Science Magazine Podcast

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Promo

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Music

Interviewer – Edward Hurme

Finally today, I'm here with *Science* staff writer Carolyn Gramling, who's here to give us a rundown on some of the recent stories from our online daily news site. First up, we have a story on the history of orchids in art. So orchids are all the rage now, but when did people first start to feature orchids in art?

Interviewee – Carolyn Gramling

Yeah, so in modern times people are very passionate about orchids, both because they're really beautiful – they've spawned this multi-billion dollar industry of trade – but also because they have had this very symbolic representation because of their resemblance to both male and female organs, people have really seen them as signs of fertility and they've been abundantly represented in paintings. And people have been tracing that representation in art as far back as the Italian Renaissance. And so one question, however, was, you know, was this actually the earliest appearance of these flowers in art? We've abundantly studied their biology and their ecology, but we really didn't know very much about their appearance in art, which there's actually a term for. It's called phytoiconography.

Interviewer – Edward Hurme

Interesting. So these phytoiconographers, what did they actually find by looking back at ancient art?

Interviewee – Carolyn Gramling

So this one botanist was very interested to sort of trace how far back the depictions of these flowers went, and she started amassing this large database of Italian paintings and sculptures and other types of art, and then tried to connect the flowers that were seen in those artistic works with actual flowers in real life. And what they found, to their surprise, was that some much more ancient pieces of art actually showed depictions of orchids. And some of these depictions went as far back as Roman times, to just after 0 BCE.

Interviewer – Edward Hurme

And so why do they think these Roman artworks were featuring orchids? What do they think was the significance?

Interviewee – Carolyn Gramling

Well, the symbolism of orchids probably was very similar back then to what it is now, in the sense that because of their very strong resemblance to the male and female organs, they probably represented fertility for them. And what's interesting, though, is that there does seem to be a gap between their depictions back in Roman times. There were many centuries when they were not actually appearing in works of art at all, and not again until the Italian Renaissance.

Interviewer – Edward Hurme
So, yeah, why did this orchid craze seem to fade?

Interviewee – Carolyn Gramling
Well, one theory for this – of course, we can't actually know – but one theory is that when the Christian era became dominant, that that actually really put a damper on people's enthusiasm for representing these flowers in art, because of their association with sexuality.

Interviewer – Edward Hurme
So from recognizing flowers in artwork, our next study looks at how the brain recognizes faces. So what do we know about how the brain does this complex task?

Interviewee – Carolyn Gramling
Well, we've done a number of imaging studies that show regions of the brain that are associated, that, you know, respond when people are responding to faces. And there's actually a part of the brain that's called the fusiform gyrus, and that people have associated for some time with facial recognition. But they didn't actually know how it's involved in that, or how significant this region is to facial recognition.

Interviewer – Edward Hurme
So there was this correlation of activity in the fusiform gyrus, but so far there wasn't really any indicator that this was actually super important.

Interviewee – Carolyn Gramling
Right.

Interviewer – Edward Hurme
How did the researchers get around this challenge?

Interviewee – Carolyn Gramling
Well, they actually had the opportunity to work with somebody, a very intrepid patient who came to them, so this was sort of a lucky break for them. There was an engineer who suffered from epilepsy. And he came to Stanford University to get treatment for his seizures. He had found that as a child, he was on medication that seemed to help, but as he got older, medication became less and less effective. So he was hoping for treatment. And his doctor suggested that they might be able to eliminate the seizures by opening up his brain and surgically destroying a very tiny area of brain tissue where they happened. So they placed electrodes on his brain, and they were trying to stimulate his brain to

figure out where the seizures were originating from. And what they found was actually to their surprise. When they stimulated a certain region of the brain, instead of having the seizures, what happened was that he looked at the doctor and he said, "Your face is all metamorphosed." And then when they stopped stimulating those electrodes in that region, he said, "Well your face went back to normal." So they knew something was going on there.

Interviewer – Edward Hurme
So now there's a potentially causal relationship between this specific brain area and identifying faces.

Interviewee – Carolyn Gramling
Yes. There were two spots where these two electrodes were that actually stimulated the faces. And what was interesting was instead of being able to see anything else in a distorted way, it only distorted the faces. So he would look objects, and they looked normal to him. But when he looked at the face of the doctor or of his assistant, those looked metamorphosed for some reason.

Interviewer – Edward Hurme
And finally, we go from the function of our brain to an article that looks at how we got such a big brain in the first place. So what did these researchers suggest was a factor in the evolution of our large brains?

Interviewee – Carolyn Gramling
Well, we know that we have significantly more neurons than any other primate. We have about 86 billion neurons, on average, compared with about 33 billion neurons in gorillas and 28 billion in chimpanzees. So we know we have this many neurons. And, of course, we know that these neurons endow us with many benefits, but they do come at a price. And that price is that when we're at rest, our body consumes 20% of its energy, compared with about 9% for these other primates. So that extra energy has to come from somewhere. And the question is how is it that we were able to fuel our brains enough to support this extra brainpower?

Interviewer – Edward Hurme
So what's their hypothesis? What's their theory?

Interviewee – Carolyn Gramling
Well, one theory that came around in the late 1990s was that because we would have to consume a significant amount of food, how will we ever have the time to be able to do that in order to support our brains? And one theory was cooking might be the secret ingredient, so to speak, in the sense that by cooking, we're essentially predigesting our food. We are making it easier for our guts to basically uptake the calories, to absorb the calories, and that that might actually be our secret weapon, in terms of being able to eat less, or spend less time fueling our bodies.

Interviewer – Edward Hurme

So how did the researchers actually go about testing such a hypothesis – this cooking hypothesis?

Interviewee – Carolyn Gramling
Well, so what they did, well, they did several different things. While this cooking hypothesis had existed, they wanted to take a look at sort of the other side of it and basically say, okay, so supposing that we were to eat only a raw food diet, would there actually be an upper limit on how much our brains could grow based on that diet alone? And so what they did was they looked at the neurons in humans and other primates, and they were able to link brain size both to the number of neurons in the brain, and then link that number directly to the amount of calories needed to fuel a brain. And then they calculated exactly how much raw food would be needed to fuel a brain of a particular size and with a particular number of neurons. And what they found was that basically there is, indeed, an upper limit to how much primates can grow their brains, based on a raw food diet. For humans, we would have to forage nine hours a day just in order to feed our big brains. And this is at least one more hour a day than for other primate species. So this is a significant more amount of time that we would have to forage.

Interviewer – Edward Hurme
So this proposes a riddle. Where do ancestors actually get the extra energy needed to begin developing a large brain in the first place?

Interviewee – Carolyn Gramling
So that is where the cooking comes in. In order to actually be able to maintain our brain size, one idea is that if we were to cook our food, we would actually be able to consume enough calories and absorb enough calories in our guts in order to be able to fuel our brains without having to sacrifice the extra time needed to forage.

Interviewer – Edward Hurme
So maybe cooking wasn't something that you needed a large brain to invent.

Interviewee – Carolyn Gramling
No.

Interviewer – Edward Hurme
Another question. How is this possible, though, because there's a growing trend of people now eating raw food diets? Shouldn't they be starving to death? Are their brains shrinking?

Interviewee – Carolyn Gramling
No. In fact, in a raw food diet, you're actually not just eating raw food that is unprocessed in any way. You're actually processing the food in blenders; you're adding protein and other nutrients. So it is, in fact, already produced in such a way that it will make it easier for our bodies to absorb that extra fuel.

Interviewer – Edward Hurme

Okay. And, Carolyn, what else have we had on the site this week?

Interviewee – Carolyn Gramling
Well, for *Science*NOW, we've got a story about using gut bacteria to fight chronic infection, and there's also a story about filament-shaped bacteria and how they can act like electric cables. And for *Science*Insider, our policy blog, we have our continuing coverage of the sentencing of six Italian earthquake experts who were convicted of manslaughter this week, and also how a controversial iron fertilization experiment off the coast of Canada is actually legal but maybe likely to produce very little science. And finally, this week's *Science*Live is about whether Neandertals were actually smarter than we give them credit for. So be sure to check all of those things out.

Interviewer – Edward Hurme
Great. Thanks, Carolyn.

Interviewee – Carolyn Gramling
Thank you.

Interviewer – Edward Hurme
Carolyn Gramling is a staff writer for *Science*. You can check out all our news at news.sciencemag.org, including daily stories from *Science*NOW and science policy from *Science*Insider. While you're there, be sure to check out *Science*Live, a live chat on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.