

**“How do plants defend themselves against infection? Get children aged 3+ interested in plant science research with the **StomaToy Activities**.”**

We are surrounded by plants. Plants are really important to us and our planet because they produce many essentials of life including oxygen to breathe and food to eat. Plant scientists study plant life. This knowledge is used for developing technologies for increasing crop productivity to help achieve global food security.



Surprisingly! many parallels can be drawn between plants and humans. Plants have tiny ‘mouths’ called STOMATA on their leaf surface which allow exchange of gases and water with the environment. Like humans, plants have a complex immune system for defence against microbial pathogen or ‘germs’ invisible to our eye. If we put hands covered in germs into our mouth, we become sick; similarly, pathogen entering the Stomata causes infection in plants and can make them sick! To prevent germ infection, plants close their ‘stomata’ as a first strategy of defence. Thus, Stomata are the guardians of plants!

**Hi Kids! Isn’t it cool that plants are alike us in so many ways?** So! what can we learn from plants? Well, they teach us ways to protect ourselves from germs!



You can play with the StomaToys and learn how the stomata help defend plants from pathogen!

**Start by watching the StomaToy video (3+)** which features the electronic interactive StomaToy that demonstrates defence signalling in plants using lights.

Stomata close for immunity and to prevent loss of water. In response to light, plants open their Stomata for exchange of gases. This gas exchange drives photosynthesis and helps plants to grow. Plants constantly face the conundrum of choosing growth vs immunity. Stomatal biologists study how plants control stomatal movements in response to environmental changes using cell biology, mathematical modelling and plant physiology analysis.



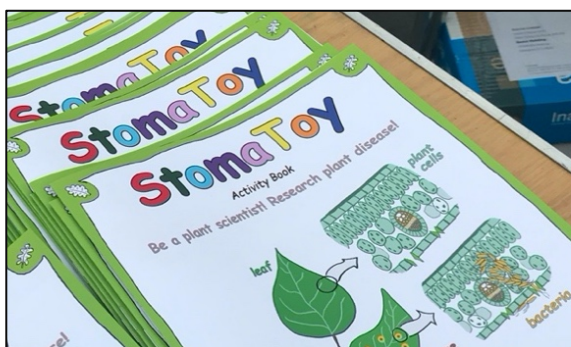
**Paper StomaToy-Leaf Cube** What will you see if you cut a section of a leaf and look at it under a microscope? You can make your own paper 3D leaf cube section with microscopic detail. Simply use your imagination to colour-in and follow instructions to cut along the purple lines. Then, glue together the sections with matching numbers and your StomaToy Leaf cube is ready! Find the stomata on the surface, with layers of cells placed underneath and the 'veins' that transport water close to the stomata for transpiration.



*Hi Grown-ups! This activity will require supervision for children and is suited for 4+ year olds. Please print on a thick paper (A4). Required: printer, thick A4 paper, scissors, glue, colours.*



**StomaToy- Activity Book** is full of learning and fun activities. You get to become a plant scientist and do real data analysis!



In our lab, we study how ion and water transport in cells helps regulate the opening and closing of stomata in response to pathogen infection. We use model plants called Arabidopsis in our research. We infect Arabidopsis plants with bacterial pathogen and study the infected plants. Infected leaves become 'necrotic' (yellow / brown in colour). The StomaToy activity book has some real data from our laboratory experiments.

You can become plant scientists and analyse these data and record your results! Also included is a 'Complete a Drawing' page in the

activity book where you can show-off what you have learnt from the StomaToys as budding wee plant scientists.

*Hi Grown-ups! **This activity is ideal for 6+ year olds.** The activity book can be printed on a regular A4 paper. The pages 4-5 for 'Be a scientist', will need to be taped together at the edges for the complete activity sheet. Required: Printer, A4 paper, pens, colours, transparent tape.*



We hope you have a lot of StomaToy fun and learning and that you become as fascinated with plant science as we are!

**Do tag us on Twitter [@Stomatal\\_2019](https://twitter.com/Stomatal_2019) with photos of your completed StomaToy activities!**

It will be great if you would like to give us feedback on the StomaToys and / or make any suggestions for improvements. Please email us at [rucha.karnik@glasgow.ac.uk](mailto:rucha.karnik@glasgow.ac.uk).

*The StomaToy project is led by the Karnik lab within the Plant Science Group, Institute of Molecular Cell and Systems Biology at the University of Glasgow. The project involves cross-disciplinary collaborators including the Human Computer Interaction lab at the University of Lancaster. Paper StomaToys use drawings by Cell Engineer Dr Mathis Riehle, at the University of Glasgow. The project is funded by the Royal Society, University of Glasgow and the BBSRC. Click [here](#) to meet the StomaToy team.*