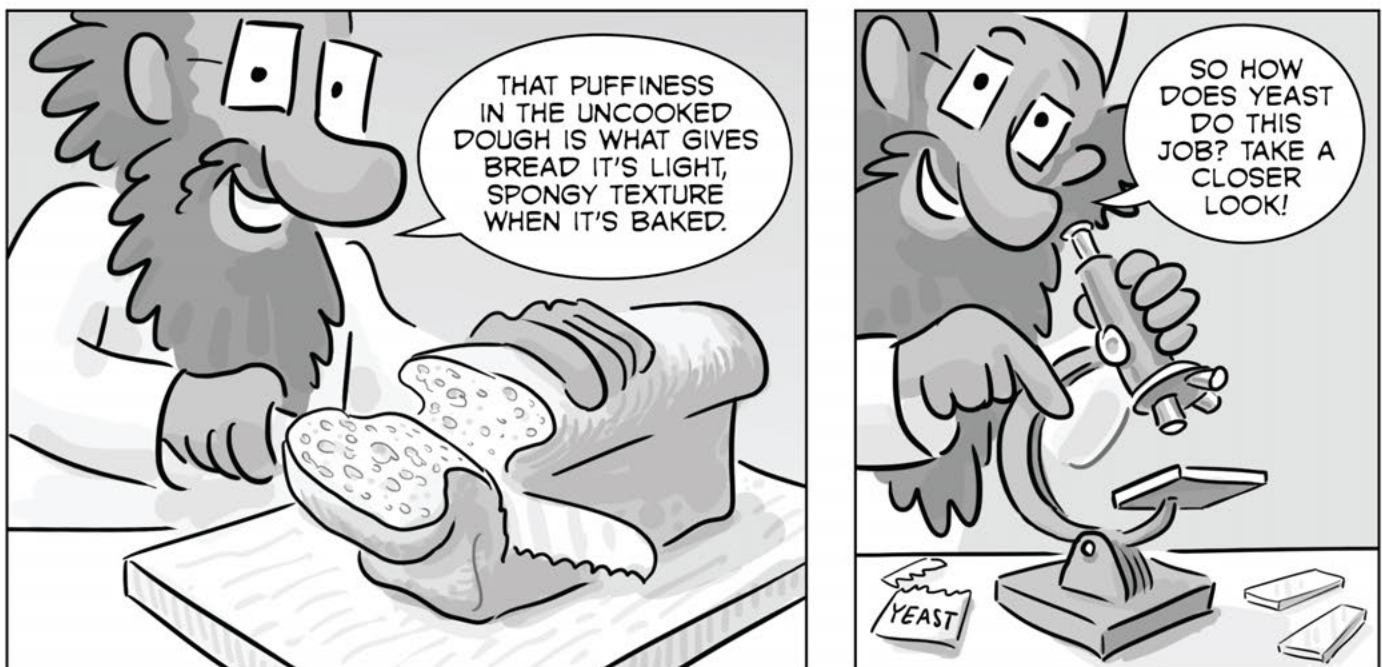
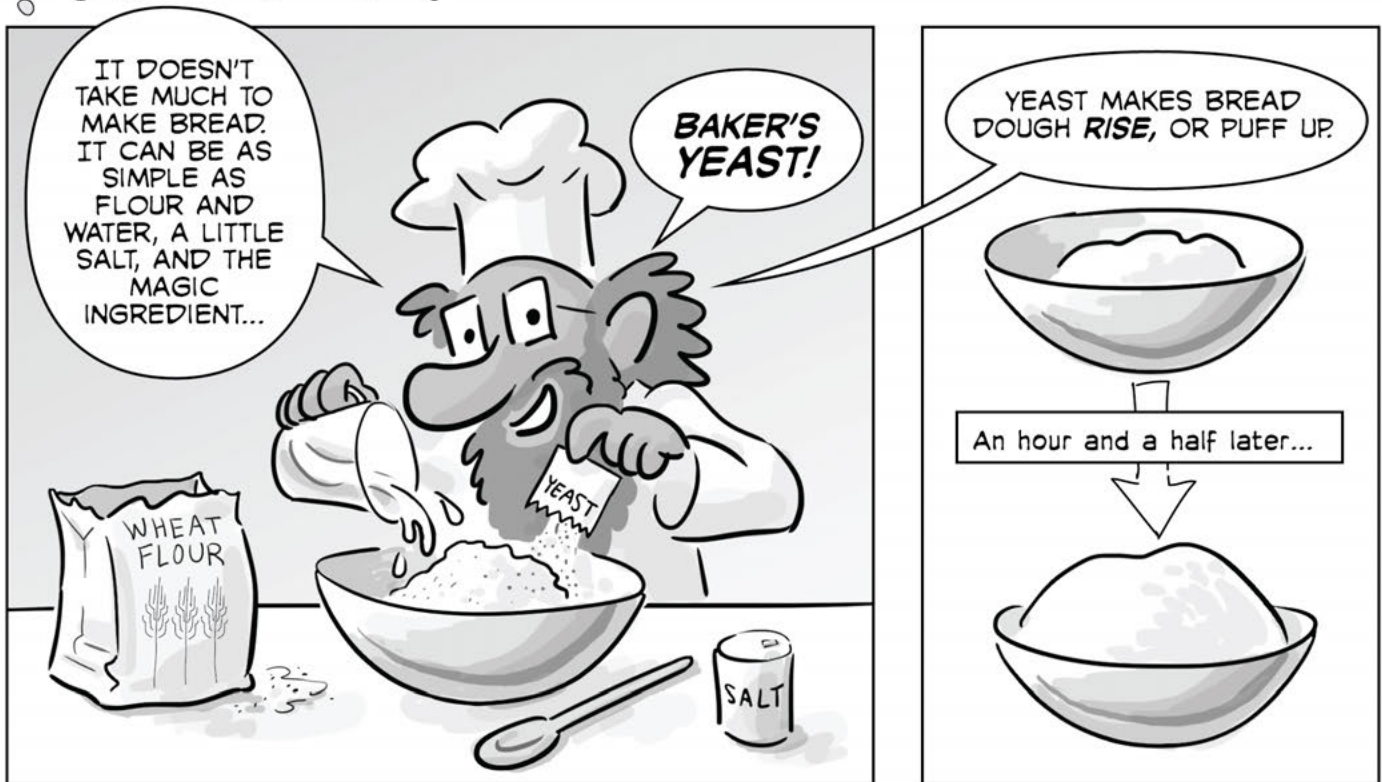


# RISE OF THE YEAST CELLS

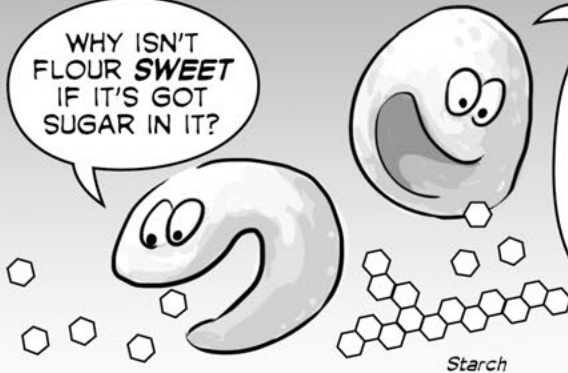
*Better bread baking through burping (and cell biology)*



Yeast is alive. Like all living things, it's made of cells. In bread dough, yeast cells eat sugar that is part of the flour.

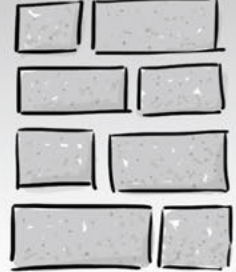
WHY ISN'T FLOUR **SWEET** IF IT'S GOT SUGAR IN IT?

THE SUGAR PARTICLES IN FLOUR ARE CONNECTED TOGETHER IN A FORM CALLED **STARCH**, AND STARCH DOESN'T TASTE SWEET.



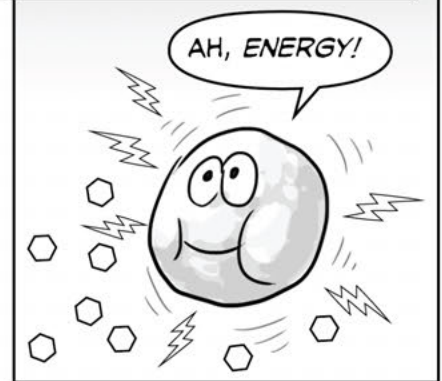
Just like us, yeast cells use their food for *two* things:

**energy** and **building materials**.



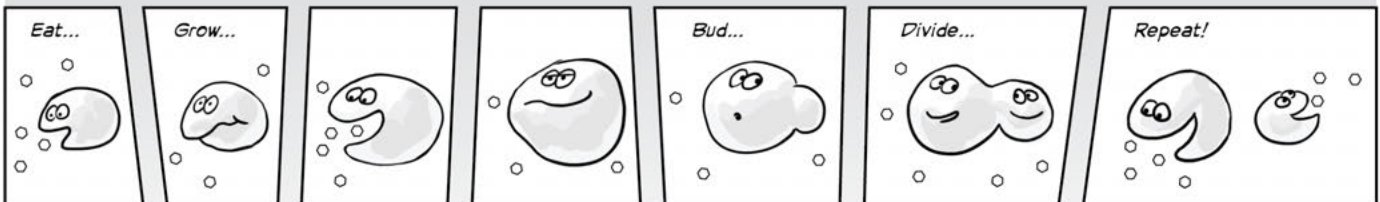
## ENERGY

Sugar is produced by plants (like wheat that's used to make bread flour). Through a process called **photosynthesis**, the plants store energy from sunlight in the sugar they produce. That stored up solar energy is what makes sugar a useful fuel for powering everything cells do.



## BUILDING MATERIALS

Some of the sugar that yeast cells eat is not used for energy. Instead, it's used for adding mass to the cells. The building materials yeast cells get from sugar allow them to grow, "bud," and divide.



By the way, this business of budding is a little unusual. Most other kinds of cells simply divide in half. But it's basically the same thing: self-reproduction by division.

Yeast cell budding



Other cell dividing





## WASTE DISPOSAL

When yeast cells break down sugar to get energy, the matter from the sugar doesn't just disappear. It gets turned into carbon dioxide.



From the point of view of the yeast cells, the carbon dioxide is just a waste product. In order to avoid swelling up and exploding, the cells need to get rid of the waste...



**BURP!**



But one organism's trash is another's treasure. In fact, the carbon dioxide gas yeast cells produce is the reason they are used in bread baking. Yeast burps out carbon dioxide gas, inflating millions of little bubbles in bread dough. That's what makes the bread dough rise, giving bread its spongy texture!



But wait a minute...



YES?

Real cells don't really have eyes or mouths!



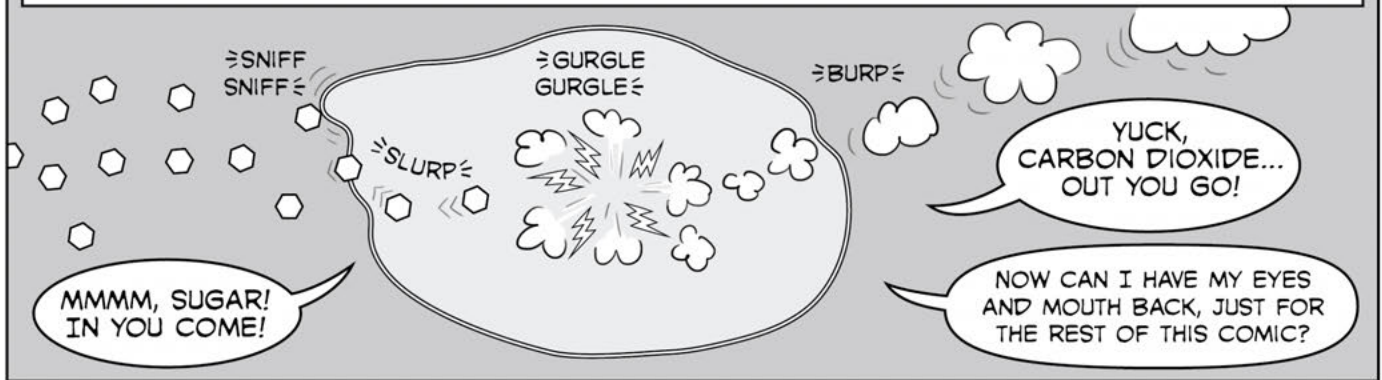
WE DON'T?

No! So how do they find food and eat? And how do they get rid of waste?



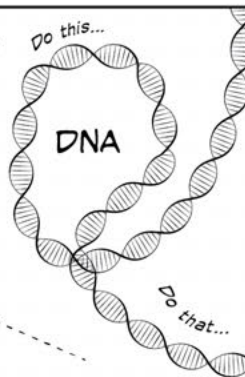
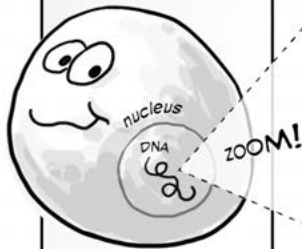
NEXT YOU'LL BE TELLING ME WE CAN'T REALLY TALK!

Yeast cells--and all other cells, for that matter--have a **cell membrane**. The cell membrane is a flexible boundary between inside and outside, between the cell and its environment. The membrane can identify many of the chemicals it touches, and it can select certain things to bring into the cell or throw out of the cell.



## INSTRUCTIONS

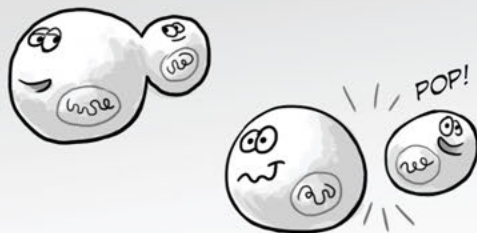
How do yeast cells know what to do? Inside each cell is a control center called the nucleus. The nucleus contains the cell's DNA.



DNA is a kind of molecule (a tiny particle of matter) that carries coded instructions for everything a cell is and does: how to eat, grow, manage energy, respond to changes in the surroundings, reproduce, and so on.

When a cell copies itself by dividing, it makes two of everything, including two nuclei (the plural of nucleus) and two copies of its DNA. Each cell gets a DNA-filled nucleus.

HANG ON TO THAT DNA, JUNIOR! AND PASS ON AN ACCURATE COPY WHEN IT'S YOUR TURN TO DIVIDE.



GETTING BUILDING MATERIALS, GETTING ENERGY, GETTING RID OF WASTE, STORING AND PASSING ON OPERATING INSTRUCTIONS--THESE ABILITIES YEAST HAS MAKE IT POSSIBLE FOR ME TO MAKE A LIVING BAKING BREAD.



End