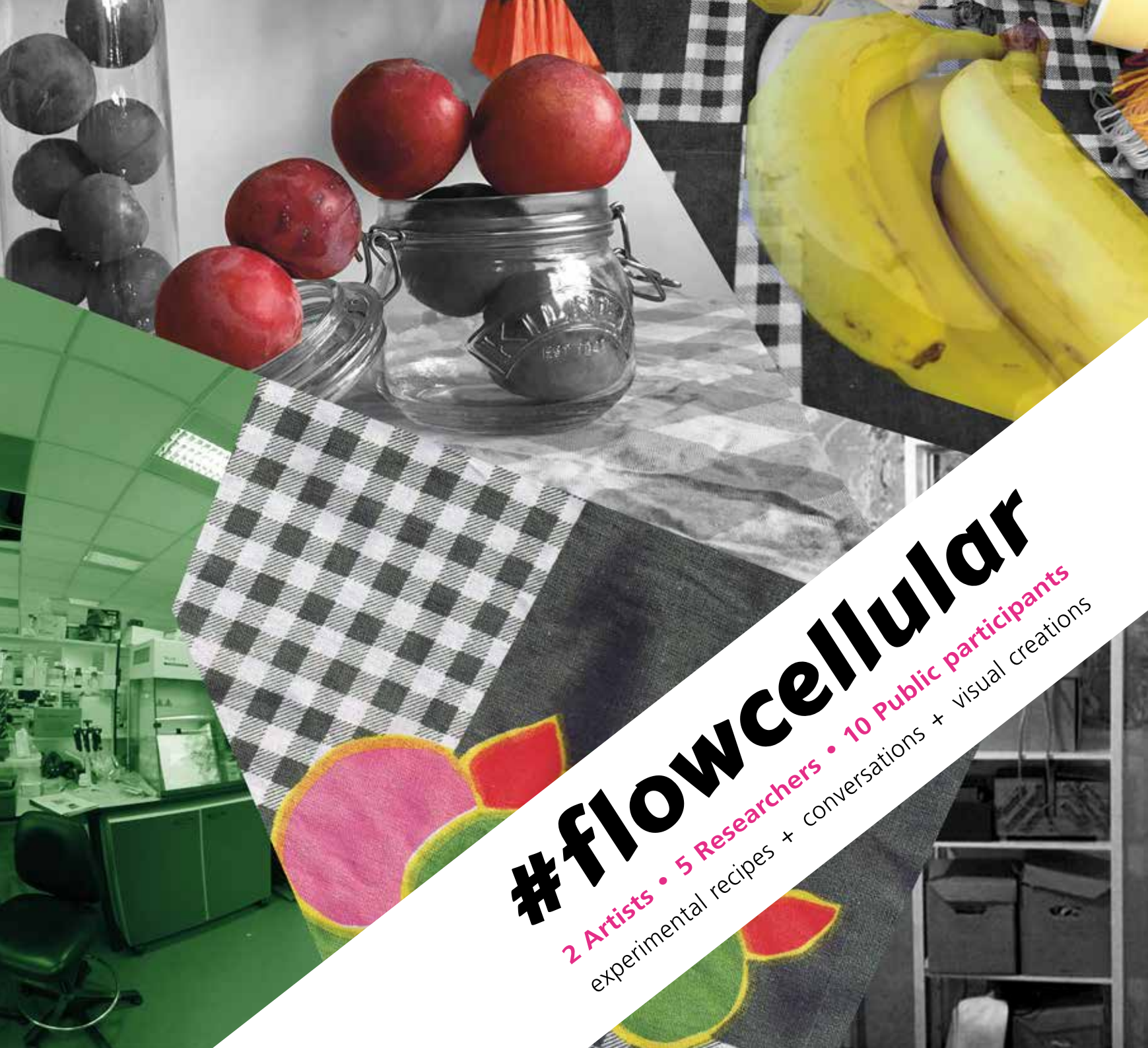

#flowcellular
2 Artists • 5 Researchers • 10 Public participants
experimental recipes + conversations + visual creations

Introduction

Welcome to the #flowcellular recipe book. Through playful encounters with food we have been exploring the science behind what happens in our DNA at a cellular level as we age. Everything on these pages has been created by people who took part in #flowcellular, a collaborative project between Wellcome Connecting Science, the Wellcome Sanger Institute's Cancer, Ageing and Somatic Mutations Programme, The Saturday Museum and public participants. Here we share some of our favourite experimental recipes, some extracts from our conversations, and other visual creations we have made over the duration of the project. We hope you enjoy discovering more about the science of ageing and feel inspired to try some of the recipes out yourselves.

#flowcellular

This art and science collaboration began in February 2020 and was due to be exhibited in our Genome Gallery later that year. However, as a result of the global pandemic we had to temporarily close our doors to the public and seek alternative virtual platforms for connecting. Unable to meet in person, or inhabit our labs or studio spaces, we decided to make the kitchen our shared space. Artists from The Saturday Museum brought together scientists and public participants, some of whom have lived experience of cancer, to explore how our DNA changes over our lifetimes from scientific and personal perspectives. Participants got together over a period of a year via Zoom in their kitchens to explore

culinary metaphors for scientific concepts, share family recipes and connect during this time of social distancing.

Our conversations sought to understand more about cancer, ageing and how our DNA changes over time, due to a variety of biological, lifestyle and environmental factors, and how these affect our health as we get older. This collaboration provided a space for us to explore the themes of the research in dialogue with people's lived experiences, and to share that learning with others.

Our approach was playful, tactile, creative, messy and empathic. We have chopped, sliced, mixed, iced, stirred, boiled and kneaded. We have made everything from multicoloured flat bread to animals from fruit. Everyone has generously shared their individual perspectives, knowledge, humour, and creative ideas. Together we have found a common language through food that has enabled us to connect with each other and the subject matter.

We have been able to share stories about our lives and loved ones and make a space for creative exploration in research in this time of social isolation. For some of us, we are now viewing and contributing to science in ways we never thought possible, and for others we are now thinking differently about how we involve people more in our science and have new questions we want to investigate as a result of these conversations.

In this recipe book we bring together our stories, discoveries, reflections and some of the many questions generated over the duration of the project to share with you. We invite you to try our recipes and contribute your perspectives on what cancer, ageing and DNA mean to you.

If you would like to share your experiments with us on Instagram please use the hashtag #flowcellular and tag @saturdaymuseum and @wgcengage. To find ways to contribute and more information about the project follow the QR code on the right or go to www.genome.gallery

About us

The Genome Gallery is based at the Wellcome Genome Campus about 12 miles south of Cambridge. The space is part of a wider public engagement resource within Wellcome Connecting Science, a major programme that enables everyone to explore genomic science and its impact on research, health and society. www.genome.gallery

The Saturday Museum is a collaborative project run by artists Lucy Steggals, who is based in London, and George Moustakas, who is based in Athens. It is an itinerant, mobile museum exploring alternative models of co-creation and gentle ways to play with existing systems and infrastructures. TSM is interested in connecting people locally, nationally and internationally. The way it works is by intuitively starting a FLOW on a theme. FLOWs are flexible frames; soft structures; play spaces; allowing for something haptic and collaborative to evolve. FLOWs are triangular – a combination of lived experience, digital dialogues and physical outputs. www.thesaturdaymuseum.org

The researchers in this project come to us from the Cancer, Ageing and Somatic Mutations Programme at the Wellcome Sanger Institute. They are part of a pioneering team that explores cutting-edge genomic science to better understand the role DNA mutation plays in cell evolution, ageing and development. www.sanger.ac.uk

The public participants in this project come to us from our project collaborators at Addenbrooke's Hospital, Wysing Arts Centre and Kettle's Yard, and Science Gallery London.

You will meet all our participants in this book.

Flat Bread

Ingredients
350g self-raising flour (plus extra for dusting)
1 teaspoon baking powder
350g natural yoghurt
Food dye

Equipment
Chopping board, medium bowl, wooden spoon, teaspoon, frying pan, rolling pin

Method
Add all the flatbread ingredients to a mixing bowl, give it a little mix with a spoon, then go in with your hands to bring the dough (body) together. Add a small amount of food colouring (cells with mutation) knead gently and notice how the dye spreads. At first just a little bit of dough changes colour and the other regions are still plain. At this point if you wanted to remove the dyed areas you could, if you were careful (removing cancer cells with surgery). Continue mixing and the dye starts to spread everywhere. The dye is now ingrained in the dough. The more you try to do something to fix the situation the stickier and messier it becomes. Sadly, the dye is now everywhere (the cancer has spread throughout the body).

Dust a clean work surface and rolling pin with flour. Separate the dough into balls (cells) with your hands. Notice how the dye (mutation) enables cells to become very effective in reproducing themselves. Pat and flatten the dough, then use a rolling pin to roll each piece into 12cm rounds. Place the griddle pan on a high heat, then once hot, cook each one for 1 to 2 minutes on each side. See what shape your bread comes out.

In this experiment Jannat, Ken, and Mattie were exploring how harmful somatic mutations behave. They discussed how cancer gives cells an advantage and makes them very effective in reproducing themselves and how, without intervention, mutations can lead to more mutations.

They also reflected on the fact that in the time taken to do this experiment, mutations could be occurring in their bodies; that you can have a lot of mutations in your cells which don't have any harmful effects, these are called neutral mutations; that all mutations that happen after fertilization are known as somatic mutations and that in this field of research there are a lot of unknowns.

The following excerpt has been transcribed from one of our creative conversations on Zoom with Jannat, Mattie, Ken, Izzy, and Lucy. It is as accurate as the technology allowed with some mutations of its own along the way.

30 July 2020

Flatbread dough is super easy. It's just 350 grams of self-raising flour. Is everyone doing okay?

The flour is going in and then it's 350 grams of the yoghurt and a teaspoon of baking powder.

It's quite a nice to make in tandem. You've actually got the same yogurt as me.

It's 500 grams. So that's about 2/3. I think I just made that up. I meant to say 3/5.

What should we do now?

Give it a little mix with a spoon to get it mixed together and then you'll want to just go in with your hands.

It's quite sticky, isn't it?

It's a very different consistency to normal dough but it is super quick to make.

Say something once in a while and then your video will come up big.

I'll pin you in a minute, but my hands are covered in dough. How is everyone doing, is it coming together?

I'm just trying to use my spoon to do that because otherwise I can't touch my computer.

I think I might need a bit of extra flour. I might be adding a little more flour as well because this is very sticky.

It's a sort of mutation in itself, isn't it?

If you work it too much it will go back to being sticky. So probably just leave it.

It this meant to teach us that the mutation process is chaotic?

Add some of whatever food colour you are using.

There are regions where this mutation process occurs, that look relatively normal.

These are sort of intermixed with red mutations and now both are so ingrained that there's no way of getting this out.

The more you try and fix it the more it just becomes a mess.

If we're taking the normal dough as a healthy human cell or series of cells and then suddenly, something goes wrong. Some kind of break happens.

The green, or in your case the red. The green is an unhealthy or harmful mutation. That now can't sort itself out.

I can't take the green out of the dough. Some parts are still okay, and some parts have got this kind of pale green and some parts are really in trouble.

So sometimes if you have too much of the food colouring or the mutation then the cell will just die.

If you add too much of the colouring the consistency of the dough would be all wrong. In this dough, we've only added a little bit so that the cell can still function, but it is functioning slightly differently. Does that make sense?

In this instance the mutations give that specific cell an advantage and so that specific cell will grow and grow and grow and grow and the regulation of the balance of the number of cells is now out.

The mutations themselves are beneficial to a single cell but incredibly harmful to the body as a whole.

The cell that causes cancer will suddenly become very effective at reproducing itself.

I can see you've got kind of purply colour going on.

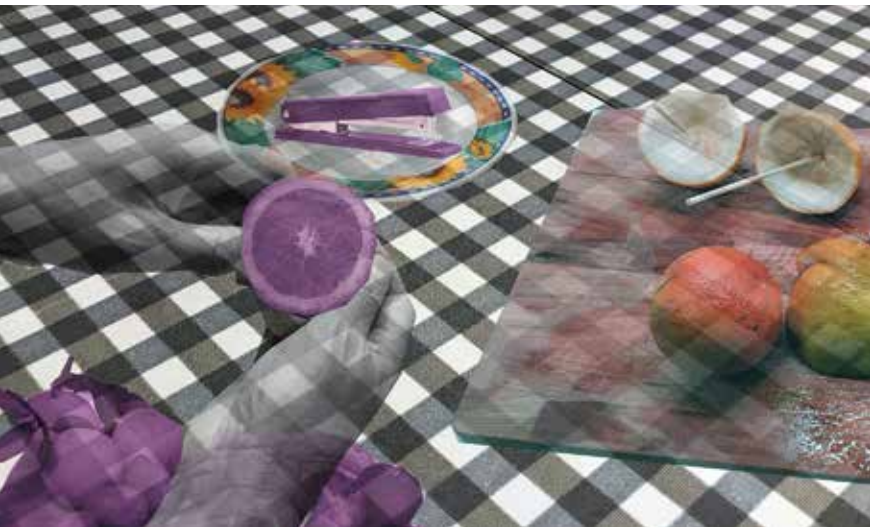
It's pink, purple in lots of different places. I've got little bits of blue.

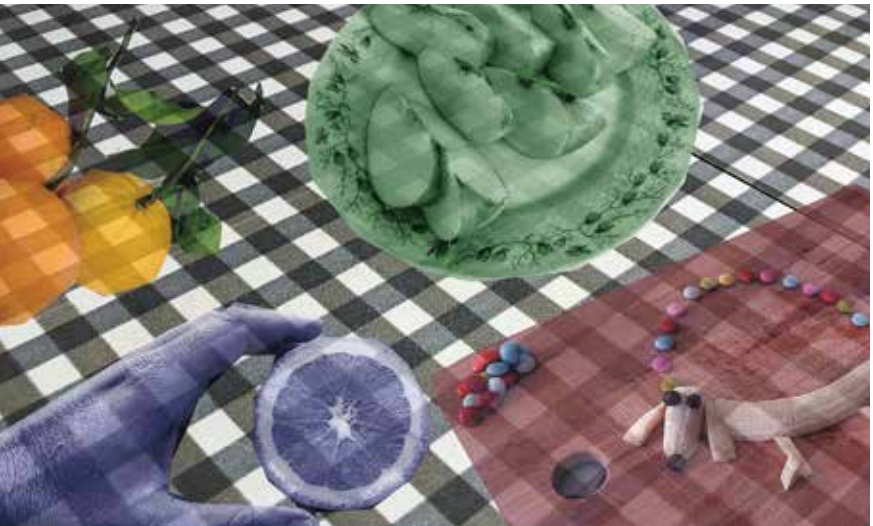
You've got a kind of cluster a really strong blue in one part. It's kind of dotting around and in slightly different places. So, you really get that sense how uncontrollable that kind of mutation is starting to become in a way.

What should we do with this slightly mutated dough now?

I mean that was kind of the extent of exploring neutral and harmful mutations and break and repair.

I'm not sure how much further I can extend this metaphor!





Fruit Animals

Ingredients
Assorted fruit (apples, oranges, blueberries, bananas)
Vegetables (carrots, tomatoes, potatoes, olives)
Smarties

Equipment
Chopping board, knife, cocktail sticks

Method
Chop up the fruit and vegetables to make three different animals. One big, one small and one fictional.

Suggestions include:
A banana dog
A crab from apples
A mouse from carrots
A potato tortoise
An insect from blueberries and olives
A fictional sea creature from everything

When you have made them put them in a line in order of their projected life spans.

This recipe was devised by Alex and Melody. They made elephants, mice, tortoises and two fictional creatures called a slugcumber and a charot. They explored ideas around learning through process, the life span of different creatures, why some animals live longer than others, how size can affect lifespan, that cells age at different rates, the variations in the number of mutations in a mouse vs an elephant and how to grapple with vast unknowingness.

The following excerpt has been transcribed from one of our creative conversations on Zoom with Alex, Melody and Lucy. It is as accurate as the technology allowed with some mutations of its own along the way.

23 September 2020

I made a tortoise out of potatoes.

I am using salt it's meant to be an elephant.

The elephant is a bit clearer than the mouse but there is supposed to be a mouse.

I was thinking of blowing them away with the straw at different speeds.

I think we should play with food animals and look at your research. Do you want to start with your tortoise?

Bring back the sugar creatures. I like them.

It's something that can be moved around. You can make the animals as you're talking about them.

What we're looking at, the ultimate question really is why do some animals live longer than others?

Everyone knows that's true, but no one really knows why. It's amazing to me that it's still a mystery. We still don't know why we age.

I'm not doing it anymore. By the way ageing.

What is ageing? Everyone's experience of ageing is different and there's not really one single definition.

We are all made up of cells like each of these grains of salt.

Why then if we are made up of the same cells does this mouse live for two years and this elephant lives for 80 or 90 years?

The question is are these cells actually the same or is the cell from an elephant actually a bit different from a cell

from a mouse?

We think DNA is one important part of ageing.

I can make a double helix out of salt, poor mouse. A DNA double helix its quite a hard structure to make out of salt.

We are seeing that their cells are ageing at different rates.

Then the question is why? What's going on inside these little cells?

I'm the tortoise because they live for 150 years.

Let's make an animal.

If we go for fictional creatures and then Alex can try and put them in some sort of life span timeline for us.

Bonkers, you can come together with somebody you don't know who comes from a very different way of seeing the world and just play and see what happens.

That crossover with a science and art and it makes the science so much more accessible.

It's such a privilege to have someone available to be able to ask the stupid questions I want to ask and without feeling intimidated.

How do you keep hope when you're searching for the unknown in the city of unknowns and trust that there's something there worth looking for?

I think of it like, you know, being an explorer or a detective. It's always exciting when you're exploring a new territory.

You don't know what you're going to find. You don't know how long it'll take you to get there, but it's kind of just the act and exploring, it's exciting.

Now do you see? Can you see that? Can you see my animal? It looks like some sort of alligator.

What's the name of this fruit creature? What have you got? I've got, I guess some kind of rodent. It's got whiskers and this is some kind of cheese.

A legless rodent. You need to think of a name for your species. Mine is a slugcumber.

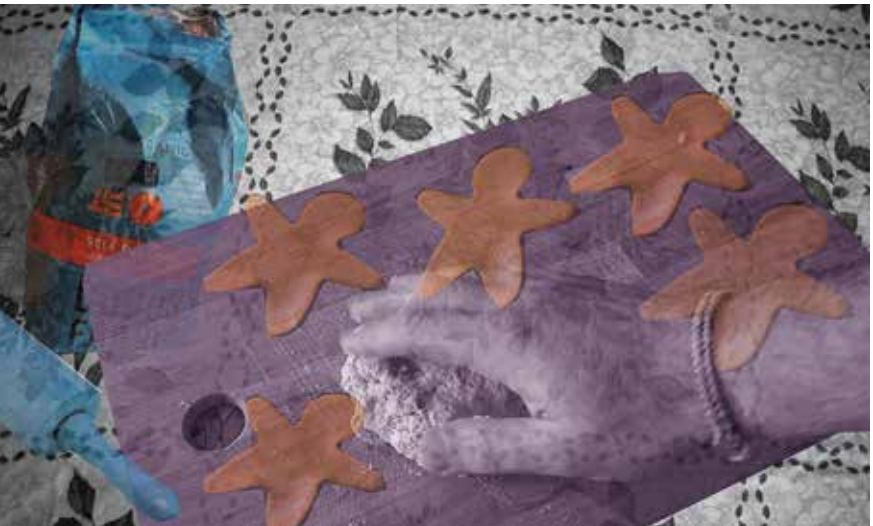
I guess mine is mostly cheese and carrots. I'll call it a charot.

In your expert opinion if these were new species coming to the lab what would you predict would be their lifespans?

Small things tend to live less long, but that's not always true. The reason they don't live as long is often they get eaten by other things. It's got very big eyes. So maybe it's quite good at avoiding predators. Maybe it can see them first and swim underwater.

What about the charot, it looks a lot like a mouse. I think the odds aren't very good for the charot. It doesn't have any legs.

Melody's slugcumber is going to be the old-time longest living dinosaur-type creature.



Gingerbread People

Ingredients
50g plain flour
100g butter
5 teaspoons ground ginger
1½ teaspoons ground cinnamon
1 teaspoon bicarbonate soda
175g light brown soft sugar
1 medium egg
Raisins and cranberries
Icing sugar in 4 colours (blue, yellow, red, green)

Equipment
Bowl, rolling pin, people cutter

Method
Preheat the oven to 180˚C. Place the flour, butter, ginger, cinnamon, raisins, cranberries and bicarbonate of soda in a bowl. Mix it together. Add the sugar and egg and mix it until it forms a dough. Using the rolling pin, roll out the dough to about 5mm thick. Dust the surface with flour. Use the people cutters to cut out a crowd. Place the cut-out dough on a non-stick baking tray. Bake in the preheated oven for about 15 minutes. Once cooled, cover each person in a mixture of multicoloured polka dots.

With a friend attempt to group them, decide on your classification parameters: colour, number of dots etc. Be aware that there are some dots made by the raisins that were part of the gingerbread before it was cooked.

This recipe was devised by Sarah and Lynne. Lynne added the cranberries and raisins into the dough, some hidden some visible as a metaphor to think about what is inherited and what is environmental. Whilst doing this experiment Sarah and Lynne discussed the challenges of classification, rough cut marmalade, the complexity of cancer, food as care, broth and how patients and researchers relate differently to research.

The following excerpt has been transcribed from one of our creative conversations on Zoom with Sarah, Lynne and Lucy. It is as accurate as the technology allowed with some mutations of its own along the way.

24 September 2020

You are wearing excellently matching stripey outfits!

My grandma was very famous for her marmalade it's the sort of marmalade where you suddenly end up with half of a piece of orange in it. She used massive shears and cut up any sort of citrus fruit. Then boiled it all up and she would have made this amazing very dark caramelized marmalade.

It's important to remember the uniqueness of the people in what we're talking about. This relates back to the science.

If you take tissue samples from people who are all seemingly healthy, the tissue, will still be hugely complex there's no normal in a sense.

There's an element of experimentation in these things, putting unlikely things together or having a realisation.

Food is what brings people together, it's a sort of care as well. I think we should do a metaphorical broth.

Over to you to share your gingerbread experiment.

One of the side effects of being in self-isolation is that I can't go out and get ingredients. I have had to get the Sainsbury's delivery well-timed for this. I have way too many gingerbread men more than I can actually ever hope to consume without being quite unwell.

This would work a lot better in person, but we'll give it a go. You have a gingerbread man. Then you also need icing tubes.

I like the idea of gingerbread because like we were saying earlier behind each of the tumour genomes there is a person and all that person's identity, hopes and dreams. They are not just epidemiology data.

I've been mean and I've given these people cancer because, well, that's what we're talking about.

It's alright, it's a gingerbread man.

Imagine that each dot of icing is a mutation, a change in someone's DNA. Then basically I'd ask them to do five or six of these gingerbread men and try to vary the number of dots of each colour.

I'm going to show you four gingerbread men and I want you to tell me what the dominant colour of mutation is. Maybe do red, green, yellow and blue but because the Sainsbury's order did a substitution, you have black instead of blue.

This is gingerbread one. I think yellow. I can't see that one, green I would say.

This is my first one when they weren't so neat. You might get one which is more of an even mixture and then basically ask people to group them. Can you group your gingerbread men into all their colours, or can you group them into ones which are more similar to each other compared to the other group for example, and that's what our project is looking for. We are looking for differences in the different mutations that these people have, different patterns. Then basically combining that information with all the information that makes up that person. Trying to combine all those things to a get an idea of what may have caused the cancer in this person.

There's something I really like about what you're doing, when you say try and group them, my brain sort of starts exploding, thinking that's really difficult, because when that person's got quite a lot of green dots, and that person has got quite a lot of red dots it's hard.

It reminds me of some of the things that you've been talking about in our past sessions about the complexity of having different kinds of cancers or mutations.

I think some of the time we talk about the research it almost makes it sound very simple and actually what we're talking about is a great huge unknown.

Do you think your gingerbread cookies will hold out?

To me obviously the dough is the stage before you get the gingerbread.

It's saying actually some things you're born with, there are things inherent in your makeup.

What's genetic and what's external? And I guess that's part of Sarah's research to extract those things as well.

I think it's also really important to remember the individuals who bring their lived experience.

Researchers don't very often have the opportunity to tell their stories.

We've actually been able to spend probably a lot more time together than we would have, had the lab opened.

Iced Biscuits

Ingredients
Bourbon biscuits
Custard Creams
Icing sugar
Grapes
Nuts
Maltesers

Equipment
Chopping board, icing gun

Method
Line up a sequence of Bourbons and Custard Creams (DNA bases). Each biscuit has two layers (strands of DNA). They are correctly paired and in the right order – this is important as the order provides the information for your body to make proteins, the building blocks of cells. Take an icing gun and add nuts, grapes and Maltesers to the top of three of the biscuits. This is what can happen when unwanted substances can attach to your DNA – changing its shape.

To remove these, separate the two halves of the Bourbon or Custard Cream and replace with another normal half from the same type of biscuit. The sequence is restored to its original state and the pattern is complete. Alternatively, you can replace with another half of a different variety of biscuit or replace the whole section with a different biscuit entirely. Even small errors in the sequence can cause things to go awry.

Take a Bourbon and add a line of icing around the edge – the two halves are now fused together representing interstrand links caused by chemotherapy drugs. They can't separate, causing breaks in the strands and leading to parts of the sequence being shuffled or deleted, stopping it from making sense.

In this experiment Ellie, Aless, Ana and Charli were exploring the different types of mutations that can occur to our genes and how chemotherapy drugs can cause changes to our DNA. They also discussed the future of food, their preconceptions about ageing, the importance of curiosity, organoids, the value of mistakes and when repair works and doesn't work.

The following excerpt has been transcribed from one of our creative conversations on Zoom with Ellie, Aless, Ana, Charli, and Lucy. It is as accurate as the technology allowed with some mutations of its own along the way.

7 September 2020

What I've got here is sandwich biscuits representing DNA bases.

You'll see the sequence of the bases is important for how your body knows how to make the proteins that do everything in your cells. You have two strands of DNA, two parts of the biscuit, these will be paired up the right way together.

What can happen with chemotherapy drugs or stuff from the environment is you can get stuff stuck on the side of them and that makes them the wrong shape basically.

So now when one of your proteins comes along to try and replicate your DNA, what it does is it's going to be aiming to pull these apart and then replicate into two different strands, but it comes along and this one is not the right shape, and the enzymes will recognise the DNA by shape and how the fit together, but now this is the wrong shape. So, what that's going to do is to pull that apart and get rid of that because that's obviously wrong. Sometimes that works just fine and what it will do is find another part and it will stick the right one back on. But, sometimes what will happen instead is it will take this one off that's wrong and it will put the wrong one back on. And sometimes, an enzyme will come along and will be like that's not right, and it will do this. That's fine now because now that's gone back to how it was in the first place. But sometimes what will happen is, when you start with this, it will go, well that's not right and it will take this one off and replace it with this one which is fine because it matches but now you've got a different message to what you started with. Sometimes that's fine it doesn't make a huge difference but sometimes that will mess up a protein which is really important and that can cause big problems.

That's one of the things that can cause cancer is if this happens in one of the genes that controls something about

how the cell grows or divides, or even worse is if it happens in one of the genes that codes for one of the proteins that's doing this whole process, because then this whole thing goes completely out of whack and it can't recognise any of this.

Another thing that can happen is you can get chemotherapy drugs that will basically glue the strands together instead of being just on something that tacks onto the side, it will form these interstrand cross links, so, you now can't get that apart. What tends to happen then is the replication stuff will come along, and it can't prize the strands apart, to replicate them. So, what then tends to cause is a double strand break. It will completely break the DNA apart.

I don't know how you did that at nine o'clock in the morning. It was genius to explain that with the biscuits.

Does anyone have any questions?

I do, so when you explain with the brown and the divided biscuit what does it depend on? Why sometimes it's wrong and sometimes it's right? How do you control that?

Like I said it kind of depends a little bit on the different pathways of DNA repair. Some of them are kind of a bit more accurate than others, but some of the time it's like pretty much sort of 50/50 if one of the bases mutates and you get a mismatch there isn't actually any way of the protein to tell which one is the wrong one.

I've got a question... so when it gets so chaotic, so obviously you've got various different things, you've got this chemotherapy drug coming in influencing all of this, how does it go back together if it can? Or is there a point where it's never going to rejig itself?

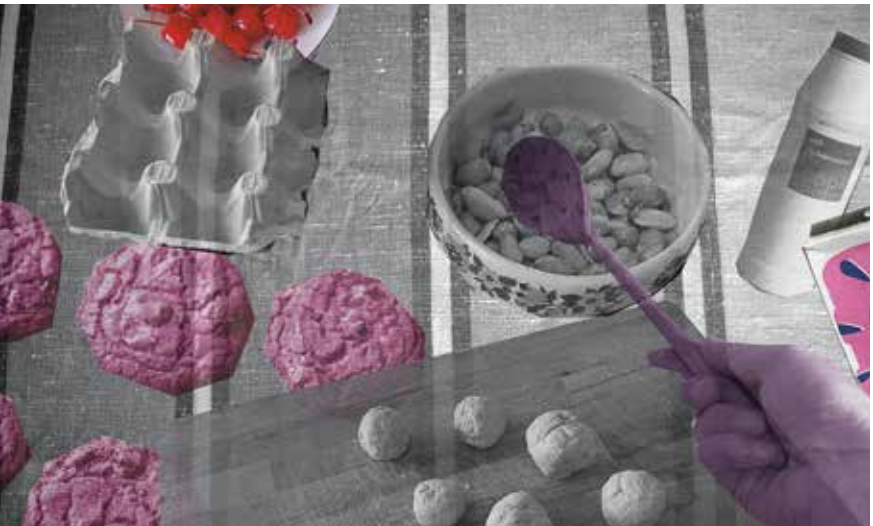
So, this doesn't usually happen in normal cells very much, but sometimes in cell division in a "normal" non-cancer cell, something will happen and one of the chromosomes will get sort of chewed up and there's not really any way to put them back, the cell doesn't know how to put them back so they go back in non-sense order. If that's a normal cell, the cell will very quickly realise that that's not right and there's all these bits of chromosomes floating around and the cell will trigger apoptosis, which is the process of when the cell kills itself.

So that's a mechanism to protect against cancer. But if that happens in a cell that already has some of these mutations in the pathways that govern a process like apoptosis or one of the proteins that detects DNA damage then the cell will go on its merry way with its chromosomes chewed up which is what causes more mutations and how you get cancers.

Has everyone got something they can take apart and try and put it back together?

A fruit or vegetable or something. Let's do this.

Can everybody take something and put it in their screen that they're going to take apart and some way and put back together and then Charli will get a dish with yogurt and a dish with milk and try something with the turmeric.



Pistachio Cookies

Ingredients

1 cup sugar
⅓ cup brown sugar
8 tablespoons butter
2 tablespoons olive oil
2 eggs
Vanilla extract
2 ⅔ cups flour
1 teaspoon baking soda
¾ teaspoon salt
¾ cup pistachios
100g dark chocolate
¾ cup maraschino cherries

Equipment

Bowl, whisk, wooden spoon, baking tray, sieve

Method

Whisk the wet ingredients
Sift in the dry ingredients
Stir in cherries, pistachios and chocolate
Shape into dough balls
Press in chopped pistachios
Bake for 10-12 mins at 350°F / 175°C

This is a family cookie recipe from Tim. These cookies can be made sifted finely or with rough cut un-sifted ingredients. Tim and Mike discussed how if the sieve represents the TP53 gene that makes the P53 protein, which protects the cookie from potentially harmful mutations, then the absence of the sieve leaves the cookie more prone to harmful mutations.

They also discussed the complexity and uniqueness of individuals; is a maraschino cherry really a cherry? What is the normal level of abnormality? And the challenges of statistics and fears around cancer and remission.

The following excerpt has been transcribed from one of our creative conversations on Zoom with Tim, Mike and Lucy. It is as accurate as the technology allowed with some mutations of its own along the way.

23 September 2020

We've managed to survive a cyclone. I think we can manage a bit of Zoom crackle.

It's not so much a recipe as something that I remember from my childhood, which I loved, it seemed normal to me, but when I mention it to people, they say that it sounds weird. It's fried bread and jam. My grandma used to cook it when I used to go and stay. It was a real treat and we used to have jam on it. It's such a marvellous combination of taste because the fried bread is hot, greasy and crunchy and then you have the sweet jam on top.

We all individually have things that we think are normal and then we put them out into the world and it's like, wow!

That's kind of parallel to what we've been talking about. What's normal and what's not normal? What's a healthy mutation? What's not?

It is very similar to the cheese and peanut butter in the sense that it's two things that you wouldn't normally put together.

Opposites, I guess there's something in that. It's like the spirit of experimentation that Tim is doing in his research.

I would have a sandwich which would be a slice of ham, a slice of cheese and then a spread of peanut butter on the cheese, which I would then roll up. I don't know why I rolled it. I guess that way it seemed fancier, like an hors d'oeuvre at a fancy cocktail party.

My family would always make these and so this is going with the thing we did last time with sifting.

The base cookie recipe got sifted and this is the other version. So, this is the same cookie with pistachios, maraschino cherries and dark chocolate in it.

I wonder which one you're going to eat first. Well, there used to be six on this thing.

Can you hold them up?

The one that's on my left is the base with the proper sifted ingredients as it should be and then what I've done is mixed and thrown in some extra things and not sifted them.

So essentially with this screen being p53, you know, you sprinkle the stuff on it, and it does this.

In this case unfortunately the cancer cookie is far more delicious than the other one.

That's the sort of strange thing about cancer there's this horrible kind of paradox.

It's doing something that's really effective, but it's backfiring and doing something that's really negative.

There's something about that and your cookies. You've done the thing that is making a mutation which is actually causing something hugely problematic. You're going to go for the pistachio, maraschino cherry cookies and if you eat too many, you're going to cause yourself a problem.

My personal connection to these cookies is the fact that to make the process for making maraschino cherries they used to be made from Maraschino liqueur. What happened in the US during prohibition is you couldn't have the liquor so a food scientist at Oregon State University where I'm from, developed how to do it with brine rather than alcohol. Now basically all maraschino cherries are made in a brine-based method rather than alcohol-based method because water and salt are a lot cheaper.

I always said I love cherries. But I hated them if they had the pit in them. It turns out the only cherries I ever ate were Maraschino. Which are delicious have but have no nutritional value.

So, because of something that happened accidentally, something else wasn't available. So, they had to find another way, which I guess if you start thinking about it is similar to the story of the history of cancer and ageing research. It's a bit like that. I mean there's something where someone goes "let's try this?" or "we can't do this", or "this is doing damage". So, let's try something else.

Maybe there's something in the maraschino cherry that we have yet to discover, a combination of things.

I like this idea of combinations because my understanding of cancer treatment is that each person needs a slightly different combination. So, it's almost like each person needs their own unique recipe for treatment.















The Saturday Museum

In the spirit of #flowcellular we thought we would share with you a little bit about how TSM approached this project in the form of a recipe.

2 artists, 2 kitchens/studios, 2 cities…

Ingredients
Coffee
Whatever is to hand
People
Stamps and envelopes

Equipment
Screens, telephones, bowls, wooden spoons and cutters

Method
Find a bowl and research it. Where does it come from? What's its history? What might we make in it? Pour in the people and stir, gently starting creative conversations using what is at hand. Mix messily, play, experiment, listen, remain curious and ask questions. We don't yet know what we are cooking. Document, photograph and make GIFs of the process, share them. Roll, edit out the sticky parts and cut into squares and rectangles. Bake and share with collaborators, friends and strangers. Thank you to everyone we have collaborated with on this project.

"It has been an extraordinary experience for George and I to collaborate from our kitchens in Athens and London with such a wonderful group of people, most of whom have never met each other in person. I have been amazed by everyone's warmth, humanity, commitment, creativity and especially for their capacity to play and experiment with the metaphor of food. We had a lot of fun, made a lot of mess and succeeded in generating more questions than we had when we started. It's been a Zoom adventure, we hope this recipe book will live on to get stained, amended and inspire many more rich conversations."

Acknowledgements

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Artists
Lucy Steggals and George Moustakas from The Saturday Museum.

Participants
Alex Cagan, Aless Gibson, Ana Alvarez Prendes, Charli Hilton, Ellie Dunstone, Gaby Da Silva, Izzy Collie-Cousins, Jannat Ijaz, Ken Deng, Lynne Cundy Jones, Mattie O'Callaghan, Melody Bottle, Mike Jump, Sarah Moody, and Tim Butler.

Project collaborators
Wellcome Sanger Institute (Cancer, Ageing and Somatic Mutations Programme), Addenbrooke's Hospital Cancer Patient Partnership Group (Lenja Bell), Wysing Arts Centre (Lucy Ship), Science Gallery London (Jamie Dorey), Cancer Research UK (Ellie Wheeler), ZSL London Zoo and Whipsnade Zoo (Nick Masters, Edmund Flach, Simon Spiro, Ethan Wrigglesworth and Inez Januszczak), Wellcome Connecting Science (Beth Elliott, Laura Olivares Boldú and Kenneth Skeldon), and Rafa Montero Yuste.

Project evaluators
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And last but not least thanks to the members of the public who have engaged with the project with your own break and repair creative responses and stories.

Melody
Alex
Lucy
Sarah
Mike
Tim
Millie
Ken
Jamie
Alexs
Ann
Charl
Ellie
Somatic
Experiments
Bubbles
Mutations
Melody
Lucy
Me
Kitchen labs
Age
Stains
Charge
Structure
Potato Turtle
Collaboration
Connection
Animals
Break & Repair
Lifespan
Metaphors
&
Stretches
Alex Cogan

Alex

Melody

Alex and Melody

Before collaborating on #flowcellular
I didn't know…
Melody: Anything about science. I've never done science, so I completely thought oh my, what am I getting into.
Alex: How much fun it would be.

I had always wondered…
Melody: How art and science connect. It's that connection that you know is there but how to demonstrate that.
Alex: How you can creatively communicate about somatic evolution. I think particularly around the visual language because it doesn't really exist. Lots of other fields of science have visuals that come to mind when you think about them like space and solar systems, but when it comes to somatic evolution, it was like a black hole. Things like the bubble metaphor didn't exist before.

During #flowcellular
I was most surprised by…
Melody: The fact that science could be so much fun you don't think of it in that way, especially when it's the studying of ageing and cancer. It's been amazingly interesting in that way. I suddenly want to be a scientist, when I grow up.
Alex: How can you use food to talk about science? I think of myself as quite open-minded, but I was like well, how is food going to work?

I experimented with…
Melody: My photography, I just got off on a complete tangent with it. It's made me use things that are around, ordinary stuff to demonstrate things. I'm in a different time, in a completely different zone from where I was. It's transformed my life. It's like thinking of an image not as a fact but as a sort of communicating something.
Alex: All sorts of ways of using food and things in the kitchen to talk about science.

Towards the end of #flowcellular
I think differently about…
Alex: What art can be. Before I thought pen and paper, or certain mediums and it was about producing something beautiful or meaningful with those. I think what we do is just as meaningful as any painting, it's about people exploring things together and co-creating. I've been thinking of new experiments to do because of this project. Playing around with things helps you think outside of the box, and it helps you to ask questions you might not have asked otherwise.
Melody: Cancer from the abstract to it becoming a reality which I didn't take seriously at all at first until I got into the treatment and then I thought oh wow, this is perhaps a little bit more serious. I hadn't had that experience when I had cancer before. I'm very interested in the hi-tech equipment they use for radiotherapy, and I suppose that's the science part of it for me. I started to look at things in a completely different way. When I heard about the [COVID-19] vaccines the first thing I wanted to know is how do they work? I want to know the science behind it, I wouldn't have thought of that before, it would have just gone over my head.

I will always remember…
Melody: I will always remember this experience and the way it changed my life. Meeting Alex that's made the whole process because he is an artist and comes from that way of thinking. We've had some wonderful discussions about Chernobyl and it's just been absolutely phenomenal for me. I wouldn't have missed it for the world.
Alex: I'll always remember Melody's enthusiasm and just how amazing all the discussions have been. Also, I am not sure about the phrase remember, I hope it will go on. I'll stay in touch with Melody so it's not an endpoint.

—

Alex – *Animal genetics, laser capture microdissection, somatic evolution, paternal age mutations, art and illustration.*
Melody – *Abstract photography, the story of radiation, kintsugi and baking.*

Sarah and Lynne

Before collaborating on #flowcellular
I didn't know…
Lynne: I didn't know mutations could be fun.
Sarah: I didn't know I could feel so bad for gingerbread men.

I had always wondered…
Lynne: What researchers do with results.
Sarah: How to make jam.

During #flowcellular
I was most surprised by…
Lynne: How creative researchers are at expressing their science from the poetry, the fire to the illustrations. Everything has just been brilliant. Seeing everyone's different approach to this complexity. How different people have approached things.
Sarah: Someone being able to explain science by setting something on fire.

I experimented with…
Lynne: Dye and photographing mutations in nature, plants and trees.
Sarah: Indelible food dye, I dyed my fingers it took three days to get the dye out.

Towards the end of #flowcellular
I think differently about…
Lynne: About science and about the creativity of science.
Sarah: Patients, it's been a very interesting experience. I don't think I've ever had such a long interaction with an individual before. Most of the time for us it is very fleeting five-minute interactions. It's been really enlightening to spend time getting to know Lynne.

I will remember…
Lynne: Sarah and everything we've done.
Sarah: Lynne.

—

Sarah – *Cancer: identifying novel preventable causes of cancer, mutational signatures (the 'fingerprints' of exposures such as smoking and UV light on the genome), reading and cats.*
Lynne – *Marmalade making, travelling and meeting people, photographing everything including lichen, painting, reading crime, dogs and people watching.*

Lynne's Plum Jam Recipe

Ingredients: 2kg plums, water/apple juice/orange juice, 2kg sugar (I like natural demerara or cane sugar but you use white or mix it up), 2tsp ground cinnamon, the skin of two fresh lemons finely grated, squeezed juice of the two lemons, butter

Equipment: glass jars, large pan, slotted spoon, labels

Method: Ready your jars. Put the plums in a big heavy bottom pan or preserving pan. It has to be deep so when jam bubbles it doesn't boil over or burn you. Have paper towels nearby and put your jam jars ready on a tray!

Add about 200ml of whatever juice you have or a mix of juice and water to the pan. Bring to a simmer and cook for about 10 mins until the plums are tender but not collapsed. Add the sugar, ground cinnamon and lemon juice. You let the sugar slowly dissolve just gentle heat.

Raise the heat, have your stirring spoon ready and bring the jam to a rolling boil. This is why you need a good height pan. At this point the plum stones all rise to the surface so you can sieve them out with a slotted spoon as you're stirring. Give it about ten minutes and take a drop of the jam and drop it on a dry saucer or small plate and run a line through it. If it hardens and keeps its shape it's ready. If not keep on boiling!

When the jam is ready take it off the heat and stir in a few small knobs of butter. This helps get rid of the scummy surface on the boiled jam. You can leave it cool for a few minutes, ensure your jars are dry then pour or ladle jam in. Have some labels ready or make your own. Store in cool dark cupboard or fridge.

Sarah

SARAH
FRUIT
THREE
MARMALADE
ORANGE LEMON &
CLEMENTINE NOV '20

SPICED
PLUMS

Lynne

Tim

Mike

Tim and Mike

Before collaborating on #flowcellular
I didn't know…
Mike: What the Sanger Institute was all about.
Tim: That the kitchen had so many useful analogies for cancer.

I had always wondered…
Mike: What it would be like to participate in an open project.
Tim: How well understood what I do is by the general public.

During #flowcellular
I was most surprised by…
Mike: The extent of Tim's knowledge of cookery.
Tim: How nice it is to have your words turned into poetry.

I experimented with…
Mike: Poetry, I had literally never done it before.
Tim: Fire.

Towards the end of #flowcellular
I think differently about…
Mike: Research scientists.
Tim: The balance between being scientifically accurate and being easily translatable. Coming up with analogies and explanations of cancer.

I will remember…
Mike: The fun of working with Tim, it's been so much fun.
Tim: How good Mike is at poetry.

—

Mike – *Cryptic crosswords, language and languages, travel, making abstract art and Google threads.*
Tim – *Breast cancer, genomics, circulating tumour DNA, gaming, treasure hunts and slow cooking.*

Poems by Mike

To my tumour

To succeed, little tumour, you'll need the key
To turn off a protein called P53
Which looks for damage in cell DNA
And, finding a rogue cell
Will put it away.
So I hope you don't find the key any time soon
Or I'll finish up singing a different tune…

Three types of mutation (Haikus)

Deleterious
Mutations, though bad for me,
Make happy cancers

What is the point of
Irrelevant ones, that will
Satisfy no one?

A gain of function
From a positive one is
More bad news for me

Jannat, Mattie and Ken

Before collaborating on #flowcellular
I didn't know…
Jannat: How much fun it would be.
Mattie: How you could explain really complex topics with the food we eat everyday.
Ken: How cancer and ageing sit together. I can make sense of cancer, but I didn't know about ageing and cancer.

I had always wondered…
Jannat: How I would be able to explain such complex topics, but in a very relatable way rather than just talking about science with somebody who has some sort of science background.
Mattie: How scientists and artists could come together to talk about important topics.
Ken: How I am going to explain this in the future.

During #flowcellular
I was most surprised by…
Jannat: How much bread we used.
Mattie: How much fun it is making things and doing things with your hands. Particularly after being on Zoom for ages.
Ken: How many daily examples we can think of to explain ageing and cancer.

I experimented with…
Mattie: How food can be a metaphor for everything.
Jannat: Bread.
Ken: Sticky dough.

Towards the end of #flowcellular
I think differently about…
Mattie: How science seems less abstract, more understandable, not something to be scared of.
Jannat: I do think a little bit differently about my data than I did before. It's sort of reminded me of the bigger picture.
Ken: About ageing.

I will remember…
Mattie: Just how much mess and fun you can have with food and ideas.
Jannat: I don't think I can eat focaccia now without thinking about #flowcellular.
Ken: Putting my computer and cutting board together.

—

Jannat – *Structural variants in genes, 3D genome, what happens to DNA when it experiences a significant trauma and baking.*
Mattie – *Curating, art-science collaborations and creative writing.*
Ken – *Science communication, discovering science and arts in daily life as an economic naturalist, photography, curating and cooking.*

Writing by Mattie

I dreamt last night of a time when we can gather again under smells of freshly baked bread, of rosemary and olives. Young and old kneading together, flour like a snow flurry blanketing the wooden surfaces. A grandmother shows her grandchild how to flip and roll, to bring air to the dough, to help it grow and change under the hot oven.

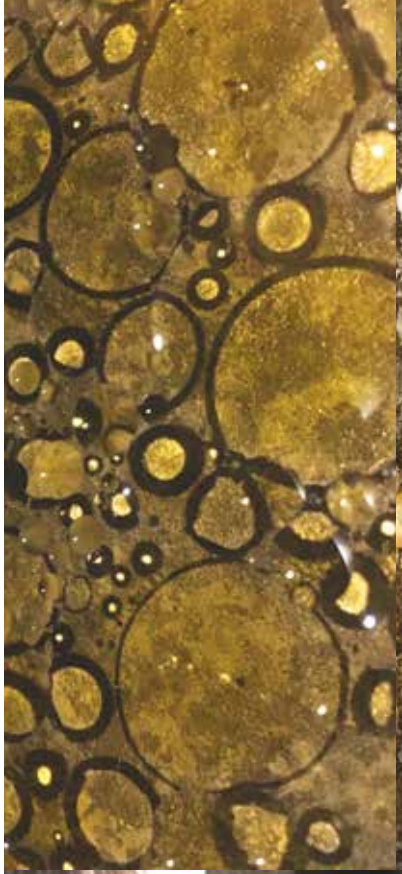
"Do we change too?", the grandchild asks, squishing sprigs of rosemary and olives into the bread. "Yes, our cells mutate so often, it's part of growing old, ageing, passing on wisdom."

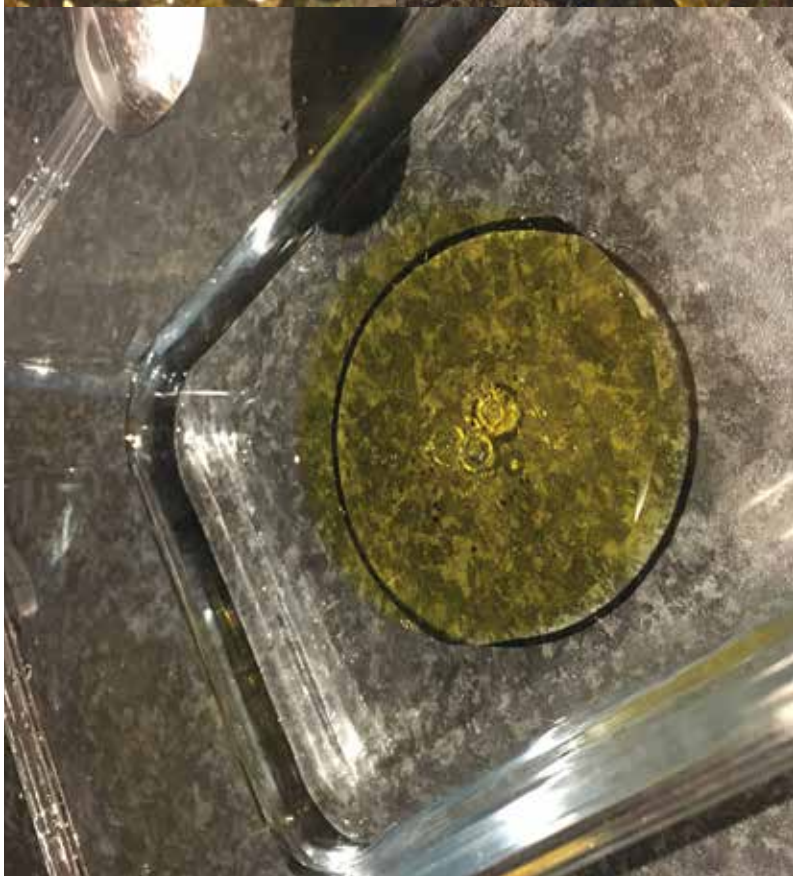
The dough enters into the hot oven and we wait until its crispy and brown. We bring it out to share, a communion in a time when the virus mutating isn't causing harm, and we can nourish ourselves without fear.



Jannat





Ken


Ellie

Sticky Toffee Pudding

Ingredients

6 oz stoned dates, finely chopped
½ lb plain flour sifted
1 teaspoon baking powder
1 egg whisked
6 oz granulated sugar
2 oz soft butter
½ pt boiling water
1 teaspoon bicarb

Toffee Topping

2½ oz demerara sugar
1½ oz butter
2 tablespoons double cream

Method

1. Cover the dates and bicarb with boiling water and leave to soak.
2. Cream the butter and sugar, with a handwhisk.
3. Add a little flour and beat in the egg, gradually mixing in the rest of the flour.
4. Whisk the dates and water into the flour. Forms a sloppy batter.
5. Pour into well greased 10" x 8" cake tin. Bake for 40 minutes gas 5/375°F. 190°C fan

Topping

1. Heat the butter, brown sugar and cream together.
2. Simmer until the sugar has dissolved, stir occasionally.
3. Pour over the warm baked pudding.

Lovely with cream, ice-cream or custard. Some of our customers have all three!

Aless

Ellie, Aless, Ana and Charli

Before collaborating on #flowcellular
I didn't know…
Aless: How food would become a useful reference in cancer and that messing about with people could mean learning about science.
Charli: That there is a lot that I didn't know and still is a lot I don't know. I didn't even know what would come of this project.
Ana: I didn't know anything about ageing.
Ellie: I missed some of the early meetings so I really had no idea what to expect.

I had always wondered…
Aless: How you could take research and science into a weird place where it just kind of creates itself. How you can find out new stuff by grabbing a lot of yogurt and some turmeric and going I'm sure this is a thing that works.
Charli: I had always wondered how science could be communicated through food.
Ana: How it would be to work with a group of people online with an artist and scientists and see what can come from there.
Ellie: How it was going to work doing a public engagement project online with less input from the public than you normally get and how that was going to pan out.

During #flowcellular
I was most surprised by…
Aless: The range of stuff that we heard was going on in the different groups. I think we did quite interesting stuff and it was curious to see how the things that we were doing connected to the topics we were talking about. Realising other people were blowing bubbles, making gingerbread people and all sorts. The fact that this variety was happening even though we were all talking about the same things.
Charli: The other conversations that came of it. The broader conversations and the sort of general life conversations.
Ana: How such an easy thing as food as a metaphor could be used to understand such a complex thing.
Ellie: How many ways you can use practical things to explain stuff and how well that works to help people to relate to it.

I experimented with…
Aless: The idea of experimenting itself. I suppose experiment and science has a particular connotation, but actually this is experimenting by playing is not really a conventional way to do science.
Charli: I experimented with the different aesthetic appearances of chopping boards to decide which one would look the best on camera.
Ana: The photographic techniques, making these 3D models. I have done it before, but this was the perfect opportunity to say let's do this and see what happens.
Ellie: I spent quite a while trying to experiment with different things that I could sieve that would or wouldn't sieve out from each other. That made a right mess of my kitchen.

Towards the end of #flowcellular
I think differently about…
Aless: Definitely how I approach science. I probably learn science in the same way, but kind of how I see. As someone who's likely to work in science in the future it adds more weight to me understanding the different ways that you can talk about a subject to make it relatable to people.
Ana: About ageing it was something I didn't even think about before, I wasn't even aware of it. So now it's something that is more present and it's more present how I think about my body.
Charli: I was going to say exactly the same, I now see ageing kind of almost like a spectrum, we're all on it, we're just at different points.
Ellie: How other people relate to the work that I do, because it's very easy when you're working on your own to become quite detached from it. That's one of the reasons I like doing public engagement – it reminds you about how this actually relates to people's lives and their health.

[continued…]

I will remember…
Aless: Turmeric and yogurt.
Charli: I'll remember that things are always better when you collaborate and come together as a big group.
Ana: How cool it was to create this collaboratively and to see how it developed without even knowing the outcome.
Ellie: Trying to put an apple back together with cocktail sticks and pins.

—

Ellie – *Investigating patterns of somatic mutation caused by chemotherapy drugs, cooking and dancing.*
Aless – *Medicine, Twitch broadcasting and science communication.*
Ana – *Communications in arts and science, dancing, taking film, photos and experimenting with 3D.*
Charli – *Chemistry, yoga and science communication.*

Sticky Toffee Pudding recipe from:
Recipes from the Moon cookbook printed by The Piggery Press

3D Experiments by Ana and Rafa

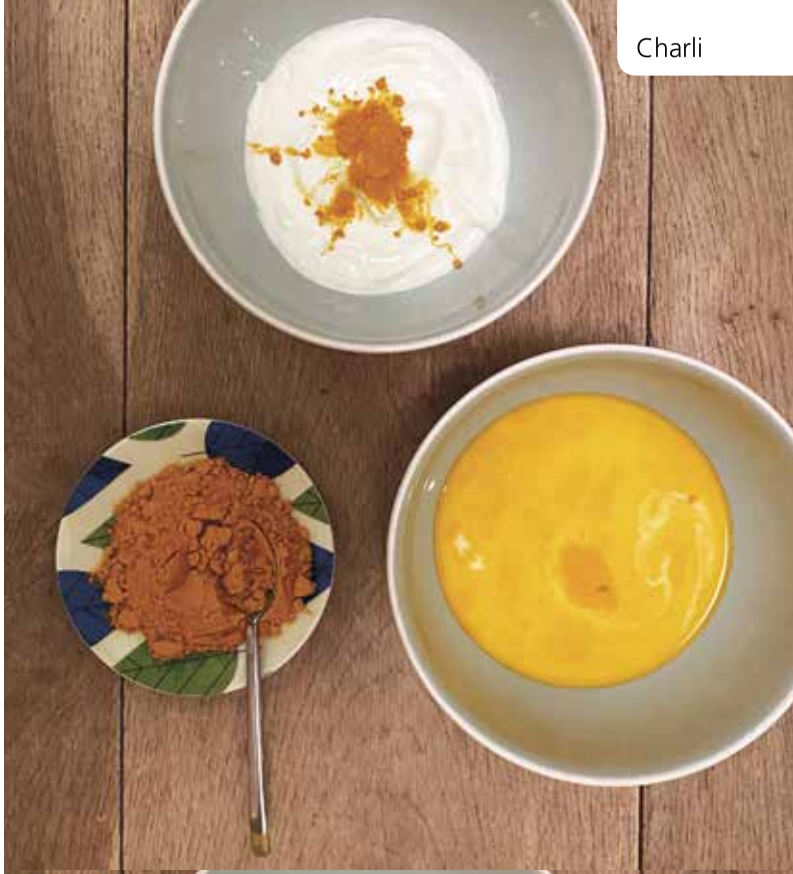
In cells, both metabolic activities and environmental factors can cause DNA damage, resulting in thousands of lesions per cell every day. The DNA repair processes are constantly active; however, errors in these mechanisms might lead to somatic mutations.

Through photogrammetry, this 3D interpretation of the DNA damage and repair processes shines a light on human bodies' invisible dynamism. These images are generated as a hybrid between a conventional photographic capture and software-based scanning.

These breakages, its reconstructed pieces and the different fixing methods are a metaphor for DNA's reality. Portrayed between a state of motion and stillness, the fruits reflect both our outsider static perception and the active processes constantly taking place inside our cells.

In these models we experimented with:
– a pomegranate repaired with blue cable ties
– an apple repaired with red candle wax
– a lemon repaired with pink tape and screws


Ana & Rafa


Charli

Invitation
Add your own family recipe or food experiment here:

Find all our experiments on our website www.genome.gallery and on Instagram
Try an experiment and tag us #flowcellular @wgcengage @saturdaymuseum


FOOD
LOVE

wellcome connecting science

wellcome sanger institute

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