Featured: Simon Brassell
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PRE-SCRIPT

In the fourth episode of BIOmarkers, the audio series that archives the oral history of organic geochemistry, we speak with Dr. Simon Brassell, Professor of Geological Sciences, Biogeochemistry, and Molecular Organic Geochemistry at the Department of Earth and Atmospheric Sciences at Indiana University Bloomington. In his interview, Simon discusses his time at the University of Bristol, proxies, and what piques his interest today.

SCRIPT

Fatima Husain: Welcome to BIOmarkers, an audio series that archives the oral history of organic geochemistry. I'm your host, Fatima Husain, and I'm here today with my series co-creators and fellow organic geochemists Angel Mojarro and Juliana Drozd.

Angel Mojarro: For today's episode, we spoke with Dr. Simon Brassell.

> *Simon Brassell: I'm Simon Brassell, I'm a professor of Earth and Planetary Sciences at Indiana University. When anyone asked me what I am, I would say I'm a molecular organic geochemistry and molecular bio bio geochemist, because my area of expertise started in looking at biomarkers, and I have pretty much stayed in that area all along.*

Juliana Drozd: We spoke with Simon briefly in between sessions at the 2019 International Meeting on Organic Geochemistry about his career pathway and insights into the field.

Fatima Husain: It turns out, this isn't too hard to do:

> *Simon Brassell: This is about something like the 14th, 15th time I've come to IMOG and every year there are two, two. There's one meeting each year that I always try and get to and it's the IMOG and then even years, it's the Gordon research conference on organic chemistry because I learn more at those meetings about the specifics of the subject than I do at any other bigger or meetings that aren't a less focused on organic geochemistry, and it's always great to come back and see people who I've known some for 10 years, some for 20 years, some 30 years, some 40 years.*

Angel: To start, we asked Simon what he's interested in today, and worked backwards from there:

> *Simon Brassell: So my interest extend from thinking about the sources of biomarkers in terms of organisms, how they differ among different environments, and more particularly, then how by looking at them in the sediment record, we can interpret the nature of environment, whether it's from rocks that were 100 million years old or 500 million years old, and ultimately that also then leads to the fact of what gets preserved. Thinking about the utility of biomarkers as a tool in the petroleum*

industry. And so over the years I've worked in analyses of, of organisms that microbial maps of recent sediments have, essentially, I think sediments of almost all ages apart from very deep time. I've done comparatively little work on on pre Cambrian and then at all levels of maturity from organisms to pirate Richmond's.

Juliana: But how did this all begin?

Simon Brassell: I went as an undergraduate to the University of Bristol, and my I always had an interest in chemistry because I did a lot of chemistry at school and I was good at it. But I was also interested in geology. And I think one of the things that was transformative for my generation is in the late 60s, In early 70s, I went to as an undergraduate at university in 1973. The whole area of plate tectonics was evolving. So geology was an incredibly exciting field. So I thought rather than just do straight chemistry, I'd like to do something with geology. And the University of Bristol had a joint honors program in chemistry and geology, actually applied for the same program at a couple of other universities as well because that's where I thought I'd like to go and accurate at Bristol, the person who heard initiated that degree program or joint degree program was Geoff Eglinton. And so as a second-year student, then I started to taking courses in environmental chemistry and began to because of what Jay, Jeff Eglinton and James Maxwell taught in those classes, to realize that there is this fantastic story about the fate of molecules in sediments and that sort of got me hooked onto that because I was competent and I understood what the chemistry was. And yet here was a way to link it in to to the geological record. And so at Bristol I then did a senior honors project with Jeff was my advisor to stayed on in Bristol as a graduate student. I then was a postdoc there then I was a Royal Society Research Fellow, before leaving Bristol when I took my first academic position in the US.

Angel: We asked Simon to tell us a little more about Geoff's role in his education and training.

Simon Brassell: I think one of the things that Jeff Eglinton was great at doing was getting students enthused about the variety of different projects that were going on. So the first thing I worked on, was trying to heat cholesterol to generate steroids trying to better understand The pathways for transformation of sterols to steranes. Then as that was as an undergraduate, and then as a graduates, student, I started working on microbial mat systems. But it was also the timing where the deep sea drilling project, the UK became a main player in that and there was an opportunity and Jeff was able to secure funding. And I had a research student ship that was based on investigating organic molecules in the sediments from all over the oceans of different ages. And one of the wonderful things about that era was that you could get funding from the agencies to do what was essentially exploratory work. The idea was that the molecules can tell us a story. We don't know what those stories are going to be. But unless we examine and we understand what's there, we're never gonna to be able to develop that. So it was part of that fantastic era where there was an opportunity to do

that exploration to find out what the composition of biomarkers was in, in the sediment record, and then be able to begin the process of reconstructing the stories that they were telling us.

Juliana: Today, we have so many advanced analytical tools at our disposal — but what was it like in the early days at Bristol?

Simon Brassell: So when I first was in Bristol, if you wanted to run a GCMS system, the GCMS would scan at about seven seconds. So you could only get one mass spectrum every seven seconds. And to get that mass spectrum, you actually had to hit a button to get a UV chart recorder. But Jeff was very good. Together with James Maxwell in recognizing how computerizing some of those characteristics would work. And there was a couple of individuals might come And in particular, I remember who wrote some of the code for our home built computerized system so that we didn't have to hit the button to get the mass spectrum. And by Gosh, by about 19 I guess it was 1977 then Finnegan was manufacturing. The first system was called in costs as a computerized system. So you could do GCMS analysis, that would process the data, it print out the mass spectra, you could quantify things. And suddenly that transformed the possibility. And in particular, the the resolution that you could get in terms of with pillory, GCMS, tiny little peaks, you could get good quality mass spectrum on them, and identify many more many more components that way. One of the papers that he published in 19 I think it was 1981. Jeff gave a lecture. I think it was the international geological Congress and was approached by one of the editors of science. Could you write this up for, for the for the journal Science. And so, in 1982, there's a paper there that we published that's called the geological fate of steroids. And in that there's a little series of histograms that show the the number of stair rolls, and the number of stair rains and the number of hole panes that were known. Well, I think the last data is 1980. And the one before that was probably 1970, and maybe 1960, to show this exponential growth in that variety of compounds. And if you were to plot those same data today, I mean, that trend would be the numbers would be so much greater. But that was a very much again, it's this era of exploration. So with some exceptions, especially molecules like GD GTS that were discovered much later, but Rogers talk this morning on carotenoids when we knew what crowd noise were, so that we found those in a variety of sediments, not with the same resolving power that we saw this morning. But but but many of the fundamental families of compounds that are foundation of much of organic geochemistry were were discovered and worked on in that time period in the 1970s and 1980s.

Fatima: We also asked Simon about proxies — and about the role they play today in our field.

Simon Brassell: Um, I think the, the key consideration is that we now have a whole series of different proxies. ly, the first goal with any proxy is to demonstrate that it works. But sometimes the more interesting thing is when it doesn't work or why one

> *proxy works, and another one doesn't, and understanding those more subtle nuances of how an environment is changing, plus the fact that over time, there are more and more tools that we have to be able to apply to this. Now thinking about originally we're looking at molecules and then we're able to look at the molecules and their carbon isotopic composition. So now we're able to look at their hydrogen isotopic compositions again, so it's as if you've got these additional dimensions to the to the work that further expands the possibilities.*

Juliana: And of course, we had to ask Simon: what makes a good organic geochemist?

> *Simon Brassell: Curiosity? That has to be the number one, because I think if you're not driven by curiosity, you need to when you have data, you need to want to understand it to the nth degree. And I think that's the, I would say that's the most single thing. And then you need know that either computational skills, lab skills, some combination of those, but also, I know one of the things that has helped me over the years is actually also having a good memory. And remembering that if you've seen something at some point, to be able to make connections, so curiosity and making connections I think that's critical.*

Fatima: Thanks so much for joining us today, and a sincere thank you to Dr. Simon Brassell for speaking with us and sharing his insights.

Angel: And now, let's hear Roger's advice on how you can stay up to date on all our upcoming episodes.

> Roger: *If you are enjoying the BIOmarkers Podcast and would like to stay up to date with all of our upcoming episodes, you can now follow us on Apple Podcasts, Google Podcasts, Spotify, or wherever you listen to your favorite shows.*

Fatima: Thanks, Roger. Next time, we'll speak with Kliti Grice. To tune in, go to summons dot m-i-t dot edu backslash BIOmarkersPodcast. BIOmarkers is produced in the Summons Lab at the Massachusetts Institute of Technology.

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