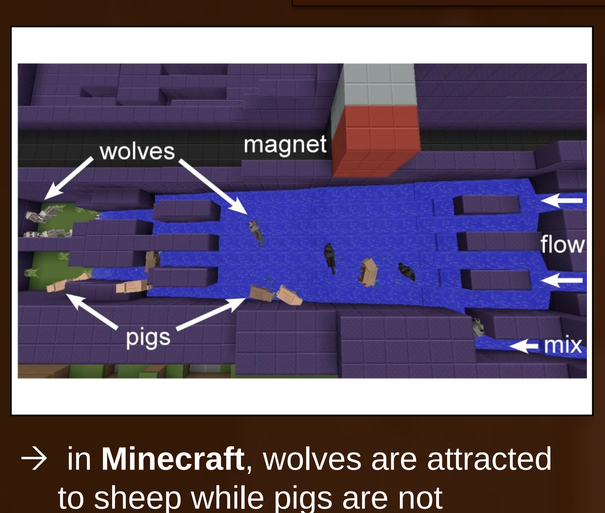
APPLICATIONS

Magnetic cell sorting



→ unlabelled and magnetically labelled cells are pumped into a chamber

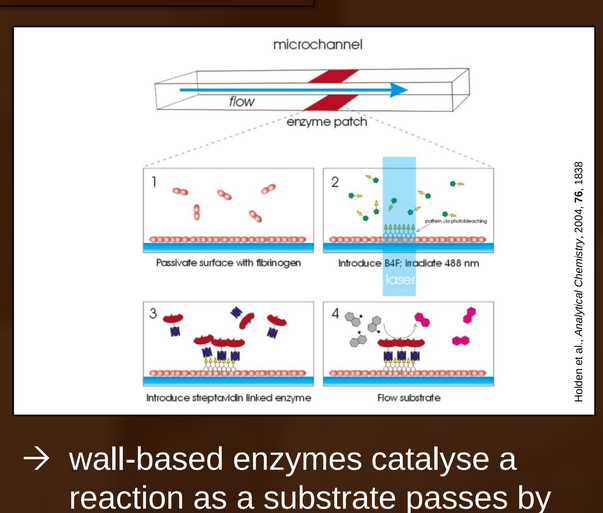
→ magnetic field used to separate the two cell types in continuous flow



→ in **Minecraft**, wolves are attracted to sheep while pigs are not

→ wolves and pigs can be separated via a sheep hidden in a "magnet"

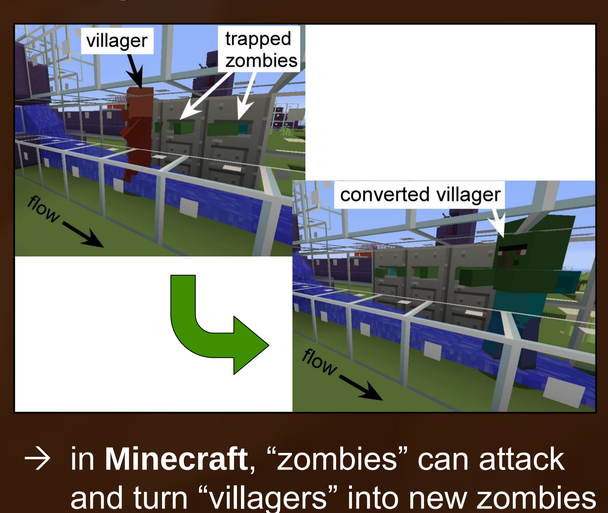
Wall-based enzymatic reactions



Holden et al., *Analytical Chemistry*, 2004, **76**, 1838

→ wall-based enzymes catalyse a reaction as a substrate passes by

→ employed for chemical reactions and chemiluminescence detection



→ in **Minecraft**, "zombies" can attack and turn "villagers" into new zombies

→ zombies can be trapped in walls convert to villagers as they pass by

SUMMARY

→ we have developed a number of microfluidic models in **Minecraft**

→ **initial trials** have proven popular and **have provided feedback** for **further improvements** that will be incorporated into an upcoming **public release**

→ **TRY IT OUT FOR YOURSELF IN THE LEVEL 3 FOYER OF THE CCD!!!!**

References

[1] M. M. N. Esfahani et al., *Biomicrofluidics*, 011301 (2016).

[2] M. Jimenez, H. L. Bridle, *Lab Chip*, **15**, 947-957 (2015).

Acknowledgements

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