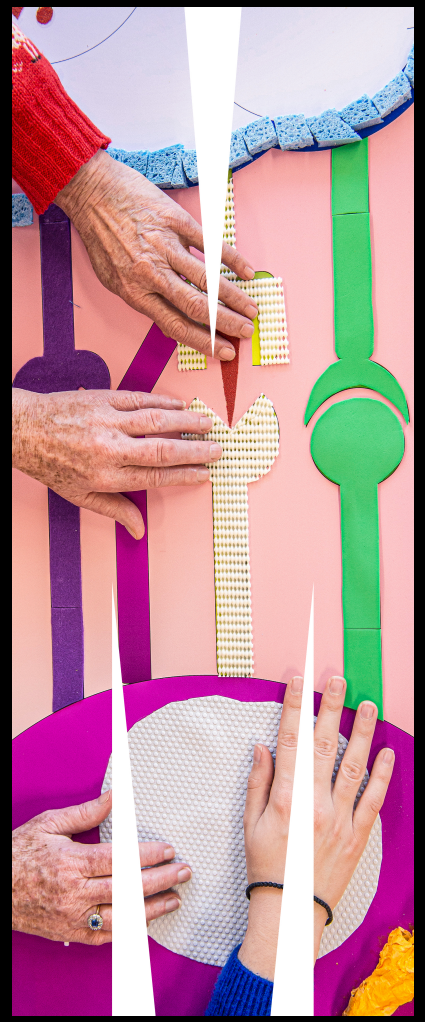


Interactive multisensory science books for blind and low vision readers

Dr Stu Favilla, School of Design and Architecture, Swinburne University

Dr Erica Tandori, Biomedicine Discovery Institute, Monash University

We do science communication for people with BLV, diverse needs

Stu interaction design, me legally blind artist at Rossjohn lab at BDI Monash

background/ gap

plenty of scientific data around us!

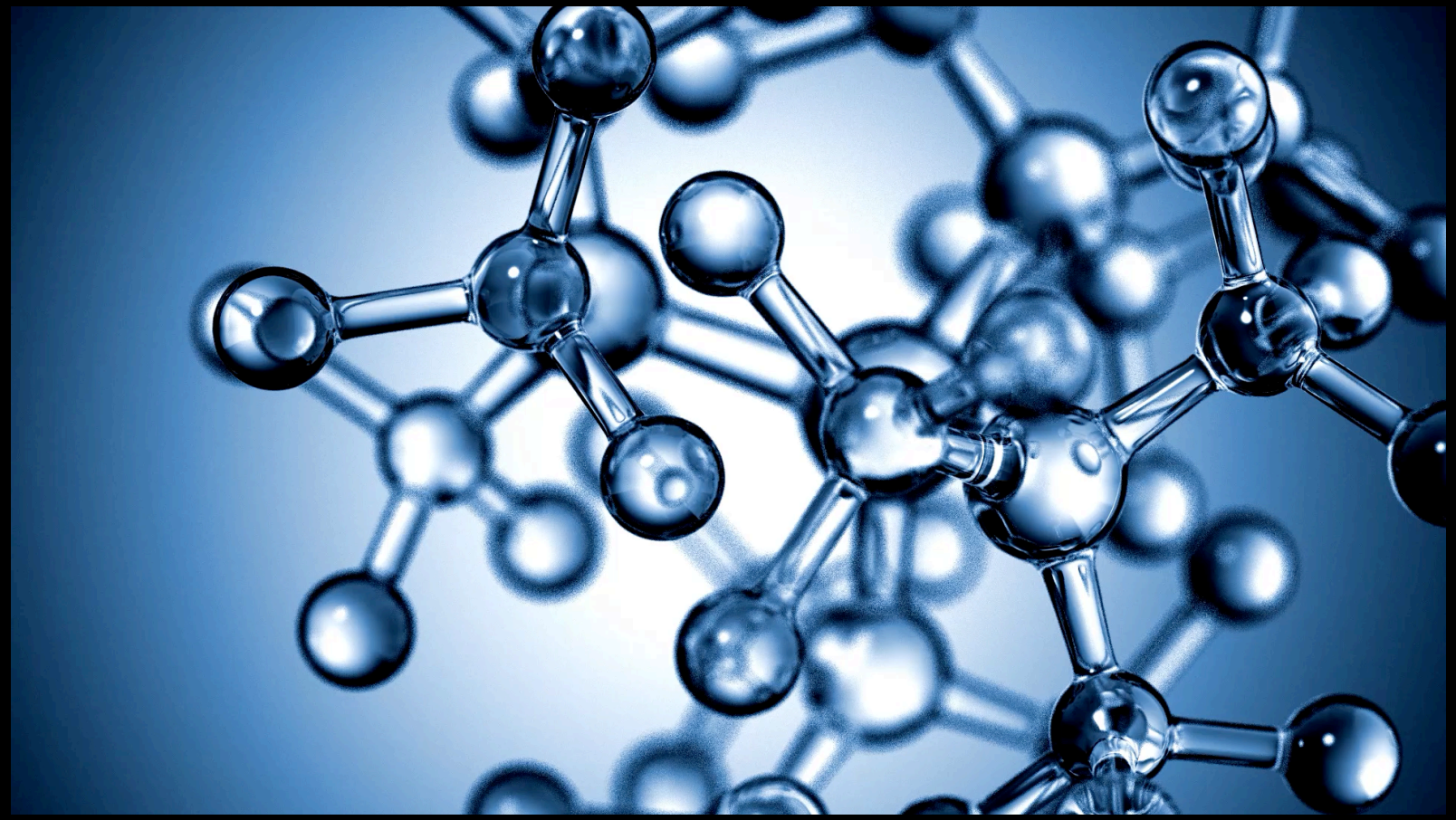
So much of it is vision based and vision biased…

IMMUNOLOGY DATA

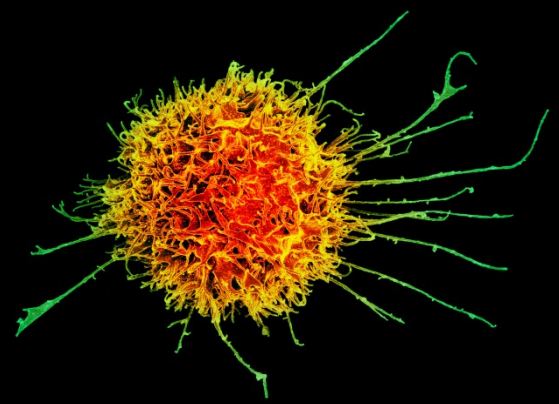
A huge amount of beautiful images abbot biomedicine…

electron microscopes,
 X-ray diffractometers
synchrotrons

show us the world at atomic level, really beautiful!!



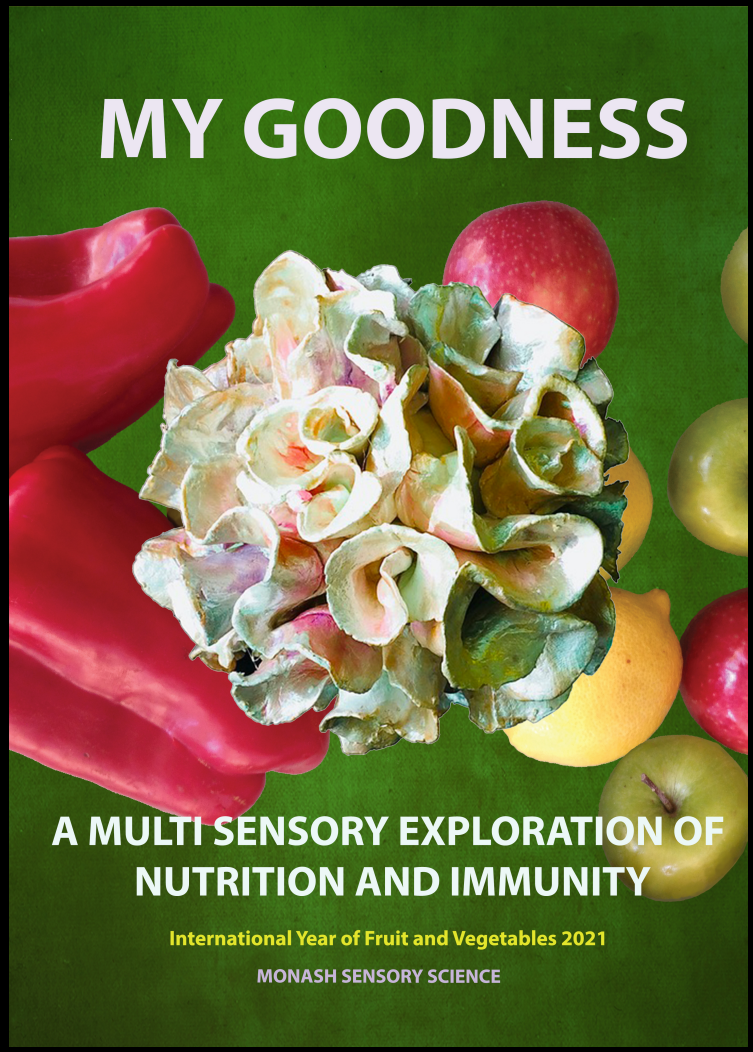
for people with Low Vision or Blindness, the world of microbiology can be out of sight and out of reach



So, in 2018 under the guidance and initiative of my boss Prof Jamie Rossjohn, at the Biomedicine Discovery Institute, Monash we started the Monash Sensory Science Initiative to make Biomedical research accessible to people with low vision or blindness

2021 Stu and I got the National Science Week grant to create and exhibit a set of multisensory Interactive Science books for blind and low vision readers

The books are about immunity, gut health and microbiome, celebrating the United Nations International Year of Fruits and Vegetables



10 Books made, A3 size laminated pages

text contributions from top researchers at Monash BDI working in immunity and gut health

large print, braille, tactile artworks of the immune system, computer aided interactions, using fiducials to detect page turning and prompts so that books can read to you via headphones

tactile art works on every page, a mini exhibition in each book
eg protein molecules, structures of vitamins like A and B metabolites , immune cells, viruses, bacteria,

artworks are sonified, sound is triggered via fiducial interaction and hand movement

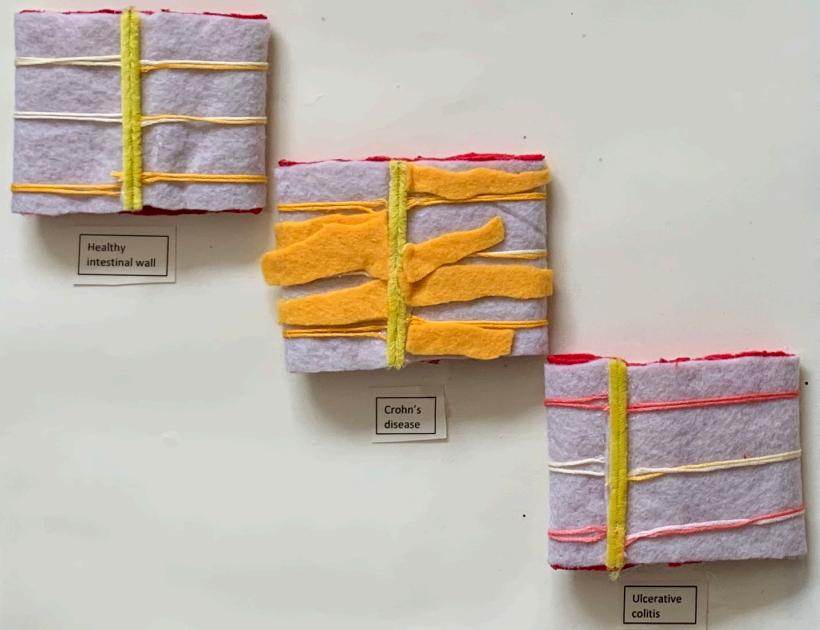
books sit on individual stands with headphone jacks and powered by mac minis

virtual book launch due to COVID shut down, cut to video

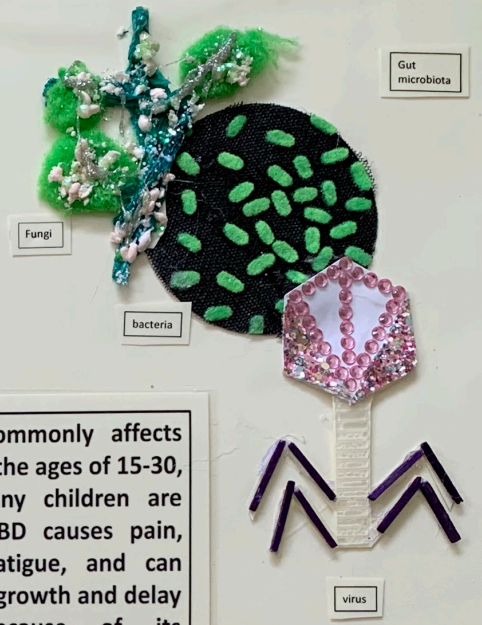
INFLAMMATORY BOWEL DISEASE AND THE MICROBIOTA

by Edward Giles

Inflammatory bowel disease (IBD), comprised of Crohn's disease and ulcerative colitis, is a chronic, incurable disease of the intestine affecting nearly 100,000 Australians. Its cause is unknown but is thought to be an abnormal immune response to the normal microbes (bacteria, fungus and other things) that live in the gut – the "microbiota".



Current treatments for IBD all target the immune response, but are not always effective, and have serious side effects. Many people need surgery during their life, and sometimes many operations.

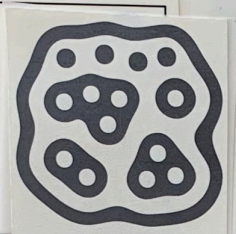


IBD most commonly affects people from the ages of 15-30, meaning many children are diagnosed. IBD causes pain, diarrhoea, fatigue, and can also prevent growth and delay puberty. Because of its embarrassing nature, young people often suffer in silence, and it affects their education, work, relationships and mental health.

By understanding the microbiota in people with IBD, and its relationship to the immune system, we hope to develop new and safer treatments for IBD, and even try to prevent it from starting.

PROTEINS AND ESSENTIAL AMINO ACIDS

by Adam Rose



Of the nutrients that we eat, protein is the most important as it is absolutely critical for our health and vitality. This is because protein provides us with amino acids, which are the building blocks for making new molecules within the cells of our body, but which are also used to make important chemicals like neurotransmitters.

Proteins are made up of chains of repeating units called amino acids which fold to form three dimensional shapes. Proteins are the building blocks of life and are found in every cell in the human body

proteins

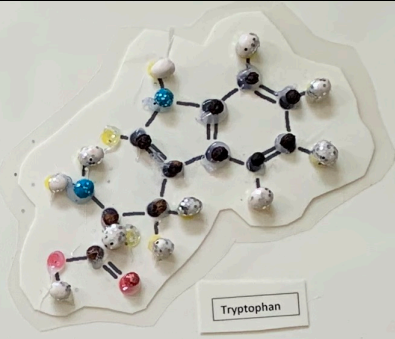
Amino acids

Peptide chains

amino acids join together to form peptide chains, the building blocks of proteins

While a diet containing no protein is not compatible with life, recent studies have shown that a moderate restriction of protein can extend not only the lifespan, but also the health span, of laboratory rodents. Importantly, early studies have shown that this effect may also be conserved in humans.

We identified that these benefits happen through restriction of a certain class of amino acids called essential amino acids. Essential amino acids are those which we cannot make from scratch within our own body and therefore we need to consume them through our diet.

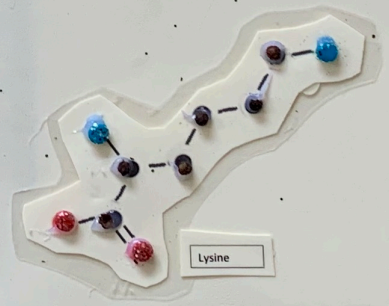


Tryptophan

Neurotransmitters

Synapses

Amino acids make important chemicals such as neurotransmitters. Neurotransmitters are crucial messengers in the body, sending signals between neurons and from neurons to muscles through a process called synapsing



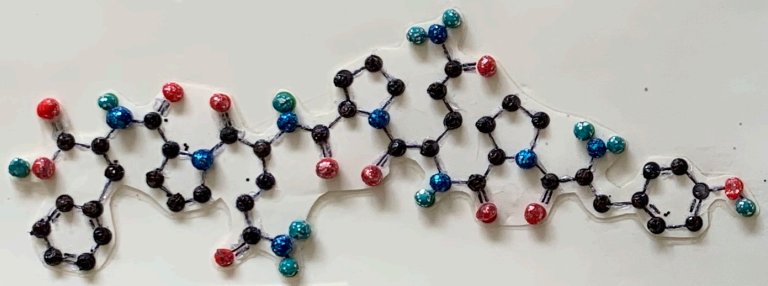
Lysine

Scientists are currently trying to find ways to mimic these benefits without incurring negative health risks such as immune dysfunction and frailty.

COELIAC DISEASE AND THE IMMUNE RESPONSE

by Jason Tye-Din

Imagine not being able to enjoy pizza, pasta or warm, crusty bread straight out of the oven. What if eating these foods, or any containing wheat, rye or barley, could actually hurt you? This is what sufferers of coeliac disease have to worry about every single day.



Gluten protein molecule

Coeliac (*pronounced see-lee-ak*) disease is a serious medical illness caused by gluten, a common food protein found in wheat, rye and barley. In coeliac disease, specific immune cells called CD4+ T cells that normally help the body fight off infections and clear tumours, become reactive to gluten. Why this happens is a mystery.

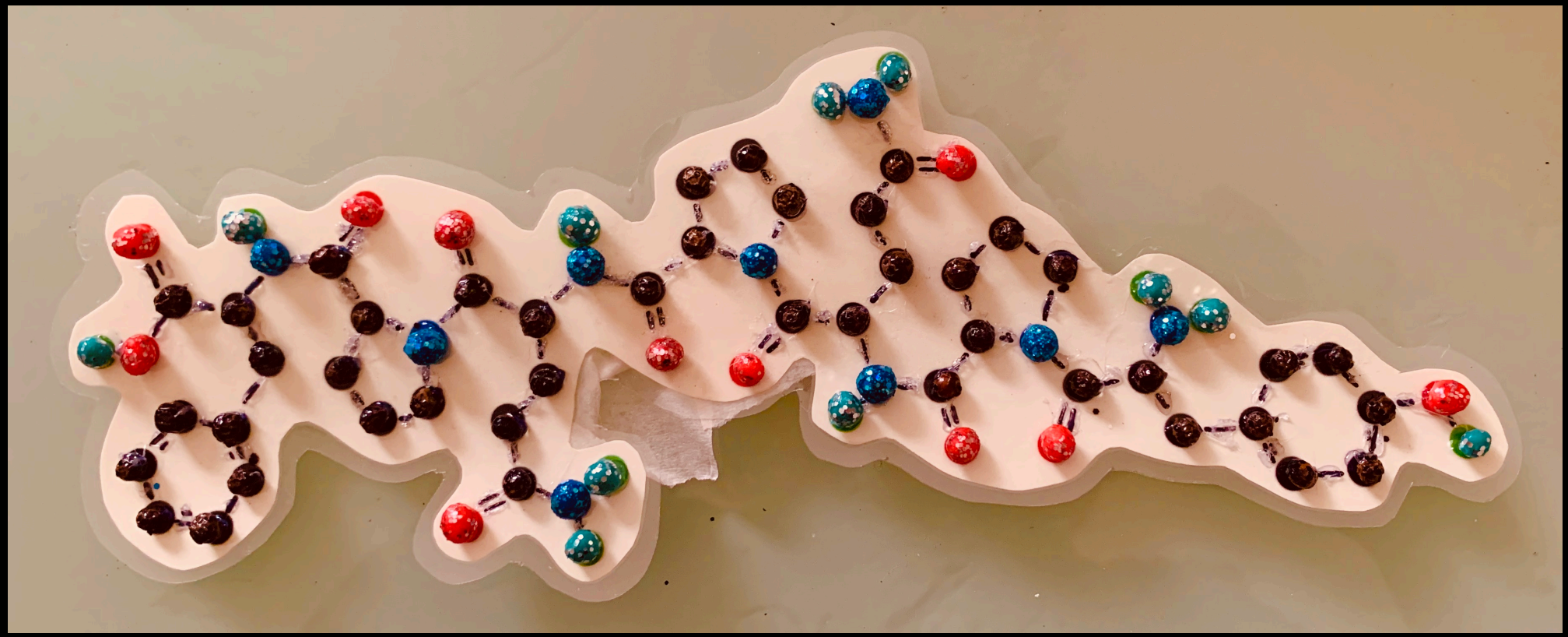
gluten proteins are found in grains produced by some grasses such as wheat, barley and rye

Whenever these T cells are exposed to gluten they activate and produce chemical messengers called cytokines. This orchestrates an inflammatory cascade involving many immune cell types that culminates in small intestinal damage and problems such as tummy pain and upset, chronic fatigue, low iron, osteoporosis and even a type of cancer called lymphoma. The only treatment is to remove the T cell "trigger" by strict and lifelong avoidance of dietary gluten.

Cytokines – chemical messengers

T cell

Our research studies people with coeliac disease to learn more about how the causative T cells and gluten interact at a molecular level and why immune tolerance to gluten is lost in the first place. This knowledge will help us design better diagnostic tests and treatment approaches. By understanding how coeliac disease develops, it may one day be possible to prevent it altogether.

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Many thanks to all the people who have contributed to making the books – the Rossjohn lab, Monash Biomedicine Discovery Institute and the IxD Lab at Swinburne

Also thanks to Inspiring Australia National Science Week
Dept of Industry, Science, Energy and Resources

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