

Gastroegyptology with Seamus Blackley

Ologies Podcast

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Oh hey, it's your grandfatherly neighbor, who secretly waters your plants for you, Alie Ward, back with a fresh, hot, steamy, *yeasty* episode of *Ologies*. We're all staying in, and without hitting up the store for fresh bread, a lot of y'all have been rising to the occasion and baking at home. So this past week I hunted down an ologist who can help make your bread troubles *toast!* I think you're gonna loaf it. But before that, thank you to all the patrons at Patreon.com/Ologies for supporting the show. Right now podcasters are lucky to work from their closets, but recording remotely is a giant pain in the hot buns and it costs more to deal with in post, so thank you for supporting, Patrons.

Happy birthday on April 17th to Steven Ray Morris. Everyone wish him a happy one on Friday. Thank you to everyone wearing items from OlogiesMerch.com, every person telling a friend or sending an episode around, rating, subscribing, all of those are life changers, and of course reviewing on iTunes. And to honor and embarrass someone each week I pick a fresh one, and this week, thank you A.K.Pete, who says they bought an iPad just so they could finally give me a review. That was way too kind — also I hope you also use it for pinteresting some bread recipes, 'cause you're gonna want them. Also thank you to Lut Norse for their review — four stars, titled "Crude language! This would be a fabulous podcast but the crude language by the host is a stopper for kids hearing it. Clean it up. Thanks."

Lut Norse, I hear you, and surprise, there are free bleeped episodes, safe for kids up. They've been up there for years, they're at AlieWard.com on the *Ologies-extras* page, it's linked in the show notes. Have at it! I'm sorry, heads up: there are some very enthusiastic curses in this episode. It's a hell of a ride. You have no idea what you're in for.

Okay, first off, *Gastroegyptology* — is this a real word? It is now. As of July 28, 2019. More on that story in a bit. *Gastro* comes from the Greek for 'stomach', *Egypt* is a duh. So eating Egypt, getting Egypt in our bellies.

This self-proclaimed "amateur" gastroegyptologist made global headlines last summer when he Tweeted about his experiments resurrecting 4,000-year-old Egyptian yeast captured from ancient pottery. Is he a professional baker? Nope! This wacky genius is a true polymath: his accomplishments are varied, they're all astounding. He studied particle physics, he's been a video game producer, he's widely known as the Father of the Xbox — that's right, he made the Xbox! — he was a Hollywood agent at CAA representing video game artists, and is now a tech CEO. He also loves to bake and I'll let him tell you the tales of his international triumphs in the world of yeast starters.

We were introduced via Twitter, and we're only a few towns away, but we socially distanced and spoke remotely, as the LA rain drizzled and I got hungrier every minute. Now, the first half of this episode will make you appreciate bread in ways you never have before — in ways *Oprah* never has before. It's chewy with history, and culture, and context, and a meditative appreciation for life, no matter how whack it feels — that is the *Why*. And the last half of the episode is the *How*: the very delicious DIY of bread, how to culture yeast from thin air, naming a starter, how long it takes to

make bread, what kind of flour to use, what to do if you kill a starter, how to be a yeast daddy, and the analog chill of taking a grain and letting it fuel you, with physicist, video game godfather and “amateur” gastroegyptologist, Seamus Blackley.

Alie: When I clicked over to your Twitter profile and saw that you were an amateur gastroegyptologist I was like, “That’s an ology, we’re doing this.” So how did you come to call yourself that, by the way? How long have you been owning that as a title?

Seamus: Well, that was actually suggested by somebody on Twitter who said, “Gastro Egyptology!” And so we very politely asked him, could we use that to describe this? And he said, “As long as you make sure as a disclaimer to say that it was suggested sarcastically.” So, okay, yes, it was sarcastically suggested, one should never take it seriously, and there you have it. So, I’m an amateur gastroegyptologist, and it may be that there actually are no professional gastroegyptologists yet, but you know, I’m hoping in the future that there’s a huge army of them.

Alie: Well, I kinda disagree, because you call yourself an amateur but I feel like you’re the only person in the world who’s doing it at a pretty high level. Are you an amateur? Really?

Seamus: You know, I mean, I’m not getting paid for it, that’s for sure. So really, if I could get like, you know, a grant or something, I suppose that then I could remove that. But I mean, look, I have a day job. I’m the CEO of this very stealthy tech startup and that’s more than a full-time job. So, the thing I used to do on Sunday mornings, that’s grown like the monster out of some 1950s science fiction movie into a city-destroying monster. And I still am not quite sure myself what exactly the hell is going on.

Alie: That was my first question for you in my notes. It just says, “Your backstory: What the fuck?!” You’re a physicist, but you’re also a video game engineer, you’re the father of the Xbox, you were an agent at CAA, like what — your life! *How* did you do all of these things and what were you always interested in growing up?

Seamus: One way to think of it is as, you know, a profound lack of a career, [*clip from 1990 movie Misery: “Ooooh, you!”*] or you know, a profound lack of direction in one’s life. That would be the, sort of, “stern uncle” way to talk about it. But I think the other hand of that is just that I’m really interested in basically everything. And so there’s some aspect of, like, doing whatever is in front of you that looks cool.

Alie: When you get into something, are you just so passionate about it you just go down a wormhole?

Seamus: Y-yeah... [*laughter*] You know, I think that the universe is so magnificently interesting, and beautiful, and profound. In even the smallest things, there’s so much complexity and beauty. It seems like a crime to ignore it or to walk by it. It really does to me. And so, I have this kind of fear of missing out of, like, everything. And I think that really is a powerful thing for me. You know, just walking around and noticing things, there’s just so much beauty. It’s remarkable to me.

Aside: Urgh! You thought this episode was just about bread? No! Buckle up and prepare for some heartfelt shit.

Alie: And do you think that, partly, why you started baking, was that something where you were slowing down and working with your hands since you work digitally a lot or in tech? When did you get into that?

Seamus: That was kind of the idea, and that's part of why it's so weird to think... it was so strange to find myself at Harvard, doing biological sampling of really ancient, like, priceless artifacts when it was supposed to be the relaxing thing I was going to do to get away from research on Sunday morning. But I think that, realistically - and I think it's probably true for everyone - that to really reset your mind, to clear your conceptual palette, you have to distract your brain with something else.

Aside: I asked if he knew when he fiiiirst started baking:

Seamus: Yeah, well I can't remember. My mother was this, sort of, perennially amateur kind of chef, and she loved cooking, and sometimes it was even good. *[laughs]* Her heart was really in it. And I started to be interested, for reasons I couldn't understand, in the baking of bread. And in college and then in graduate school, I would occasionally go through phases where I'd get it in my mind that I was going to bake some bread and it came out variously good and bad.

Aside: Seamus says he ended up working with someone on an optics job who inherited a wheat field, and the folks on their engineering team would bake sourdough from the family farm grains.

Seamus: And I thought, "You know, in terms of nerdiness, that's pretty good and maybe I should learn how to do that." 'Cause it's what your physics, or math, or engineering brain does with anything; you look at it, and you dissect it, and you want to find its purest part in its purest form, and you want to find challenge in it and find ways to challenge yourself, I think. And so a lot of engineers and scientists end up making sourdough because of, I think, a few things.

First of all, it's really interesting, technically. You have this somewhat random biological sample and it does an amazing thing. It transforms powdered grass seed into the foundation of civilization. And that's incredible! But it does it in a really, kind of, wistful, uncontrollable kind of naughty way. It's not predictable. You don't know what's in it, you don't know how long it's going to take. Based on the humidity in the air, and the temperature, and a million other things that maybe you can control and maybe you can't, the behavior of this stuff is different, but it turns out... and I think this is really lucky for our species: it turns out that almost any screw up or half-right way to bake natural bread like this, you know, is delicious and nourishing. So your village will survive no matter how bad you are at it.

It might have a lot to do with human beings, like me, being here! Because you can grow this grass which grows easily. Okay, and you get the seeds off it, and you can make this food, and the grain lasts a long time. You can store the seeds and it lasts for a really long

time. And then when you need it, you can kind of grind it up and make this stuff with it that feeds everybody. And people don't die! It turns out to have enough protein, and enough amino acids in it, and enough micronutrients, and starches, and sugars, and all these things that human beings need, it just turns out to have that. It's kind of miraculous.

And when you think about, "Is there life on other planets?" and in the universe, and all of that, you know, how lucky do you have to be to find something like that? And it's got all sorts of additional benefits too. Like, I have come to firmly believe that the fact that you can make beer at the same time as making bread is also hugely important in human civilization, because all of the people who need to go do all this heavy labor, you know, to farm, and to harvest, and to winnow, and all of that, you can tell them, "Hey, if you go do all this work, so the village survives, we'll also make some beer." *[round of applause]* It's like the lubricant that makes all the other hard work happen.

So it's really lucky that you can collect out of the air. Even if you just leave some of this grass seed around and mix it with water, it's going to start bubbling up. And if you, kind of, freeze those bubbles by putting it in an oven or getting it hot, you get this satisfying, yummy stuff that stops your kids from dying. Really super lucky. Really lucky. And so I started to think about all of that and I thought, "A really good, interesting challenge would be to figure out if I was, you know, as smart as your average 12 year old in the 1400s," and I could make bread out of just grass seed, or what the deal would be. So I started screwing around with that and collecting yeast, and it turns out that it was really delicious.

Aside: He realized that maybe ancient foods weren't gross, maybe we just lost the skill of cooking the ingredients right. Agrarian societies, just a side note, emerged about 10,000 years ago, and being able to stay in one place and have more reliable food sources is cited as a huge advancement toward the current, industrial age. And all because fermented, more aerated bread was fluffier, tastier and more nutritious. How do yeasts elevate it like that?

Seamus: The microorganisms that cause bread to rise, that make CO₂ - and also make the alcohols that give it its flavor - they're natural animals. They live on the grain. You know, it's not like yeast exists because we started making bread. No. The yeast has been there for a really long time and it eats the grain. When we started to make gruel out of this stuff, the theory goes, the gruel started to bubble if you left it out long enough. And if you left it out long enough and you heated it, it would make bread. And if you left it out long enough covered, the yeast would start to run out of air. And yeast can respire and feed both aerobically and anaerobically, meaning with or without oxygen. And when it respirates aerobically, it makes CO₂, which is the farts that make bubbles and bread and make bread soft.

[fart noise] [clip from YouTube: "Mmm smells so good"] When it respirates, when it eats anaerobically it poops out alcohol which what gives us beer. So if you leave it covered then you get a boozy kind of a thing, and that's pretty good. I mean, people definitely

would have taken notice of that. [*clip from Star Trek: The Next Generation: "So you mean I'm drunk!"*] This relationship between humans and fermentation starts, and it's hard to know what those primitive peoples thought of it, but they certainly kept the tradition going. And by the time that cultures like the Egyptian Sumerian cultures show up, they're already, from the start, experts at brewing and baking.

Alie: And did you, did you already know a lot of this stuff earlier? Did you always like Egyptology? And how did you partner up with Dr. Serena Love? She's the Egyptologist that helped you actually nab this yeast. Were you already in the Egyptologist scene, were you, like, in the group chats? Were you hanging out on the Reddit forums?

Seamus: Oh god no. All of this replaced, like, useful knowledge that I used to have but I don't have anymore. [*laughs*] I've always been a fan of Egyptology, like anyone. I mean, how can you not be? It's like dinosaurs, you know? If you don't like it, then something's wrong and we need to take you to see the nice man who's going to ask you questions about your emotions, right? The thing that happened to me was that when I was in college, I had to take a distribution requirement, one of the options that was available was actually Egyptian hieroglyphics. Yeah, it was cool. The teacher was actually an Egyptologist at the museum of fine arts in Boston, which is where I ended up doing some sampling last summer. The final exam for this class was actually going to the museum and translating stuff off of actual objects, which was so cool.

Alie: Oh my god!

Seamus: Well, even cooler than that, and I think this is lost on a lot of people - you can read those words and you can know what's in the minds of our ancestors thousands of years ago.

Aside: So what kind of mysteries do you unfurl when you translate hieroglyphics? I bet mysterious deep ones, right? Seamus explains:

Seamus: The other thing that I think people miss out on is that it's not some sort of weird, formal thing like you see in movies. It's a lot of, like, "Hey, uh, so, you know, Senewosret's sister is dating the overseer on the work crew and we know her crew is getting 50% more than we are and we demand that you change that." It's stuff like that. Or like, you know, "So-and-So's wife is sleeping with like So-and-so and so I made a wax crocodile in the hope that it would come to life under his bed." These stories are tremendous, and you suddenly get to know these people, and they were hilarious.

Their language is written down in these hieroglyphs and some of them are pictures of things, and they made puns with them, and they had a certain kind of humor. They were so smart and so successful. Their civilization lasted 5,000 years. I mean, it lasted longer than it's been since it ended. You know, they were, extraordinary and I came to realize what an extraordinary civilization this was, and yet how close to them we are and how much we owe them.

Aside: Seamus says he started to realize what a debt we owe to the ancient Egyptians, not just for carbs but for the way they understood medicine, and architecture, and how essentially the Greeks revered them and bit their style. And then

the Romans copied the Greeks! So the Egyptians are like your smart friends whose paper you copied. They were the nerds - as well as the hotties - and the ones should not challenge to a fight.

Seamus: Ancient Egypt was called Kemet to the Egyptians and Waset was the capital. Waset is actually the name of the ceremonial mace that the Pharaoh would brain his enemy with.

Alie: [*gasp!*]

Seamus: Okay, so that's the name of the capital. You'd go to Waset, and the pyramids were there, and they were smooth and white because they were covered in very precisely cut limestone that was actually taken off of them by the Arab invaders who are the modern Egyptians and used to build Cairo. And so, it was fantastically intimidating, and the Pharaoh was the ruler of the known world.

Alie: I feel like Egyptians were the first Instagram influencers, like everyone looked up to them and now that's just you being so extra. So extra at bread making. [*laughs*]

Seamus: No, it's totally true. You can look at the temples at Karnak and places and you see the Pharaohs. It was total Instagram. They'd have huge pictures of themselves and descriptions of all the stuff that they had done. There's this famous one actually of Ramesses II, Ramesses the Great. He was probably the Pharaoh from the Bible. He had this big military expedition early in his reign, and he got his ass kicked and handed to him. But if you look at the inscriptions and picture of this in Karnak, this huge temple complex, like his advertising for himself, what it shows is a series of epic victories each one just a little bit closer to home. So great. So great.

Alie: [*laughs*] I love that being a petty bitch is in our DNA. It's who we are.

Aside: So, Seamus got into all this history and hunger arose.

Seamus: Learning all of this, which was really news to me, the programmer physicist guy, was really powerful. And one day a few years ago - I guess less than that, maybe two years ago - a friend of mine who I know from the video game industry, who's a famous beer brewer, sent me a sample of some brewing yeast that was purportedly, you know, scraped from some ancient Egyptian pots. Various brewing companies had made Ancient Egyptian beer with this stuff.

Aside: But... what if he tried baking with it? Wait, stupid question: Can you bake with beer yeast?

Seamus: Oh yes, it's all the same. It's all the same stuff. Beer and bread are really the right and left hand of the same thing.

Alie: Okay.

Seamus: They really are. Like I said before, just in one case, in bread, you introduce a lot of air into the dough. And you don't take that long, you take maybe, you know, half a day or 18 hours if you're really crazy and trying to get really sour sourdough. So, you don't give

the yeast really a lot of time to respire anaerobically. So that doesn't make a lot of alcohol, but it makes a lot of CO₂, which is what you want to leaven the bread, right?

Alie: Yeah!

Seamus: When you make beer, you seal it up and you get the yeast to make alcohol.

Aside: And just a quick side note; if you missed the Zymology episode on fermentation and beer, yeasts are a fungus, and they're single celled, and humans have been using them in food and drinks for thousands of years, starting in the fertile crescent in the Middle East. You can see them under a microscope under 400x power, but it wasn't until 1857 when microbiologist, and French man, and father of the rabies vaccine Louis Pasteur figured out that it was yeast and not just chemistry that made bread rise and beer bubble up! 1857! That's when he figured it out!

Now, there's pretty much one common yeast used in baking and brewing with a ton of different strains, although there are a handful of other yeasts that do that work too. For thousands of years bread was just made with whatever yeasts were naturally present, and these little critters had more time to break down the grains and then rise up the dough.

Seamus: There wasn't any Fleischmann's Yeast in the old kingdom. You didn't go to the supermarket and get your yeast out of the fridge.

Alie: *[laughs]* Yeah!

Seamus: You collected it out of the air, or it came in with your flour, or most likely you were taking some of your old dough, or some of the yeast froth that develops on the top of beer and using that.

Alie: And so, this friend of yours is like, "Yo I got a hookup on some beer and this old yeast."

Seamus: Yeah so, I get it and I bake with it because, you know, it's right in line with everything I love; Egyptology and all of this. I think to myself, "This is fantastic! Now, in addition to knowing the minds of these people, maybe we could share a meal with them!" That would be tremendous, you know? What would this be like? And so you do some research into what the grains were a little bit, and I bake this bread. And I had been posting photographs of my medieval baking adventures, like trying to collect yeast out of the air in different places, and use different grains, and I had started milling some old grains like rye, like the central Europeans, and trying to make medieval peasant bread, basically.

So I applied that technique to this Egyptian yeast and put pictures up. I was used to, you know, getting a couple hundred likes or something, and it was like suddenly there were millions of people watching this. I was like, "What the hell is going on?" And it was really tense too because I would send pictures, like as I was baking during the day on Sunday, because it was relaxing, and suddenly this was no longer relaxing! This was like super intense because now it's, "Oh shit this has to come out!"

But part of it was that people started asking questions, like, "How do you know this is ancient yeast? Where'd you get this from? How do you know you're doing this the right way? How did they bake?" I didn't have any answers, and worst of all, my wife said, "Yeah, well, they have a point." [*"Oh come on, man!"*] So I found the most vocal critics, two of whom were, Dr. Serena Love, and Rich Bowman, who's a microbiologist at University of Iowa, and I said, "All right! So you're right. How would we fix it? How would we do it right?" And that's where our little product was born.

Aside: Well, he certainly leveled up from his sleepy Sunday bread sessions. Seamus mentioned that there are still DNA & RNA analysis to do, and they're working on it, given it's pretty much a side hustle passion project.

Seamus: This is like gentlemanly science in the Victorian sense, right? Where we may be all professional scientists on other projects, but this is a little self-funded project of our own. Getting DNA analysis of yeast is complex, and we're doing it, and that's just really a disclaimer. What we decided to do was take advantage of a couple of different things that are true about baking, and natural yeast, and ancient Egypt.

First is that yeast and a lot of the bacteria that make up natural leavening can hibernate. They can go to sleep, they can encapsulate themselves in various and sundry ways and survive almost anything. People have taken yeast strains to space, exposed them to vacuum in space and brought them back to Earth and revived them. Yeast might be able to survive indefinitely long, you can dry it all the way out and then give it water again and it comes back.

Aside: So, this dormant state is called 'quiescence' and it means essentially 'to rest' or 'to snooze'. I came across one microbiology paper called "Sleeping beauty: quiescence in *Saccharomyces cerevisiae*." But how does it even chill that hard and how long can it take a fungus nap? Nobody knows!!

Seamus: Maybe it's just immortal, to be honest, and I'm not exaggerating, so that's important to know. The other thing is that the ancient Egyptians used ceramics kind of like plastic. There's a very technical term Egyptologists use, which is *crapware*. And *crapware* is the pottery that Egyptians made in huge quantities, and would just toss away when it broke, and just make more because they're constantly making it. And you find piles of this stuff, apparently, on digs, like the size of houses of just broken pottery, just a trash heap. You find little cups for drinking, and you find brewing and baking vessels, and *et cetera*, *et cetera*. Well, all of the brewing and baking vessels are candidates for us because this was all, like, terracotta.

Aside: Terracotta, side note, is unglazed pottery. It's that ruddy rough stuff.

Seamus: But it had what's called 'inclusions', which means basically animal poo, and sand, and stuff. What it meant was that these fired ceramics were porous and liquids could soak into them. So the theory is, and I think it's true because we've done experiments on this and seen it, that the microbes that are in beer or baking activity can soak into the ceramic matrix, into the little pores in the middle of the walls of the vessels, right? And

then they can dry out, and then you could throw the vessel away, or bury it, or whatever, and they're protected. It's like a little time capsule inside the middle of the pottery. Okay. When people say, "Oh, we scraped some yeast off of the wall of a bakery..." or off a pot, you know, I think you just scraping modern dirt off. Especially if it's in a museum, you know, it's whatever dirt it was buried in and whatever was in the museum for hundreds of years.

But inside, really, you can imagine the sort of porous microstructure of this pottery where the yeast had seeped in, and the bacteria, and gone to sleep. They might still be there. So Rich Bowman's idea was: Could we do a kind of microbial fracking on that? Could we use a fluid filled with nutrients and amino acids, all the stuff that these organisms like... Could we flood a piece of ceramic with that, let it sit for a little while so that things wake up and start to, like, let go of the surfaces that they're attached to, and then vacuum them back up again, and take them to the lab and see if we can revive them. [clip from *Young Frankenstein*, Dr. Frankenstein: "Alive! It's aliiiiive!"]

Aside: Okay, so this pottery is 4,000 years old, and it was recovered from below a temple in Giza near the base of the pyramids. And this plucky team of gastroegyptologists were allowed to suck up the yeast from these pieces at the Museum of Fine Arts in Boston and the Peabody Museum at Harvard because their collection methods were non-invasive: so no scraping, no breaking it open. They actually do three levels of samplings. This is not for casual hobbyists.

Seamus: So, a lot of thought is put into this and a very specific type of fluid is used. And when we do this it's in as much of a sterile environment as possible. I wear sterile garb, and masks, and gloves, I mean stuff that's normal today. [laughs] Last summer it was weird to see people dress like this. Now you see people like that on the street but, fine.

Alie: 2020 Spring fashion!

Seamus: Yeah. In any case, that's how we ended up sampling. That was a protocol developed by Rich in answer to my question of [sarcastically] "Okay, smart guy, [both laughing] if you want to tell me I'm doing it wrong, how do I do it right?" But that's only half the equation, because the other half is how the hell do you get anybody to let you do this? Dr. Love, she really took a bet on me not being a crazy person, or rather being the right kind of crazy person I guess.

Alie: [laughs]

Seamus: She put her reputation on the line with a lot of really important people in the world of Egyptology, that it was okay to talk to us, and we wouldn't hurt anything, and this would be interesting.

Alie: And what kind of pot exactly were you able to get access to?

Seamus: A lot of pots. And the pressure was really on for me, because Serena had bet a lot of her reputation on this, as did Rich. And I would show up like, [goofy, arm-flailing voice] "Ah you know, I'm a particle physicist, I don't know anything about this." to try to make good on this, and make sure the result was treated respectfully, and also get people excited

about Egyptology. But anyway that's an aside. The goal was to find the kinds of vessels that would have been infected with the beer and bread culture, where it would have dried out. So vessels that beer was brewed in, vessels that bread is kneaded in or rose in, or where the dough was mixed. And we had a lot of guesses.

We even sampled fossilised, or preserved, or dried out actual ceremonial loaves that had been buried in the old kingdom. We tried a lot of different things. We have a lot of samples. All of them were categorised by where they were taken, when it was from, what the vessel was, which sample it was. Rich then freezes some of each one so we have a record forever that's sitting at -80°C in a freezer in Iowa. Then he would feed some of them, and develop them into colonies, and select out the yeast and the bacteria, and the things that were obviously modern, and get rid of those.

Aside: And then there are DNA and RNA extractions and further analysis. So first come the lab coats, then come the aprons.

Seamus: And this is the Sunday morning hobby that everyone is looking for. I mean, good lord. [*jokingly*].

Alie: [*laughing*] Sounds super relaxing.

Seamus: [*sarcastic*] Super relaxing, no stress, really inexpensive.

Alie: [*fake YouTuber voice*] It's really DIY, just things you have lying around.

Seamus: Yeah, I was thinking of, you know, learning how to make kombucha, or maybe travelling all over the world doing microbial sampling of ancient Egyptian artifacts. One of the two.

Aside: Okay, so once you get a few of these sleepy little yeasties, what do you do? How do you make it a thriving, grinding, burping, farting fungus party? Okay here we go. We have the passion, we have the history, we have the context. So how do you start a starter?

Alie: How much yeast do you need to make a starter?

Seamus: Not very much because what you do is you amplify it. You need not more than a few cells. That's the trick. Those cells are everywhere. I always say... and I've actually considering doing this, you could probably bake bread using the yeast in the air in your car tires. Yeast is everywhere and it's on everything.

Alie: [*incredulous*] Nooo.

Seamus: Yeah, it's just everywhere. It's hard *not* to collect it. One of the funny things about the pandemic has been that apparently there's a shortage of baking yeast.

Alie: Yes, people are saying that.

Seamus: And you see all these microbiologists responding on social media saying, "Guys! There's no shortage of yeast. What the hell are you saying?"

Alie: [*laughing*] Yeah.

Seamus: What you really need to do is amplify it so you have enough yeast, hundreds of billions of yeast cells, to make a loaf of bread. And you just do that by feeding it. And it's actually pretty simple. Again, this goes back to the luck we have as the human race that this is so easy. You just feed it flour because you want it to eat flour. So you have this jar of stuff, and you keep feeding it flour and pouring half off, and eventually everything that can't eat flour is gonna die because it's starving.

The stuff that can eat flour is going to reproduce and reproduce like a huge, amazing buffet orgy until you have a lot of it in this jar. You're purifying it by doing this, and that's really what raising a starter culture is. [*clip from The Hunger Games: Effie Trinket, "May the odds be ever in your favor."*] And I think you should feel vaguely guilty about it when you have your sourdough starter, frankly.

Alie: You went like full hog – what do they call that? – you went ham on it and you used, like, hand-churned, hand ground amaranth and old Egyptian grains to do this loaf right?

Seamus: Yeah, the Egyptians used a very early wheat, the first cultivated wheat we think, called emmer, which is also farro, for bread. They used barley and einkorn also, but usually just for beer. And those are also both very primitive grains. Barley is used for soup now and farro is put into warm salads.

Aside: Seamus makes a point that emmer or farro and barley, these were like the burliest of grains, they built the people that built empires. But you may now recognize it from the menu of a boho chic outdoor wedding reception.

Seamus: [*laughing*] The Roman armies that conquered Europe were fed emmer and now it's used for *warm salads*, so that's kind of cool. I'm sure that a huge muscle-bound centurion would find that amazingly amusing. So yeah, we got that stuff not only for accuracy but also these microbes have been asleep a very long time. If we did actually get ancient microbes then they lived and went to sleep before modern wheat had ever been bred. They have no knowledge of it – they want to eat emmer. And what we found just anecdotally is that this culture that we have doesn't like modern wheat. We have hundreds of samples, but I just use one culture actively because I kind of stole it around the edge to try out.

I took one sample home and I sent the rest to Rich. This one sample I started to raise like a regular sourdough starter but in a sterile environment. I sterilised all the food and water that it gets, and I used UV lights and flames and stuff to make sure it didn't get contaminated with anything. So, it's really just that sample. Recently I sent some of it back to Rich and he confirmed that I hadn't contaminated it yet, which is pretty good. And it lets me have a lot of cool equipment in my kitchen too, which is great.

But when I split off some of this stuff and try to feed it modern wheat, or hard red wheat, or any of these varieties that were developed over the past couple of thousand years it doesn't grow very well. [*"Yeah, no thank you."*] But when I feed it emmer it's crazy. It loves it. It's its food, its comfort food. That's a good sign. That's part of what gives me confidence that we actually captured some ancient organisms.

Aside: Seamus says that sourdough is three ingredients: flour, water, and salt. And then of course all the little yeasties in the air. Now the rest he says is just technique. Think of it this way: you can have three balls sitting on the counter. They don't do much, but if you learn to juggle, dang, those three things just became a party. So it's not the objects, it's just what you do with them. Hm!

Seamus: There have been teams that have made "ancient bread" and "ancient beer," and they say "Oh it's not very good," and "ancient people must have had different tastes." Oh fuck you, it's bullshit. Bullshit. It's just that you're bad at it. It's that you're a scientist, and you may be a very talented scientist, but you're not a baker. If you had a master baker in, and the master baker took the time to learn how to do this, that person could probably make really excellent bread using these ingredients and these techniques just as people millennia ago did.

Just like in the Navy where the food is the most important part of the morale of the sailor, the food is the most important part of the morale of these work crews. All these guys were put up in these temporary towns that were at the base of the pyramids or the base of the temples that they were building, and we find the bakeries there, and the breweries there, and the kitchens, and the flop houses were they all slept. And you know they were fed well. A guy who works out all day moving multi-ton blocks of granite, and moving them into position within the width of a piece of paper next to one another, which is how the stones are set in the pyramid; these guys had a high caloric intake! They needed to be fed really well. I think the job of figuring this out is figuring out how you would have made bread that would have satisfied those guys. A guy who could trivially snap your neck after moving around four-ton blocks of granite all day.

Aside: When someone has been hauling tons of huge bricks, for lunch you do not hand them another brick.

Seamus: You don't do that!

Alie: [*Laughing*] Yeah. So you baked it, it came out of the oven. How was it?

Seamus: It was really good. But again, I knew it was going to be really good because I could tell that it was going well. I could tell that the starter was doing well because I had done it all before. It wasn't like a big mysterious reveal like everybody wants to tell a story. I'm sorry.

Alie: You said on Twitter, it was a little sweeter?

Seamus: Yeah, well all sourdough starters taste different if you collect them different places. People say, "Oh it's the water" and all these different things. No, it's just the microbe content. The different species of microbes produce a different flavor, and the flour that you use produces a different flavor. It's not mysterious craziness. This culture, when I was amplifying it, when I was feeding it the sterilized emmer flour, it smelled really different from my other starters. Really, really different. It's probably what excited me about it. When we tried the bread, it had a different, delicate, sweet character. It was sweeter, it was sour in a more delicate way.

The miraculous thing was just that it made bread! It made a really nice loaf of bread. It was this starter made by sampling a pot. You have to understand that we did it in sterile conditions, with sterile fluids, and that it was always moved under UV light and sterile conditions, and fed sterilized food. So there's nothing in it that didn't come from the inside of that pot at all and [*amazed*] it made bread!

Alie: [*exclaims in amazement*] Ahhh!

Seamus: That's amazing to me. And watching it, and doing it yourself, and taking the care, and ensuring that it's all sterile, and then seeing that happen is extraordinary. The flavor was different, and it was really cool. I was glad for it because it made me feel like maybe we had done something right. The overarching thing for me is a little bit more subtle. And maybe after listening to me talking about all this, this is going to make sense, but for me the emotional thing wasn't eating the bread.

For me, the emotional thing was that 4,500 years ago, there was someone who was making this bread, and she had her starter, and it was her whole life. She was making all these loaves of bread for all these workmen on the Giza plateau, and it was her job and her life, it was her work. And I got a little bit of her starter and I got to be there with her baking. And I was with her. And that, for me, was the most important, most mind-blowing thing.

Alie: That's huge, that you have a connection with this person.

Seamus: Yeah. A real connection, not bullshit.

Alie: Who you'll never meet but there's... yeah.

Seamus: Yeah...

Aside: Seamus made the point that the Egyptian culture and religion was based on the idea of eternal life and coming back from periods of dormancy, of forced inactivity. So if you're listening to this in your Tuesday sweatpants, that might strike a chord.

Seamus: The symbolism, the idea of resurrecting that and sharing that activity: this basic, most important activity of making food like that is really special. I think at the end of the day, that might be why people are so interested in this because otherwise it's inexplicable. I mean, watching yeast cultures grow is not the most thrilling thing.

Alie: Well, I mean, seeing something fart is fun.

Seamus: Sure! I hadn't thought about that. That's true.

Alie: Sourdough starters are really personal to people, they carry them around in jars, they're named. I think right now with this pandemic, we're seeing a ton of people start to bake and a ton of people start to make their own sourdough - which I'm sure you've noticed.

Number one - did you name this sourdough starter? And what makes something a sourdough starter versus another starter? Very stupid question. But you're smart. So I'm asking it.

Seamus: [laughs] No, it's okay. So again, you just have to keep in mind our place in history, that being able to buy purified yeast for baking that's designed... literally genetically designed for baking, is a really new thing. It's really only in the past hundred years or so. Prior to that, all bread was made with natural yeast, which we would call sourdough. You really don't think about it, like a sourdough starter is really just a sample of microbial culture. And that culture can eat flour, and make gas, and leaven your bread. That's it. So sourdough really is a modern concept.

A lot of the reason we call it sourdough is because there's a specific style of baking with those organisms where you have a much longer fermentation at a cooler temperature that brings out more of the lactic acid, which is what the bacteria poop out, and causes the bread to be more sour. That is done both because people prefer that flavor, but also because it makes the bread last longer because that lactic acid is a preservative. So if you're going to be, you know, selling food to the miners as they did in San Francisco, then having more lactic acid helps the bread to last longer and not go moldy.

Aside: And that lactic acid tang comes from a *Lactobacillus* bacteria – full name, you ready for this? - *Lactobacillus sanfranciscensis*, (yeah that's a lot of S's) because of San Francisco's sourdough history. Now, I was born there and I grew up in the Bay Area and I never realized literally until this episode just how hyperlocal sourdough 'culture', if you will, was. Clam chowder served in a bread bowl: it's a way of life. And if you don't eat the bread bowl, you're actually not allowed back into the city, which is harsh but it's fair.

Also what about gluten? 1% of folks have celiac disease, which is an autoimmune disorder that damages the little fingery absorption villi in the intestines and gluten can trigger all sorts of terrible symptoms. But many more of us may have non-celiac gluten sensitivities or can't break down totally different parts of wheat, like fructans. So, sourdough starter and long fermentation can help breakdown some of that gluten, yes, but also the hard-to-digest fructans and polysaccharides, which may be why folks have an easier time eating European-made breads because they straight up might have way better yeast starters that break that stuff down. Research is ongoing.

But yes there is gluten in sourdough, less than other types of unfermented doughs, but if you find that sourdough doesn't bug your butt like other breads, gluten may or may not even be the real issue. It could be other stuff in wheat that needed to be properly broken down before you ate it.

Seamus: The fact of the matter is that there's a lot of gluten in bread because that's what makes the balloons that the gas fills that causes it to rise. So, saying there's less or more gluten is kind of funny. As a baker you want more gluten because that's how your bread rises, and if you don't have gluten then you have to have something else that can make little balloons inside the dough to hold the gas which is ultimately what makes it 'bread'. Bread is really like froth farming. You make a foam, right? It rises, it's a foam, and then you freeze that foam in the oven, and then you eat it. That's really kinda what the deal is with that.

And so, you asked also if I named the culture and no, I didn't name the Egyptian culture because it doesn't belong to me; it belongs to that baker. And that's a really important thing to keep in mind. We looted so much stuff out of Egypt in the West and also worldwide, these things belong to the ancient Egyptians. They made them, they belong to them. And this culture is no different, it belongs to that baker. My intention is, once we've done our work, to return that to Egypt and to make a strong point about the ownership of that, so that's why I didn't name it.

Aside: Seamus thinks people have probably named their starters for centuries. There's one page on Reddit of just folks sharing their starter names. I've plucked a few for you: Bradley Cooper, Clint Yeastwood, Yeast McYeastface, Vincent Van Dough and Doughy Zeschanel. The name of the subreddit? Breadit. Nice! Now, this tradition in the past may have come from a family necessity rather than a hobby. But you know, in a time of sheltering and getting out to the store less, being able to make your own fresh food at home feels kinda more important these days.

Seamus: It's like the difference between somebody naming their yacht and somebody naming their fishing boat. You know, one is a lot more serious.

Alie: Good point. Do you think that people making their own bread is somehow an attempt to feel more grounded to those times?

Seamus: I think it's the most human thing you can do. I think that the story of bread and the story of the human race are inextricably linked. And I should point out here that that's kind of biased. In Asia it's really the story of rice and rice cultivation. But it's that same deep connection, maybe in a really deep way, in a genetic sense, the idea of bread, and the comfort of bread, and the baking of bread being the most comforting thing, the most grounding home-y thing we can do. We evolved with that. It's in us. I think it may be that we have it backwards. It may be that it's *inescapable* in a crisis that people will start to bake.

Alie: Mm-hmm. And if you inspire other people to bake, then it's your fault if they're all walking around with named jars.

Seamus: Yeah, no, that's been pointed out to me.

Alie: *[laughs]* In a good way?

Seamus: There are people on social media who I thought were joking but are actually angry with me that there's no flour.

Alie: No! *[laughs disbelievingly]*

Seamus: I literally was like, "Oh yeah, hahaha!" And they're like, "No, fuck you."

Alie: Oh no!

Seamus: It's like, whoa, okay dude. I just don't think I'm actually responsible, but, okay.

Alie: I have a ton of questions from listeners. Can I just super lightning round throw a couple at you?

Seamus: Yeah for sure. I'm sorry I talked so long. Go!

Alie: I love it! Are you kidding? This is my favorite.

Aside: After the break: how to bake bread and all of your questions. But first, every episode we donate to a cause of the ologist's choosing. And with no hesitation, Seamus asked that his go to the Boys & Girls Clubs of America. Boys & Girls Clubs provide a safe haven for more than four million youth, giving them an opportunity to discover their great futures. They have tutoring, and mentorship, and after school programs. A donation went to them in Seamus's name. That donation was made possible by some sponsors of the show who you may hear about now.

[Ad Break]

Okay, how to culture a starter and bake some bread, and your questions. First question was from Patron (and a mutual beloved friend) Casey Handmer. Seamus worked with his kickass brilliant wife, Dr Christine Corbett. Casey is also a genius and an accomplished baker, and I had no idea that these two were buds but Seamus and I off-air spent a while just chatting about how wonderful, and curious, and smart they are. Anyway:

Alie: Casey Handmer: Can yeast synthesize vitamins? What's up with that?

Seamus: I think yeast can actually be made to synthesize almost anything. I've looked at some papers recently - Casey and I will text them to you [Alie giggles] - where people actually have yeast making all sorts of molecules, and there's actually a naturally occurring yeast that makes oil, and even wax. So it's an incredibly versatile lifeform.

Aside: Okay, sidenote, I did some digging of my own, and for some light bedtime reading may I suggest *The Journal of Microbial Cell Factory's* March 2019 paper "Increasing jojoba-like wax ester production in *Saccharomyces cerevisiae* by enhancing very long-chain, monounsaturated fatty acid synthesis"? It's a ripper.

Alie: Helen Pang wants to know: How does yeast activity correlate to temperature? How fast does sourdough rise at 40°, versus 60°, versus 80°?

Seamus: Okay, so that's a complicated question. And I will unnecessarily complicate it further! Yeast, like all microbes, operates at a higher rate at a higher temperature right up until you start to shake it apart with heat and it dies. Proofing your bread at a higher temperature is going to make it proof faster. It's going to change the way that the water moves around in your dough, and it's going to change some other things about it too. So you gotta be careful not to go really hot all the time. But the flavor profile of the bread also gets changed specifically with sourdough because you have a mix of microorganisms and all of those microorganisms are more or less happy at different temperatures. But bacteria are much happier at lower temperatures. And I mentioned before when we were talking about San Francisco sourdough that you can make bread more sour by fermenting at a lower temperature for a longer period of time. And that's because the bacteria are happier there.

On the other side, in Egypt, on the Giza plateau, it's pretty hot during the day and so one of the things I learned about these yeast samples that we have from there is that they're really happy working at 95° or 98°. [*“Oh, I like it hot.”*] And in fact you can get a fairly sour bread at 90°, which I don't find to be the case with other sourdough starters that I have.

Aside: And again, a sourdough starter is just water, flour and whatever little single-celled friends and lactobacillus bacteria harmoniously chomp and break it down. Bakers yeasts or quick yeasts that you buy in a package work faster but may have fewer nutritional and digestive benefits than fermenting your dough and raising a beautiful burping sourdough baby that you name, like, Breaddy White, or Scoop Doughy Dough. [*clip of Snoop Dogg: “You gotta understand that you're the gift that keeps on giving.”*]

Also, Elliott Warden asked: I heard of someone making bread using their vaginal yeast and I thought that was so cool. Maybe not recommended, but suuuuper cool, Elliott says. And yes, Elliott, I looked it up for all of us and that is one way to get yeast, and Zoe Stavri, a British blogger, wrote all about it. I followed some links and it lead to me getting RickRolled, but I'm never one to give up, I'm never gonna let you down, so I kept searching. Her blog post (I finally found it!) said that the end product of this experiment was pretty tasty but the yeast was most likely stuff that was in the air and in the flour. There are better, maybe less personally invasive, ways to procure fresh wild yeast.

Patrons including Heather Munro, Topher Henness (and his lovely wife), Mari Strydom, Veronica, Brandon Lepine, Kylie Caromba wanted to know about proper yeast hunting in the wild.

Alie: Danielle Garrett wants to know: How does one know what kind of wild yeast is good for what? Is the yeast found in certain areas of the wild? And Sam Gordon wants to know: Does yeast from different locations contribute to bread bake time or rise? Like, if you were going to, say, go out - you get a wild hair to get a wild yeast, what is a good strategy?

Seamus: A few things. Different yeast you collect in different places absolutely taste different and they act different. A lot of questions to me on social media right now, including from close friends of mine are, “Oh my God, how long is this going to take? And how long should it rise? How long is my starter going to take to get over the rubber band I put around my jar?” The answer is based on how much water versus flour you have, what microbes you have, what temperature it is, everything changes. And that's part of the great thing about baking with sourdough is that it's not like a rules-based thing. It's the ultimate escape from programming or actuarial work. You don't know. It's 100% feel and you just have to watch, and smell, and listen, and learn, and practice a lot.

And there are a lot of Instagrammers who are like, [*goofy voice*] “This is my sourdough starter!” And I gotta be honest with you: Everyone I know who's a baker knows that they're full of shit. They're putting commercial yeast in there and showing it pop up. It's totally clear. [*“Gotcha!”*] Also, there are a lot of bakers out there on Instagram and Twitter who say, [*goofy voice*] “Here's my 100% whole wheat,” and you're like, “That is

not 100% whole wheat.” It has none of the signs of being whole wheat and you’re full of shit. But we try to be nice.

You get a different flavor everywhere. There’s yeast in the flour that you get because the yeast is living on the grain in the wild on the farm. So you can actually make a good starter in your kitchen. You don’t have to sterilize your flour and then go out in nature and collect it. I do that because I want to get different flavors and characteristics from yeast that we get in different places. But you don’t have to if you just want to experiment with a starter. You don’t have to use whole grain. You can use regular white bread flour and you’re going to have a much easier time, and I’d encourage you to do that.

But you know, if you’re a freak like me and you go out in the field, you’ll get all sorts of different organisms from different places and they’ll give you really different flavors in your breads. It’s super fun and interesting. And it’s also communion with our ancestors who had no choice, right? You can really respect them by trying to see if you can bake like they did, trying to see if you can feed your family with some grass seed, and some water, and some salt if you’re lucky. And that’s a really cool thing. You know, in this crisis that we have now, I think that we’re all drawn back toward that, and I think it’s important to remember that people endured much bigger challenges than the one that we have right now with much less and did great.

Aside: So if you’re sad about staying in or annoyed that you’re missing Coachella, I get it. But remember we are saving a lot of pain, including our own, by just sheltering in place. You used to have to know CPR or how to work a firehose in order to save lives, but isn’t it cool you can do the same thing just by watching Netflix and eating frozen pizza? Or baking bread.

But how do you *dooooo* it? So many of you Patrons wanted to know, what are the tips for baking? Where do we start? Shea Littlepage, Michael Aiguier, Ira Gray, Guillermo Ruano, Annie Calonico, Kim, Kelly Semon, Catherine Gilbert, Kaydee Coast, Kailey Rhone, and first-time question-askers, Rachel Davis and Heather Moore all wanted to know: How do we start?

Kelly said: Any tips on a homemade bread one could make at home with access to flour, no yeast, and a housemate who will absolutely throw away anything bubbling in a jar no matter how much promise it holds?

Catherine Gilbert wanted to know: why the eff can’t I cook bread? It fails every time!

We understand, that’s why we’re here.

Alie: If you were going to start... If you were like, “This is it. I want to work with my hands, I want to get my mind off of things, I wanna bake bread,” where should people start?

Seamus: Well there are a lot of resources, but if you look on my Twitter page @SeamusBlackley, I am continuously putting up there a big thread on yeast collection, with some jokes of various levels of funny in it. But it has pictures and shows you exactly what it should look like. It takes about a week. And then there’s a tutorial on taking that and making your first loaf of bread with it. A lot of people have had success doing it. And like I said,

there are many resources for this. You can look all over the place and there are a lot of really great video/pictorial examples of how to do this. You should look for it.

It's really not that hard once you get your mind around it. It's like training a dog and the dog trainer is always telling you that you're not training the dog, you're training yourself, right? And it's the same thing. It's training yourself to pay attention to what you're doing and not thinking that it's like an app and you tell it, "Bread now. Bread!" and it does it. That's not how it works, okay? You need to get out of yourself, get out of your fuckin' head, get into the dough a little bit. The rewards you're going to get are many-fold.

Aside: Okay, I searched his twitter and I found this massive thread from June 2, 2019, and I'm going to read it to you very quickly in an overview and there'll be a link in the show notes. Seamus wrote:

First, you need to have a very active (technical term: BANGIN') yeast culture ready. We will need 150g of culture for this loaf, so put 80-90g flour in a bowl, pour 20g of your main culture in, and mix with enough pure water to get the consistency shown here.

Also sidenote from me, go for pure water or filtered water or boil your water and let it cool, that way it doesn't have a bunch of chlorine in it and it kills your yeast. Just sayin'. Seamus says:

Now wait. While you wait, take a moment to get your shit together. You're going to need: 300+g of filtered water that you let sit for 30+ minutes, pure sea- or mined-salt, really good extra virgin olive oil and the best flour you can find.

Other things you need to have ready:

An oven that can really get to 500F/260C; Good kitchen scale; A whisk; Big main bowl; Medium Bowl; Baking Sheet; Some ice cubes; Plastic wrap or waxed cloth; The ability to stay sane while nothing seems to happen.

He shows a picture of what your culture is supposed to look like just when it's about ready to go. There's a bubbly surface - looks like Jello.

Now we are ready to begin. Using your scale, and being as exact as you can, add 250g water, 25g oil, and 150g culture to your bowl. The culture should FLOAT!

Add 100g of the flour and whisk everything together until it's smooth. We want a lot of air in the mix for the yeast to respire. Remember, these little dudes have got to breathe.

Next, add the remaining 400g of flour to make a total of 500g. Mix it around. [There are pictures of the consistency.] If it's too dry, add a little water and knead it. Too wet: use some flour. It should be just on the edge of sticky but not actually coming off of anything. Now, cover it and wait for half an hour. What's happening is that water is moving around and filling all of the flour, dragging the yeast along with it. Next, we either die of boredom - or - prepare the bowl for the next steps.

He shows some kneading tips, folding some salt into the dough...

To recap, mix all of the stuff together. Wait, like an abandoned dog. Knead in the salt, wait like an unwanted lover. Do the foldy thing. Wait. Foldy. Wait some more. Fold-y. Nearly perish from ennui.

He goes on the detail how to continue to let it rise, a cute pretty slice in it, tossing it into a 500° oven for 10 minutes, then putting in some ice cubes, lowering the heat, and letting it continue to cook and become bread.

Anyway, that is an overview. If you go to [AlieWard.com/Ologies/Gastroegyptology](https://www.alieward.com/Ologies/Gastroegyptology), I will link this particular Twitter thread. There are so many photos and video, and just follow Seamus Blackley while you're there for all of your bread inspiration needs.

Alie: Rachel Davis, first-time question-asker, asks: What's the best type of pan to bake bread in? Glass, metal, or ceramic? Does it matter with bread?

Seamus: Apparently not. Rachel, that's a good question. People have baked bread in, literally, everything. Hobos make bread on railroad tracks, as Casey knows. Australians have damper bread which is made on a hot plate. Egyptians baked without ovens in pots that they buried in holes with embers in them. You can bake in anything.

If you're starting out as a baker and you're doing it in your oven, the easiest thing to do is to bake inside a Dutch oven inside your oven or any kind of stoneware or metal pot. If you're an inexperienced baker, it helps you get really nice-looking loaves because it keeps all of the moisture around the bread. Moisture inside of the oven, believe it or not, really helps the bread to stay elastic as it bakes and expands in the oven. You've probably seen the videos of bread baking in the oven that are amazing. [*clip of Oprah: "This is the joy for me. I love bread!"*] If you have a container inside a container in your oven, it really helps with that. So you can look up Dutch oven. It's a really great way to start.

Aside: If you're like, "A Dutch oven? Are we talking about farting again?" No ma'am, we're not. A Dutch oven is like a cast iron pot with a lid. The benefit to starting off baking your bread in a sealed pot is that it traps the steam from the dough and it gives your sourdough a good rise and a shiny crust. If you have an oven-safe pot with a lid, look into baking times with that action. Oh, and speaking of upper crust...

Alie: Rylee Clingingsmith wants to know: Why do people make slits in the top of loaves before baking them? Is it decorative or functional? When did it start? How long have people been doing it as art, too? I know I've seen some beautiful spiral slits. What's going on with that?

Seamus: Like all good engineering, it's both decorative and also functional. When you put bread in the oven, as I said before, bread is like a foam. You're, like, froth farming. All the microbes in the bread - whether it's commercial yeast or wild yeast - have farted out CO2 into the dough. And the gluten in the dough... or if you're baking gluten-free, your xanthan gum or whatever you're using to give it elasticity, what you're really doing is making little balloons inside the dough. They're filling with the gas that the microbes are pooping or farting out. This causes the bread to rise. It's kind of cool because it rises

everywhere at the same time at the same rate. Which, by the way, is exactly analogous to the way the universe expanded. But I don't want to digress.

When you bake, what you're really doing is trying to 'freeze' that into the position so that you have a solid object now. The dough is, obviously, squishy when it's rising and when you put it in the oven it comes out as a solid. But, in the oven, when that CO₂ heats up, it expands. Everybody in high school should have learned the ideal gas law: $PV=nRT$. What it basically says is: all things being equal, if you heat up a gas it expands. That's what happens to the little pockets of CO₂, yeast farts, inside your dough; they'll all expand. So the loaf expands and pops up inside of the oven. [*Pillsbury Doughboy "hoo-hoo!"*]

What will happen, if you don't have places that you've slashed on the surface of the bread for the expansion to take place, is that your loaf is going to rip open. That's cool, that's cool and kind of free jazz, ya know? It's like, you know, gonna be weird. But if you want to control that and have it look professional and adult, people have developed really sophisticated ways to introduce faults; fault lines on the surface of the bread so that it splits open in a predictable way. That's what people are really doing. If you have a lot of practice with it, then you can control how it opens up and make really beautiful designs.

At its most fundamental level, if you don't want the thing ripped open... and also, to be honest, if you want the bread to have really good texture, or if you want the crumb to be nice, you want to make sure to relieve that stress so that all the bubbles can continue expand. In part of your loaf, if they can't expand like they want to before they're constricted, you're going to have dense bread there. You don't want dense bread, so you want to relieve that stress. That's basically the deal.

Learning how to do the slashing, and learning how to make your dough so that the outer layer, when you're ready to put it in the oven, is a little bit dryer than the inside so that it takes those slash marks in a way that you can control better is part of the skill of learning how to make really good bread.

Aside: So those bread slashes, side note, is called scoring, and Seamus has some guidelines for how many to do. Essentially, make your decorative gashes add up to the length of the loaf total to give some expanding room as it cooks. He makes his about a quarter-inch to a half-inch deep and with a razor blade, but likely a knife or a very long toenail will probably do. I don't know your situation.

Alie: Ezra want to know: Can you knead bread dough too much? Or is it better to over-knead or under-knead?

Seamus: That's an interesting question. It's hard to imagine over-kneading bread. Usually, when people get really tense about kneading bread, what they're really doing is getting something else wrong. What you're doing when you're kneading is aligning all of these crazy long chains of protein molecules inside the bread so that they form better gas pockets. You're making it so that when the microbes fart out their gas, it stays around in

the bread instead of venting off and then your bread doesn't rise. You could actually have a ton of microbes happily living and farting in the loaf, and if you don't have enough gluten or something in there that can make balloons, then all that CO2 is just going to float away. You're going to have a hockey puck. [*"It's tough"*] What you're doing when you're kneading is trying to set the gluten up and distribute it so that it naturally forms bubbles.

Aside: Listen up, 'cuz this is the analogy that we all need.

Seamus: It's no different than... if you remember when you were learning how to blow bubbles with gum there was a super specific way that you had to learn how to form it so it was in the right kind of a sheet and thickness so when you blow it makes a bubble... Kneading is essentially exactly like chewing bubble gum. You don't have to knead it in the conventional sense or in the bread machine. A very effective technique, especially with the more cranky grains that have less gluten (so it's harder to get the bubbles to form) is a technique of stretching or 'no-knead' bread. In fact, you have to knead the 'no-knead' bread, but what you're doing is stretching it. That mechanical motion of these long molecules against each other aligns them, and that turns out to be what it takes to make the bubbles form successfully. So, there's way more than you wanted to know about that.

Alie: No, that's amazing. Like, that's *why* you do it. The science of cooking makes it so much easier to adhere to those practices instead of lazily skipping steps.

Seamus: That's right. Human beings hate being told when to do something and not why, like, "No... just do this" and "But why, man?!"

Alie: "But why?! I need a reason!"

Alex Quinton wants to know: Why does my sourdough starter stops growing from day four? Day three is beautiful, it doubles in size, perfect, and day four stops growing. They think they keep doing it wrong and dump it in the bin.

Seamus: No! Don't dump it in the bin! A sourdough starter is like having billions of pets and some days they poo in the living room; that's just how it is. You don't throw away your dog because he does that, so don't throw away your starter. It goes up and down. I think part of the issue here is Instagram poisoning of people who show these bangin' starters in these jars. Again, anybody who does wild starters and feeds them grains knows that 90% of those pictures are garbage and lies, so don't beat yourself up. Just keep feeding it.

A few important things about starter cultures: First of all, as the microbes eat the food and they excrete whatever they can excrete (they poo), it's CO2, lactic acid, alcohol, whatever it is... it's a big mix of things based on whatever is in your sample. Just like you wouldn't want to sleep in your bed if you pooped in your bed, they don't want to do that, it's not good for them. So when you pour half off, *really* pour half off. You have to be really brutal, and you have to replace it with fresh flour and fresh water because the pH changes and the CO2 changes the pH and makes it more acidic in there. That's bad for

them and causes them to grow more slowly. You have to be careful and replace that quite a bit.

If it's slowing down, you can feed it two or three times a day, it's no big deal. Sometimes you won't even see a difference, but you have to understand the microbes are in there, and unless you've killed them with heat, or your roommate is a total dick and has poured bleach in there or something, it's not dead. Believe me; if we can amplify a few yeast molecules from a 5,000-year-old pot into bread, there's no way you've killed all but two yeast cells in your starter. Don't give up on your starter. Have some sympathy! Don't be a monster! [*Come on, man.*]

Alie: [*laughs*] You mentioned the old bread, and Obilot asked: What did the ancients put on their bread? Like, did butter exist? What kind of oils? Did they schmear it with tahini? Yogurt? How was it eaten? And did you adhere to that when you first made your ancient loaf?

Seamus: A few things... First of all, fat. So, I'm the proud owner of a vast library of different ancient animal fats. I've tried baking and seasoning pots and using them for all sorts of different things from beef tallow, to goose fat, to lamb fat, flax oil, different plant oils, and they all make good bread. In fact, I have to be honest with you, the pork fat bread is ridiculously awesome. This was all because we were trying to figure out what fats might have been around in the old kingdom because there wasn't a recipe. People used the fats at hand, and there were a lot of waterfowl used for food in the old kingdom, and surprisingly, a lot of beef. We tried all those things out and they all work and are quite good. The ancient Egyptians also put various spices into their bread. The bread I make, I put roasted coriander in because we find that in all the mass spectroscopy studies of Old Kingdom and Giza bread. It was a very common thing for them to add.

And remember that in these cultures, people ate bread as a main foodstuff. It wasn't what they had for breakfast, and they weren't making avocado toast with it. It was their main foodstuff. These were peasants. They'd eat it right away, so the loaf didn't last. There wasn't day-old bread. Right? And when you get this loaf out of the hole in the ground, and you take the thing off and you let it cool for a bit, it does not need any topping. It just doesn't need it. It's a satisfying meal in itself. Now, that said, the ancient Egyptians were notorious for eating onions. In fact, the three things we always see in funerary offerings are bread, beer, and onions, which always caused me to think, "I don't want to be in a small room with an ancient Egyptian." [*Alie laughs*] But I'm guessing that you would have had this bread with coriander in it and some onions fried in duck fat. And I've done that and that's really exceptionally good food.

Aside: [*grunts appreciatively*] Seamus has also stepped up his gastroegyptology game by experimenting with cooking the ancient starter dough in these conical vessels in a pit of hot coals, to more authentically replicate ancient loaves. And I feel like this is not the work of an amateur. This is a professional gastroegyptologist. But coming up, he puts in all in perspective. His precision comes from play and from passion. This should be fun, after all. You should like this.

Alie: The last couple questions I always ask, any flimflam that you wanna debunk? Any myths about bread starters, sourdough starters, that you wish people knew?

Seamus: *[sighs]* Wow. *[Jeopardy theme]* So many. But the main thing is just that this is a very ancient thing, and people who knew nothing about biology or the internet could do this better than we ever will. So the key thing about sourdough is to just let the fuck go, stop overthinking it and just work on it. You know, this is a skill, not a recipe.

Alie: That's a good... You need bumper stickers! You need to sell merch! I know people want to buy your starter too, your ancient starter, and it's like, "Uh-uh."

Seamus: Well, yeah. There are two reasons for that. The first one is that we're in the middle of the research. And the second one is, like I said, it doesn't belong to me.

Alie: Yeah. I think that's beautiful. What is something that annoys you the most about the process of bread making? What's the most irksome, what's the crappiest, or the most tedious, or vexing element of baking bread or baking old bread?

Seamus: You mean aside from just being me? All right. *[Alie laughs]* So there are two obvious standouts. First one is that I mill all my own flour. I have these bags of grain that show up at my house, and milling flour is hard. It's hard work, and it's loud, and it makes a mess, and I have to do it a lot.

Second thing is that I'm incredibly careful to maintain the sterility, the non-contamination of these samples. Feeding my starter takes me half an hour and I do it every day. And that's just a lot of time and effort. That is a pain in the ass. And it's part of the reason - I apologize to everybody - that I'm so cranky. And people say, *[snobby nerd voice]* "Well how do you know?! I heard that sourdough starters get contaminated by the flour that you feed them and that they change based on..." And I'm like, *[groans]*. I just have no patience after spending half an hour with a fucking autoclave, and UV lights, the sterile gloves every day. Like, "Will you shut the fuuuck uuuup?! Read the threeeead!"

Alie: *[laughs]* Maybe you're just hangry.

Seamus: Could be. Could be it. I need some onions in goose fat.

Alie: Yeah. *[laughs]* And what about your favorite thing about baking? Your favorite thing about bread? The thing that gives you the butterflies the most?

Seamus: You know, there was a moment where I tried to Finnish milling flour one day. I have these big, sort of, outsize mason jars that I put the milled flour in, and I label them with a date. And after I sterilize flour, I label it "Sterilized" with the date on it, because I have good lab technique, because I'm a particle physicist. I was trained when there were machines that could trivially kill you if you weren't careful. *[Alie laughs]* And I found myself... I'm going to actually get verklempt at this.

One day, I don't know, like six weeks ago, I finished milling and I was writing "emmer" on the jar and I looked over and I realized that I had written it in a hieroglyphs *[Alie gasps]* and I didn't even know. And I felt like... I felt like I was there. I felt like I was a

worthy human being. I was communing with my elders, my ancestors. It was really special.

Aside: Wow. Ah shoot, I was tearing up, too.

Alie: I'm going to use all my tears to make a sourdough starter now.

Seamus: There you go! That's right. "Raised on the tears of podcast hosts!"

Alie: That's really special. That's really amazing. I want to look up how that's actually written in hieroglyphs. That's really, really interesting.

Seamus: The word is 'bdt'. [phonetic: bedet]

Aside: I looked up the hieroglyph for emmer wheat, and it looks like a foot, a hand, a loaf and a li'l shaft of wheat. It's just amazing to think of how many people over how many years have seen and read that.

Seamus: You got all this garbage about the pyramids being built by aliens, and mysterious technologies, and all of this. And you know, there's a quarry where stone was taken for the pyramids, and in one corner of it, you can go - and I don't know if you can see this or not, but I've seen pictures of it - there's a little drawing that one of the stone masons made of his friend. And it's this picture of a guy holding a chisel with a hammer and he's got kind of a big nose and over it is written "Big Nose." [*Alie laughs in wonder*]

And isn't it so much more impressive that those incredible structures were built by Big Nose and his friends than it is by aliens? Isn't that enough? Isn't it enough that they were able to do that? Why do we need aliens?

Alie: I think what you're doing, getting people interested in the history, and the culture, and the people, and slowing down and trying to do it themselves, is really cool. I mean, in a time like this that sucks, it's great that you're doing this. There's a lot of people that will have so much more appreciation.

Aside: So who knew that a particle physicist and a guy who designed the Xbox would be the one in a crisis to help us slow down, and relax, and stay inside, and get back to basics? The simulation, man. It throws us some curveballs, doesn't it?

Seamus: Do you want to know a truly weird conspiracy theory kind of thing that's right in front of our faces, but that's so fuckin' weird at the same time that it's too weird to even think about?

Alie: No, what is it?

Seamus: If you go look at the Xbox logo, it's a loaf of bread.

Alie: [*echoing and distorted*] Nooooo!

Seamus: I'm telling you. Go look at it. It's a fuckin' sourdough loaf.

Alie: Who designed that?! Was that you?

Seamus: So the original logo for the first one was different from that. This is what they came up after I left. [*Alie gasps and squeals*]

Alie: AH! It's a boule!

Seamus: It's a fucking boule. It's crazy. Isn't that insane? So that's a little creepy. That's a little mysterious. And that's a little...

Alie: Like Berenstein/Berenstain bears, Mandela effect.

Seamus: Just a little bit, yeah. That's a little bit X-Files right there.

[*X-Files theme song fades into the outro*]

So ask smart people stupid questions. Ask sweet people sourdough questions, because they have knowledge to spare, and bread is tasty. We're all in this together to stay in and slooow dooown and maybe reframe, and tell the people we love that we love them. That we loaf them.

You can follow Seamus Blackley on [Twitter](#). There's a link in the show notes. And also follow Egyptologist [Dr. Serena Love](#) and [Richard Bowman](#), the microbiologist. They're also linked. [Kieran Donnachie](#) came up with the word 'gastroegyptology', thank you for that. We are @Ologies on [Twitter](#) and [Instagram](#), and I'm [@AlieWard](#) on [both](#). And a ton of links, including to Seamus's threads, are up at [AlieWard.com/Ologies/Gastroegyptology](#). And bleeped episodes and transcripts are up at [AlieWard.com/Ologies-Extras](#), link in the show notes.

Thank you to professional transcriptionist Emily White and her army of volunteers in the Ologies Transcribers Facebook group. I see you, I love you all. Thank you for what you do. Ologies merch is available at [OlogiesMerch.com](#). Thank you Shannon Feltus and Boni Dutch - sisters who host the comedy podcast [You Are That](#) - for managing that. Thank you Erin Talbert for wrangling the [Ologies Podcast Facebook group](#). Thank you to each and every Patron for submitting questions and being the anchor of the show.

Thank you to Travis. And Miles, congrats on your new sourdough starter. I wanna hear what it's named. Happy birthday to my niece Olivia and my good pal Colleen Flanagan.

Assistant editing was done by the wonderful Jarrett Sleeper who does *Quarantine Calisthenics* every day at noon Pacific Time, sometimes in character in a red long john onesie and a floppy hat, calling himself an olde-timey gold propsector by the name of Antoine Calvin DeBouvier, who's avenging his nemesis Silver Tongue Jack for stealing his biscuits and bacon. Workouts in those themes, those are up on his Instagram, [@jarrett sleeper](#). Get into it. And of course, thank you to lead editor and host of the kitty-themed *Purrrrcast* and the dino-themed *See Jurrassic Right*, [Steven "Rye" Morris](#), we couldn't dough it without you. (I'm sorry.)

Theme song was written by Nick Thorburn of the band Islands. And if you listen to the end, you know I tell you a secret. And this week, I was very excited to interview Seamus and I told my boifrenn Jarrett. I was like, "I'm talking to this sourdough expert. He also invented the... Nintendo... PS4." And he thought I was joking, and I wasn't. And he paused, and Jarrett got on his Discord chat with his gamer dude friends and told them what I had said, and then I heard them all laugh on

speakerphone and they continued to roast me just ruthlessly. And I deserve it. So apparently Xbox is not a Nintendo or a PS4. I was just throwin' around words! I don't know the difference. Now I do. But yes, look it up, the Xbox logo very much looks like a sourdough. Goosebumps.

All right, I butter go. Stay safe, you're doing great out there! Okay, berbye.

Transcribed by

Your pal Aska Djikia whose foray into yeast started with fermented hot sauce; please send bread.

Colette Ayers

Hana Snook, London, England

Laura Ayson

Kadi Eubanks

Other links which may be of use:

Seamus's [recipe tutorial megathread](#)

[Gastroegyptology in the New York Times](#)

[More on his resurrection of Egyptian yeast](#)

[Sourdough and cereal fermentation](#)

["Yeast of the Dead," University of Iowa article](#)

[Bread from below a mausoleum](#)

[Hieroglyph of "emmer"](#)

[A beer/wine/bread microscope](#)

["Increasing jojoba-like wax ester production in *Saccharomyces cerevisiae* by enhancing very long-chain, monounsaturated fatty acid synthesis"](#)

[Sourdough: less gluten, but not gluten-free](#)

[Cast iron Dutch oven baking tips](#)

[Emmer hieroglyphs](#)

[Vaginal yeast sourdough: why not?](#)

[What was Egyptian beer — aka Pharaoh Ale — like?](#)

[Fleischmann history](#)

["Sleeping Beauty: Quiescence in *Saccharomyces cerevisiae*"](#)

["Stable and non-competitive association of *Saccharomyces cerevisiae*, *Candida milleri* and *Lactobacillus sanfranciscensis* during manufacture of two traditional sourdough baked goods"](#)

[Heirloom sourdough starter](#)

[Martha and Snoop Dogg](#)

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Theme song by Nick Thorburn

For comments and enquiries on this or other transcripts, please contact OlogiteEmily@gmail.com