

The Fields Guides : Episode 34 "Spring Science to Geek Out Over"

March 29th, 2019

Hosts: Bill Michalek and Steve Fleck

Transcribed by Joe Stormer

[Sound of footsteps]

Steve Fleck: Hello, and welcome to The Field Guides. I'm Steve, and I'm here with Bill. Good morning, Bill.

Bill Michalek: [Irish accent] Top o' the mornin' to ya, Steven!

Steve: Oh, god. [Laughs]

Bill: Happy Saint Patty's Day.

Steve: [Grudgingly] Happy Saint Patty's Day. [Mutters] Oh, god.

Bill: [Continuing Irish accent] I'm go'n ta do the whole episode - [ends accent] no, I'm just kidding.

Steve: I'm going to quit the podcast. Alright, so for those of you who don't know who Saint Patrick is . . . oh, are you doing a snake episode; is that what's going on? For anyone who doesn't know the folklore around Saint Patrick?

Bill: That's a good idea, but not today.

Steve: Yeah, they wouldn't be too active today. It's pretty cold. What did you say it was?

Bill: Thirteen.

Steve: Holy cow. Feels like thirteen, yeah. So for anyone who hasn't listened to the podcast, what we're going to do today (and over the course of many future episodes) is give you the experience of what it's like to be out in the field, in the woods, and on the trail. For every episode, we pick a natural history topic, research the science on that topic, head out to a natural area, and share with you everything we learned. Now, Bill and I kind of split up the responsibilities for the next couple episodes, and he refused to tell me what he researched for today's episode, so I'm actually pretty excited to find out. So Bill, what are we talking about?

Bill: Well, last episode we focused on studies that have to do with winter, with snow; and I thought since we're in March now (spring is almost here), I chose to look at studies that focus on spring phenomena. [Bird call] And you can actually hear some spring phenomena; it was sort of that squeaking call.

Steve: Yeah, "con cah-REE".

Bill: He's not doing the "con cah-ree" right now.

Steve: I hear one a second ago.

Bill: So that is the red-winged blackbird and here in western New York, when we start seeing red-winged blackbirds in large numbers, then we know that spring is right around the corner. So even though it doesn't *feel* like spring right now, we are just – what? - four or five days away from the first day of spring.

Steve: Oh, you're right.

Bill: And I do have to point out that on Facebook recently, someone posted a picture of a robin and they said, "Oh, first bird of spring!" And someone responded by saying - **Steve:** "Well, actually."

Bill: "Well, actually." And not only did they do that, they posted the local records of American robins during Christmas bird counts and winter bird counts to PROVE tp that person that -

Steve: You know, that's actually the best that I've ever heard of, cuz normally it's just somebody trying to flex and, you know, not backing it up at all.

Bill: But, c'mon. I just stood there shaking my head.

Steve: Nope, I mean there's better and worse versions of that, so I prefer someone sharing a link like that. It was me.

[Laughter]

Bill: It actually was. Your Facebook alias. Alright, so we are at a site today (we actually should talk about this) called Sinking Ponds. This is a small, maybe (I don't know for sure) twenty acre park but it is this great pocket of green surrounded by suburbia. I actually can see a golf course on the other side of the marsh. But this site is surrounded by some marsh and some lowland woods and it is a prime site of warblers. So I've always been shocked by the number of warblers I see in eBird reports - not only during migration here but even during the breeding season. So even though it's a small site, it's a nice patch of woods. It's a nice marsh; obviously the red-winged blackbirds enjoy it. You guys [sic] are going to be hearing them throughout the course of today's episode. But we're not going to be focused strictly on warblers today, but I will be talking about birds in general because some of the studies I focused on do focus on migration. But why don't we walk a little bit, cuz Steve is getting chilly.

Steve: Yeah, it is a cold day!

Bill: Why don't we get out of the wind.

[Footsteps]

Steve: I'm sure the listeners will appreciate that.

Bill: So while we're walking, though, and before I get into my topic, I do want to mention that one thing that is new for our podcast is that our most recent episodes, we do have transcripts available on our website. If you do know people

that would benefit from those transcripts, please let them know. And we want to thank listener Joe Stormer who has put in the hours and effort to make those transcripts a possibility. So thanks a lot, Joe.

Steve: Yeah, thank you, Joe.

Bill: And we also want to congratulate our friend, Matt, and his podcast and his blog In Defense of Plants. Do you know that they just passed two hundred episodes?

Steve: No, I didn't know that!

Bill: Two hundred episodes. So way to go, Matt.

Steve: Yeah, congrats.

Bill: Alright, why don't we stop here. We're in a little bit of a sheltered spot. Hopefully the mic is picking up those sounds of the red-winged blackbirds.

[Bird calls and moving water]

Bill: There's one!

Steve: Ahh!

Bill: Steve, you know about this thing called climate change going on?

Steve: Yeah, the theory?

[Laughter]

Bill: So how do you think climate change is affecting plant growth in the spring time?

Steve: Umm, I think it might be hurting it, but I'll tell you why. And that is because I think we might have some false starts for the plants, so maybe they start growing.

Bill: I love putting Steve on the spot.

Steve: And then [laughter] maybe they get frost damage because maybe it snows again. I don't know. But I think that happens all the time, so who knows? I just try to be as pessimistic as possible.

Bill: So generally it was thought that climate change obviously was causing us to have an earlier spring. So that would mean more plant growth, right?

Steve: Sure.

Bill: You would think. And it was thought that in many areas it was one factor that was helping to slow climate change because if you have more plants and they're growing longer, they're going to be absorbing more carbon. But this study that I looked at, this is from 2013 in the journal *Nature*.

Steve: Oh, the big one!

Bill: The big one. And this was a large international study and satellite data was used to look at this assumption. So because of recent innovations in collecting satellite data - the data that we have available - we can now look at global patterns of this effect. And they said that in areas of high vegetation, they can detect that light is strongly absorbed and infrared radiation is strongly reflected. That makes sense, right?

Steve: Okay.

Bill: And they can use that to determine how much photosynthesis is occurring and how much carbon is taken up during photosynthesis. And this is across the globe on a point-by-point basis.

Steve: Holy cow.

Bill: Yeah. So when spring-like weather starts earlier, it's reasonable to assume that plants are going to have more time to grow and as I said absorb more carbon and produce more biomass, but according to this data, this isn't the case. And the data show that, yes, the Northern Hemisphere is in fact greener in the spring when temperatures are warmer earlier, but this impact can often be reversed by summer and autumn. And in most areas it leads to an overall reduction of carbon uptake, as a result.

Steve: Wow. So it is true - there is an increased growth in spring.

Bill: In spring.

Steve: But we just can't look at one part of the year.

Bill: Right, exactly. And it's not like the plants just start earlier and keep going until the growing season is over.

Steve: Got it.

Bill: So their not sure what all the mechanisms are that are in place. They said that there may be a range of reasons. One idea is greater plant growth in the spring, it may increase transpiration, obviously, and then the demand for water. This in turn is going to decrease soil moisture content and then this results in insufficient water being available later in the year. So if you're getting an early start, you're using up your water resources sooner.

Steve: Right. And especially this year, we didn't have much of a snowpack so I can see that having an effect as well on the water availability. Also, we've talked before in previous episodes about non-native species like multiflora rose and honeysuckle kind of getting an earlier start than everything else, so I wonder if those type of plants are going to be the ones seeing more growth.

Bill: Absolutely. Well, I think you would have to assume that the more adaptable plants - the generalists, right? - they're going to do better. It could also be that certain plants have evolved a pre-determined growth period.

Steve: Yeah, cuz a lot of them I think go by the amount of sunlight, not just by the temperature.

Bill: Right. So it doesn't matter that they start growing earlier; they're still only going to grow so long.

Steve: Wait, so what do you mean by that? I was thinking like photoperiod. So I wasn't thinking like a set amount of time. I was thinking, you know, it could make sense evolutionarily that - let's say - February has a really warm day. A plant isn't going to be like, "Oh, I've got to start growing; it's spring." It'll wait until there's a certain amount of sunlight each day - like a photoperiod type of effect - so it doesn't end up having that growth squashed by a freezing period afterward.

Bill: "Squashed"?

Steve: I don't know, I made up that work.

Bill: I like that word! I think that's more what they were talking about - the photoperiod. Again I would have to go back into the paper to see; is a plant just going to grow for a set, certain number of days? Or a certain range of days. Or is it also related to a photoperiod, as well. That leads perfectly to my next point, which they went out of their way in this paper to say, "Look, this all is very complicated and it varies a lot on a regional basis." So there actually are in certain areas, there are plants that because of the earlier spring- they were two decades ago. But on average, plant productivity decreases during years that experiences a warm spring. So, unfortunately, this changes climate forecasts for the worse. You know, all these consequences of climate change are going to be MORE dramatic than previously calculated. Alright, you're looking chilly. Let's walk a little more?

Steve: Sure.

[Sound of footsteps]

Bill: Alright, so now I'm going to focus on birds, and specifically on spring migration.

Steve: Okay.

Bill: I'll give you an easier question to answer than the last one I asked you.

Steve: Sure, yeah, that was tough.

Bill: So how do you think climate change is going to affect spring migration timing, generally thinking?

Steve: Okay, I think this time it IS going to move it up in the year, so things will happen earlier.

Bill: Yeah, so obviously birds are going to move earlier once temperatures start to shift. Birds are going to start migrating. So this next study that I looked at,

this is actually from this year, 2019, in Ecological Indicators. And this looked at European and North American birds and the timing of their migration based on bird-banding, trapping, and on volunteer observations – just like point counts, basically. And this collected data over the past five decades. And what they found is that birds in both North America and Europe have advanced the timing of their spring migration due to climate change, and the average bird has advanced its migration by approximately one week in those past five decades.

Steve: Wow.

Bill: You wanna look?

Steve: Sure, that was just the first bud, I think.

Bill: So Steve just stopped and pointed at a bud here that is not quite open but it looks . . . do you know this one? **Steve:** I know I should know it.

Bill: Alright, folks, we have a small tree here. The end bud, it's probably about half an inch long, slender, and it's yellowish. So it almost looks like kind of a velvety-yellow color and the only reason that I know this one (it's on the top of my head) is that just a couple of weeks ago is that I was on a hike and I took a picture of it and took it home. This is a walnut. NO!

Steve: Not a walnut.

Bill: A hickory! Yes!

Steve: I was going to say, "Is it *Carya*?" And I should know it too because I wasn't expecting to see a hickory here but you guys are going to have to call me out if it's not *Carya* . . .

Bill: *Carya*.

Steve: The one with the yellow bud, I think the specific epithet begins with an L or something. I don't know. Because they don't all do this. It's not all walnuts that have the yellow.

Bill: Hickory.

Steve: Damn it! It's not all hickories that have this yellow.

Bill: Right. And I can't remember if it's a shagbark or a bitternut.

Steve: Well, we'll put that in the episode notes.

Bill: Alright. So the average migratory bird has advanced its spring migration by about one week over the last five decades. And keep in mind that that week time period, that's the average.

Steve: Yeah.

Bill: There are some birds that have shifted a lot more than a week.

Steve: Oh, yeah, okay.

Bill: So the greatest advances were found among short-distance migrants that winter in Europe and North America (that was one and a half to two days) and the longest distance migrants that winter in the tropics, they've also advanced but their advance was shorter – anywhere from half to a little more than a day per decade. So long distance migrants (think of the insectivorous warblers; the ones that travel down to Central and South America) and then the short-distance migrants (the majority of the ducks and geese; these are our short-distance migrants).

Steve: And you're probably hearing a lot of barking dogs in the distance because, uh, Canadian geese.

Bill: [Gasps] Did you say, "Canadian"?

Steve: I also said "geeks".

Bill: Oh, I missed that! [Laughter] Nice. As I said, this study was based on long-term monitoring data. There were twenty-one different observatories (bird observatories) and then they looked at two hundred different study species. So this was really a broad study.

Steve: Yeah!

Bill: And the data they collected, they started in 1959 and back in the early 60s. So they said that based on these changes in median migration dates, birds on average advanced their spring migration by a little over a week. And as I said before, some species show much greater advances. They talked about one species (whooper swans; and this is a Eurasian counterpart of our trumpeter swan); they arrive in Finland about two weeks earlier than they did just in the 1980s.

Steve: From where to where?

Bill: I'm not sure where their wintering grounds are. That's the one part of this study that I didn't like, is that they didn't really go into the individual species. I had to locate a news piece on this study to find that comment on the whooper swan because they didn't really at all go into the individual species and how their individual times have changed. So a reporter who was speaking to the researchers was able to get them to give that piece of information.

[Birds calls]

Steve: Okay.

Bill: The advances in spring migration dates, they're not equal across the migration season. So think about this: early migrants have advanced their migration dates more than late migrants. So the first migrants, they have the highest pressure to arrive early. Why?

Steve: Uhhh.

Bill: Well think about these red-winged blackbirds.

Steve: Okay.

Bill: Who do we have – males or females – around us right now? Do you know?

Steve: I actually don't know, but I imagine that it would be related to nesting.

Bill: Right. The males have come back first. Why? What are they doing?

Steve: Oh, are they building nests? Setting things up for -

Bill: They're setting up territory. So you want to get the first arrival, they're getting there because they're gonna get the best chance of breeding success. They're gonna have first pick of breeding territory (first pick of nesting sites if they're the ones that build the nest), whereas the later migrants, they're typically non-breeders. They have no rush to move north. So this asymmetry has led to an overall increase. So with these warmer temperatures arriving early, those early migrants are like, "I can leave even earlier." I should say they're not thinking that, right?

[Laughter]

Steve: Thanks for catching it, actually.

Bill: And the later ones are "thinking", "I'm not in a hurry; I'm not getting it on when I get to my breeding ground."

Steve: [Laughs]

Bill: "I'm just going to stay here as long as I can." So these arrival dates, they're linked to a number of factors but one of the key factors is local temperatures. So you're talking about when do birds migrate – I'm sure it has to do with photoperiod as well, but local temperatures (and they reference lots of different studies that found this, that local temperatures do play a role). So the earlier the spring, the earlier the time of migration, and the longer the migration season is going to be. **Steve:** Got it.

[Geese honking]

Bill: And they also did say that birds advanced their migration dates more in Europe than here in North America because spring temperatures have risen more quickly in Europe. Alright, how you doing temperature-wise?

Steve: Goodish. I have to keep switching hands for warmth's sake.

Bill: So I do have to say that here in western New York in the Buffalo area, this week on Thursday it was sixty-something.

Steve: I know; I took a lot of outdoor walks around campus.

Bill: It was sooooo nice. We took the kids outside for recess and normally recess is supposed to be twenty-to-twenty-five minutes and after about thirty-five minutes, some of the kids are like, "Mr. Michalek, shouldn't we be going inside?"

I'm like, "Nah, we're good." [Laughter] We were outside for about an hour because I knew it was going to be gone.

Steve: Yeah, right.

Bill:

So the next two studies we're going to look at takes this concept of migration and delve into it a little further.

Steve: Well, speaking of migration, in about a month and a half we will be doing our Birdathon, and what might be really useful for that is a pair of nice rubber boots.

[Laughter]

Bill: Oh, it's time for our plug.

Steve: So this episode is brought to you by Gumleaf USA. This company makes high-quality, super-comfortable, handmade tall rubber boots and we've actually had a few listeners purchase some of the products from Gumleaf.

Bill: Thanks, folks!

Steve: And if any of you guys [sic] ever want to share any of your experiences with the boots, let us know any we could relay your message to the rest of the audience. Alright, so this company makes high-quality, super-comfortable, handmade tall rubber boots and (like Bill said before) we have a pair ourselves. I don't know, Bill, what do you think?

Bill: Yeah, they're super comfortable. I always get compliments on them when I'm wearing them out in the woods. They have a lot of little bells and whistles like a gusseted zipper. They're tall. There's a buckle at the top to kind of close them up a little bit. They have a lining that keeps your feet warm and they're just great, all-around outdoor boots.

Steve: They're 100% waterproof, durable, and made with 85% natural rubber so you won't have to worry about them cracking over time. They have styles for men and women and they're great for birding, botanizing, or really any outdoor activity. And if you're interested in high-quality tall rubber boots, we recommend visiting GumleafUSA.com and exploring their products. It's also a really great way to support the podcast and it'll help us do cooler things in the future. So there will be a link in the episode notes and on the website for Gumleaf USA.

Bill: Check 'em out, folks. Alright, so onward and on with our studies.

Steve: Yeah!

Bill: So the next one that I'm going to talk about is from 2016 in *The Auk*, and it looks at the speed at which birds migrate. So I promise this is my last question for you, Steve.

Steve: Okay.

Bill: Do you think birds fly faster in the spring when they're migrating or in the fall when they're migrating? And this is one I can't think of any reason why you would know this.

Bill:

Steve: So I'm wondering if it's a function of their weight. Maybe they pack a lot of food in before migration.

Uh, you're thinking about it too hard.

Steve: Okay, fine, I have no idea.

Bill: Think about it. In the spring, you have a reason to get where you're going sooner. In the fall, you're not in a huge hurry.

Steve: Got it. Cuz in the spring, you're rushing to beat everyone else to the spot before it becomes nice and habitable.

Bill: Right. So this study used radar data. Have you seen those pictures during migration? People post them online of weather radar, but it's showing all the birds migrating at night?

Steve: You mean like our friend Tom who posts it every single day during migration?

Bill: [Laughing] Yeah, that's right. Previously, migration studies would look at a few individuals - maybe on the scale of hundreds - but with this new radar data, they're actually documenting the behaviors of millions of individual birds on a given night. That's a lot of data.

Steve: And you know what, one thing that I will say is that I love seeing data like this in real time because it makes you appreciate all the things that you never see, that you just don't experience. Like when you were talking about flying squirrels - they're all over the place, but I never see. And I almost never see animals kill other animals to eat and there's a million things that I never see but you know that's going on every single day.

Bill: Right, and when we can get a little window into that, that's just so cool.

Steve: Yeah, it's fascinating.

Bill: So because of this data, they can see these flight behavior results that are regionally or seasonally different; they can just piece apart what these birds are doing on such a deeper level. What they found in this particular study is that migrating birds fly faster and they put more effort into staying on course in the spring than in the fall, and we think it's because they're racing to arrive to their breeding grounds as soon as possible to get that edge. Arriving late can negatively affect reproductive success. So studies have shown that migrants do take shorter breaks in the spring, but it was always hard to tell whether they actually moved faster in the air.

Steve: That's what I wanted to know; is it just, you know, their average miles per hour is changed?

Bill:

Bill: No, no, no. So this radar, this high tech weather radar, this stuff's operated by NOAA and the Department of Defense and they found that birds did indeed fly faster in the spring and compensated more for crosswinds that could blow them off course.

Steve: Wow, okay.

And the next that I'm going to talk about actually looks more into that in depth, how fast birds are flying.

Steve: Now, on a radar, what does a prairie warbler look like versus a hooded warbler? The answer is that they don't. They don't look different.

Bill: They're both colored dots. BUT they can look at how birds are oriented directly for the first time.

Steve: Yeah, cuz without like telemetry data, and you need to hook a bird up with some technology to do that, so this is a way where we don't need to interfere at all. We can just pick them up on radar and see their positioning over time.

Bill: As far as we know, we're not interfering at all. Maybe the radar is somehow affecting their – what is it called? What what was the gland?

Steve: Oh, the one that fluoride hardens and it turns your spiritual powers off. Oh, what was that one? I know it's not the pituitary gland.

Bill: No, that's what I was thinking about. We talked about this last episode with the snowshoed hares. Alright, well you think while I talk about the next study cuz I know you're just going to tune me out anyway.

Steve: Oh, I usually do, yeah.

Bill: So I think this is a good point, before I talk about the last episode. We received an email just in the past two days. Someone who just got in touch with us, you know, wonderful email saying about all the nice things that they liked about the podcast – and the last line (I love) said, "You should do more episodes where Steve is just the comic relief.

[Laughter]

Steve: No, cuz Bill seems to think that it's because she just liked how much he did research better than me.

Bill: Right!

Steve: But I think it was because she was complimenting how entertaining I am, and Bill is like, "We've got to give Steve more things to do next time."

Bill:

Bill: That's what the last episode, folks, if you haven't listened, it's kind of like this one where I did the research and Steve just held the mic and made comments throughout. Although you've been kind of quiet today.

Steve: It's cuz I'm trying to think of this gland.

Bill: No but we were talking about this before we turned on the mic but this listener, she did something pretty crazy [sic] - **Steve:** Oh yeah! Well, it's not too crazy.

Bill: In a GOOD way.

Steve: As she's listening to the podcast, she's been making a list – an ongoing list – of the bird species that she's been picking up, so that's awesome. We could always share the list with everyone.

Bill: Yeah, thank you for that.

Steve: Thank you very much.

Bill: We'll get her name, because we didn't think to bring it. We'll have it on the next episode. Alright, let's get back to our study. So I mentioned that this study was going to look at how fast birds are flying. Now one thing that was known was that birds that migrate at night tend to fly faster in spring than they do in autumn to reach where they're going. The seasonal difference in flight speed, it's mostly noticeable on birds that are short-distance migrants. These guys (the ones that aren't going as far) they have the luxury of waiting until the winds are just right. [Bird calls] So these researchers, as we keep saying – **Steve:** Shut up!

Bill: What?

Steve: It's the pineal [pronounced at "PEE-nee-al"] gland, or pineal [pronounced as "pin-EE-al"] gland.

Bill: That's right!

[Laughter]

Steve: And Bill, I hope I didn't hurt your feelings; I'm sorry.

Bill: No, not at all. So the researchers, as we keep saying, birds fly faster in spring because they're trying to get to their breeding grounds first to choose the best territory. So while this time savings made in spring may seem minuscule, these time savings are important because they influence the arrival order of individual birds. In autumn, birds can take things more slowly because they're not as pressured to reach their wintering grounds. Now wind is one weather condition that influences birds' decisions the most about when to take off, and I've gotta say the researchers did use that word, *decision*.

Steve: Okay, okay.

Bill: And the researchers found that passerine birds can actually fine-tune their flights to make full use of winds, making their flying and subsequent migration easier. And it did seem that short-distance migrants did this more often. So we're going to talk a bit about air speed versus ground speed here, because I didn't know the difference between these terms; I don't know if you did.

Steve: Well, I'm thinking one is like the roadrunner from the old coyote and roadrunner cartoons. So that's like the ground speed, right?

Bill: So the ground speed is your speed relative to the ground, okay? The other one is air speed, and that's your speed relative to the air around you. Now, air is moving -

Steve: So does that have to do with Mach 1 and Mach 2?

Bill: I have no idea.

Steve: Because it's the reason that you get that sonic boom have something to do with the relative speed you're going compared to the air around you?

Bill: Okay.

Steve: I think so. Well no, cuz I think it's like . . . eh, I don't know guys [sic]; I don't know enough about this stuff.

Bill: Alright, so these birds are making use of wind assistance. Short distance bird migrants have higher ground speed, so they're flying faster relative to the ground, than air speed; so they're not much different from the air around them.

Steve: Now you're gonna compare this to long-distance migrants?

Bill: Correct. So long-distance migrants are often traveling where air speeds are exceeding ground speeds, and this is resulting from flying into head-winds.

Steve: They're flying INTO headwinds? Oh, so okay – let's say if you're flying five miles an hour forward, but the wind is moving five miles per hour backwards, is you air speed ten miles per hour?

Bill: I don't know. [Laughter] But what this all means is that long-distance migrants receive very little wind assistance on average. It's basically like I have such a long way to go, I can't wait for the winds to be right. I've gotta go when my instinct is telling me to go.

Steve: So they're not taking advantage of wind direction or anything like that; they're just powering through.

Bill: Where a short-distance migrant can say, [tentatively] "Winds aren't great today."

Steve: "I've got time; I'm just gonna pop up when the wind is right." **Bill:**

So short-distance migrants, they have a more flexible flight schedule.

Steve: Work smarter, not harder. When you can; when you can afford it.

Bill: That's right. This waiting for good wind conditions, it will save them energy but it will prolong their migration.

Steve: Right, that makes sense. It's kind of like a crap shoot.

Bill: Okay.

Steve: I mean it's like a gamble. They could be there early, they could be there later, they just don't control it all that much.

Bill: Right. And the researchers did go on to say that these results indicate finetuned seasonal modulation of air speed and responses to wind. So associated with different strategies that they have going on, passerine birds are adapted to different levels of time selection pressures during their spring and autumn migration – you know, dependent on whether they're short-distance or longdistance migrants.

Steve: Got it, okay.

Bill: So that was all that I had for today on migration and then also on plants in spring. So those are our springtime studies.

Steve: So we dealt with the most important organisms – the plants and the birds. There's nothing else to think about.

Bill: Now I've got to come up with as good a pun as I came up with the last episode for the hare episode.

Steve: "Receding hare line"? I think that was a shot at me!

Bill: What!

Steve: [Laughing] No, I'm kidding, I'm kidding.

Bill: But I'm glad you said that; that is the perfect segue because I do have a shot at you.

Steve: Oh, good!

Bill: So last episode if you folks didn't listen, I would say at least stop and go back and listen to the last part of the episode where Steve trashes Charles Darwin.

Steve: Okay, I think you're exaggerating that a little bit.

Bill: So this is some of what Steve said: "Darwin doesn't mean anything . . . It doesn't matter what he said cuz it could all be wrong." **Steve:** Uh-huh.

Bill: "We would have eventually figured out all that stuff anyway."

Steve: Yeah.

Bill: And my favorite Steve-ism: "Darwin is a fleck of garbage on the side of history."

Steve: [Laughing] Now, that was some strong rhetoric that I was trying to go so far in the opposite direction. Of course I don't literally mean that. I was trying to speak . . . I was just trying to add some color to what I was trying to say. To hit my point home.

Bill: Sure. I believe that's called hyperbole.

Steve: Yeah. There's a lot of hyperbole involved and Charles Darwin – brilliant man, came up with a great theory of evolution but my point that I was trying to

bring up is that there is no authority in science. Or there should be an authority in science. There can be great brilliant people that come up with very useful ideas, and then it can turn out that they're wrong.

Bill: True.

Steve: For example, Aristotle was wrong about nearly everything he believed. And Darwin, he proposed evolution but he didn't have all the mechanisms down.

Bill: Sure.

Steve: So even though he had this idea, he didn't actually have the evidence to back up his ideas. So at his time, for someone to say, "Oh, this is true," would have been wrong because you would have been making too big of a claim based on the evidence. And over time we built up evidence and the only way evolution would be wrong is if we're living in a . . . I don't know . . .

Bill: The Matrix.

Steve: Yeah, yeah. I was thinking some type of illusion, hallucination or something. So reality would have to be fundamentally different from what we expect it to be for evolution to be incorrect.

Bill: Alright, cuz I'm one of those people who when someone makes a strong point like that, I have a hard time responding right away.

Steve: Sure, yeah, I'm glad that you had some time to think about it - **Bill:**

Over the past month, I've been stewing about . . . no.

Steve: Bill has heroes, unlike me.

Bill: No, no. One point we made last episode was you said that we shouldn't have heroes. **Steve:** Yeah.

Bill: And I will say that as I've become older, I've become very wary of putting someone on that hero pedestal and I think it's unfair to do that to people – to expect them to be perfect. But I feel like what you just said kind of undercuts most of my points, because I was going to make the point that one thing that you did say was that to hold Darwin up isn't giving credit to the people who came after or before him, where you almost were making it sound like it's a level field. And thinking about it, I'm like, "No, cuz there's bad scientists; there's good scientists. There's a spectrum." And I don't think that anyone would argue that he wasn't a great scientist. And not only that, he was a great science communicator, which is so hugely important because science needs to impact everyone, hopefully. And if it's not communicated well, that's a problem. It doesn't take place in a vacuum.

Steve: So I will agree with Bill. I think that Bill and I are much more valuable than all the researchers that we cite in our episodes.

[Laughter]

Bill: That was going to be one of my points, that even if we end up doing this podcast for the rest of our lives, what we're doing is nothing compared to what Charles Darwin did.

Steve: Sure, right. And we probably wouldn't be doing what we're doing without Charles Darwin.

Bill: Right. And we also (just to give it some context) I think it's important to say what he did. There was an element of bravery and courage to what he did because publishing his work – his *Origin of the Species* – was a slap in the face (in a lot of people's minds) to the church. His wife had a problem with it. A lot of people say that's why he took decades to do it; he was worried about the impact and what it meant. He was a great man, and I think it's worth holding up those people not necessarily because he was a hero but as an inspiration.

Steve: And just again, for the audience, I was misrepresenting my own opinions on Charles Darwin just to – **Bill:** To be funny.

Steve: To play up a bit. But there is an underlying truth to it that (even though I think that Charles Darwin was a great man) I value the scientific method more than any individual scientist. And the nice thing about science is that . . . let's just say that hypothetically there is a such thing as a genius. But if he or she doesn't have scientific training, in my mind that genius is going to go to waste in terms of figuring out the Universe. If that's what your goal is. There can be many geniuses, and many have nothing to do with a scientific effort.

Bill: I would say that without the scientific method or scientific practices, the genius wouldn't reach the full potential or even come close to reaching the full potential it could.

Steve: And I'm just looking at everyone who's ever come before modern science. There have been brilliant people who just get everything wrong because they don't have a method to figure out the world. And there's so much value to that where someone even like me who is clearly not anywhere near a genius –

Bill: [Laughs]

Steve: I can just follow the scientific method and all these findings and methods of people who came before me and I can find novel, exciting things that no one else has ever seen in the Universe before, you know? And there's some value to that method that it doesn't matter how smart you are. As long as you learn this technique, you can discover things with the smartest people out there. It takes away as much bias as possible and it's super careful and it's really scared to get things wrong.

Bill: And Charles Darwin is awesome. [Laughter] Okay, anything else?

Steve: No, I think that's it.

Bill: I just have two small bits that I wanted to share with the audience.

Steve: Sure.

Bill: So the first one was a comment we received on our downy-hairy game episode that was a couple of episodes back, and in that I was wondering why the American Ornithologists Union didn't have the downy and hairy woodpeckers' genus and species updated with the rest of the world, it seemed? And this person wrote in and said, "According to the newest supplement to the AOU Checklist" (and the AOU is the American Ornithologists Union), many North American scientific journals reference this checklist regarding scientific names of birds, "they say that now the downy and the hairy woodpeckers are put into the genus *Dryobates*."

Steve: Okay, cuz that is not . . . my notes, I did not have them as *Dryobates*. And speaking of *Dryobates* [pronounced as "DRY-o-baits"], I wondered the whole time if we were saying it right.

Bill: Yeah.

Steve: Cuz like part of me wanted to say like, *Dryobates* [pronounced as "dry-oBAIT-ees"] or something, cuz sometimes they'll do that. They'll put weird emphasis - **Bill:** Stresses.

Steve: Yeah, stresses on the Es in weird ways cuz I've seen other ones that are spelled the same way as *Dryobates* but you pronounce it (if you were going to do it the same way) as *Dryobates* [pronounced as "dry-o-BAIT-ees"] or something.

Bill: [Laughs] That sounds bad.

Steve: Yeah, it's sounds weird. It's like *diabetes*. Yeah.

Bill: So the only two species left in *Picoides*, this person said, are the blackbacked and the American three-toed woodpeckers. *The Birds of North America* through Cornell also follows this classification. So that's good to see.

Steve: Sure.

Bill: So thanks for that comment. And then a question I have (maybe you'll be able to answer it, if for any listener can answer this), I've been wondering this for YEARS. Why in iTunes whenever you look at our podcast, does one of the main related podcasts is SnarkMonkey?

Steve: Oh. Well I'll tell you why.

Bill: Why?

Steve: Cuz iTunes messed up at a certain point and they replaced In Defense of Plants with SnarkMonkey. So Matt had to recreate his podcast and he lost all of his reviews because if you go to that podcast a lot of the reviews will actually be In Defense of Plants and not SnarkMonkey. It was a weird glitch in the system and Matt had to re-upload his stuff and had to start over from zero reviews and had to slowly build up. And he's far surpassed us by this point.

Bill: Oh yeah.

Steve: But that was back a couple years ago that happened.

Bill: Glad I go that cleared up. Thank you, Steve.

Steve: Go support Matt. And if a long time ago you left a review for In Defense of Plants, just go and make sure that you still have that review there. And I'm sure he may have said that something within the last two years. But it's always good to double check.

Bill: Anything else?

Steve: No! So we hope you guys [sic] enjoyed the episode. First and foremost we'd like to give thanks to our growing list of Patreon supporters. So thank you Polliwog, Jaqueline Rocci, Shawn Marien, Jessica Daniels, and Crow's Path. We're thankful for every single patron, but at the end of every show we give a special thanks to our top patrons: Rob, WeNamedTheDogIndie, Dean, Christina, and Gavin; and especially Ken, Diane, Morgan, Elizabeth, Daniel, Susan, Rachel, Orange Julian, and Alyssa. Whew. Thank you, guys, so much.

Bill: Thank you so much.

Steve: And we also want to thank our new five star reviewer on iTunes. So thank you CKBones33. So thank you so much. Keep those reviews coming, guys [sic], it really helps us get the word out to more people.

Bill: Oh and did you see that we got a message from somebody suggesting that we set a Patreon goal, almost like a, "Hey, folks, help us get to a hundred patrons," or something like that. That's a good idea. We should try to do something like that.

Steve: Yeah. Maybe (and guys [sic] we have to apologize) and you guys know the deal that when you become patrons Bill and I are very busy. We try to do as much as we can; we try to put bonus episodes out but we barely have enough time to put the actual regular podcast up so it's our great hope to do more things for you guys in the future. I also have to apologize for the stickers. I'm horrible at sending those out but today I'll grab a bunch of envelopes, put your addresses on them, and send them out. So I'm sorry for those of you that have been waiting for a long time. I'll make sure to get those out; I've been finding myself cooped up in a lab every single night so I'm sorry about that, guys.

Bill: What's more important? Work or the podcast?

Steve: Well it's like my personal research/work/the podcast. It's tough; it's a balancing act.

Bill: Well if you want to get in touch with us and encourage Steve to send out more stickers or spend more time on the podcast - **Steve:** Or encourage me to stop making excuses.

[Laughter]

Bill: You can email us at TheFieldGuide@gmail.com, follow us on Facebook, you can also tweet at us @FieldGuidesPod, check out our Instagram @FieldGuidesPodcast, and you can check us out at thefieldguidespodcast.com.

Steve: And, again, one last excuse, things have been busy. I totally forgot to talk to Always Wandering Art again. BUT I'm sure they'll give us artwork for this episode. So please go check them out. Their website alwayswandering.com. And then we always have a link to their Facebook and Etsy pages in the episode notes. So definitely go give them some love, go check out their stuff.

Bill: Thank you to GumleafUSA.com.

Steve: Yeah! And links to them in the episode notes, as well.

Bill: We hope you enjoyed the episode, folks, and we'll see you next month.

Steve: Yep. We'll see you in April.