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What on earth is everyone's problem with spiders? Why all the hate?
That's what James O. Hamlin wants to know.
James O. Hamlin is a scientist with a PhD in animal behaviour
and he's particularly intrigued with the secret world of insects and spiders.
Spiders don't make good domestic pets
but James says that some kinds of spiders are not only beautiful but they're even cute
and even the not so cute ones are fascinating.
Most of us are unaware of their complex and remarkable tiny lives hidden in the undergrowth or in trees
and spiders are now at the forefront of all kinds of research
because spider silk, for such it is called, is stronger than steel and stretchier than rubber.
It is the toughest material produced by any creature on the planet.
James O. Hamlin's book is called Silk and Venom, The Incredible Life of Spiders.
Hi James.
Can I reach it?
You begin your book with a shocking act of violence.
And it's perpetrated not by a spider but on a spider by an assassin bug.
You've sort of seen the lead up to this sort of thing.
Tell me what's required to witness the astonishingly evil homicide of this spider by an assassin bug.
So these are assassin bugs, they prey on the kind of spiders that build webs.
Now if you picture that spider, it's sitting in its web, it's got its legs poised on the silk,
it's using its web essentially like a giant ear, it's listening to the world around it
and the assassin bug uses that to prepare against it.
So these assassin bugs, if you ever see them, they're these most frail, way-flight creatures.
They almost look like they're made of spider silk.
I imagine because they have to actually step onto the spider silk without drawing attention to them.
Once they're on the web or near the web, they'll reach out with these long front arms
and just start gingerly plucking the spider's web.
Like a guitar string or something.
Yeah, exactly.
And how long will they sit on the web doing that for?
They could do this for hours, six, eight hours because it's such a dangerous game.
Very quickly that spider could turn around and use its trap to catch the assassin bug.
So it takes its time just very gently plucking the spider.
Here's these vibrations goes, oh, there's something over there.
I'm going to go check it out to look very gingerly, wonder over.
Now this spider, these Orbo spiders don't have very good eyesight.
So they probably can't actually see the assassin bug right there in front of them.
They're just hearing the sound of something in the web.
Can they smell that something's wrong?
That it's not, it's not prank and they smell something there at all?
Well, they would just be smelling their own silk, if that makes sense.
Yeah.

So once they get, they get closer and closer to this assassin bug,
once they might get so close to that assassin bug is essentially poise right above them.
So these are, they're very, very long legs.
So they can arch up above the spider and have these long piercing mouth parts.
It's a tube that sticks out from their head.
Once the spider is close enough and they're, they're confident,
they're not going to get caught by the spider.
They just jam that needle syringe like my part into the back of the spider's head.
But they spiked the spider in the head.
Spiked the spider.
Right. And then what happens with the spike?
So they can inject their, their own venom essentially,
that they will incapacitate the spider and then they start releasing
digestive fluids through that spike into the spider.
And it just starts digesting the spider in from the inside out.
So the inside of that spider, inside the exoskeleton,
just turned into this lovely little spider soup.
Then the assassin bug can then suck back up and eat.
So, so it prepares the meal by sticking its digestive juices inside the spider.
So it starts what just disintegrate from within.
Yeah.
It's a bit of a twist of feats because this is kind of how spiders eat as well.
They'll do the same thing.
They'll spit out digestive fluids onto their prey.
Their prey turns into a little bit of a mushy soup and they suck it back up again.
So, yeah, spiders aren't the only formidable predators out there in the leaf litter.
I've seen humans behave worse than that.
What is it about spiders that drew you into their world
rather than make you scuttle away from them like many people would do?
It's a tricky answer because it's kind of everything.
You know, there are so, so many different things that spiders do.
And that's simply not represented by the stereotypes we've given them.
We picture the long-legged huntsman on the wall.
You know, we don't picture the spider mother that carries a clutch of babies around on her abdomen.
We don't picture the spiders that can walk on water or can swim.
You know, there's so much more.
And I just find this such a fascinating world to dive into
and find out all those little weird things you've never heard about.
Yeah, we're going to do marine biology to begin with.
So what veered you away from that towards the undergrowth?
So, yeah, the original plan was to go off into a marine biology degree.
And I think maybe that was just because it sounded cool.
You know, at the end of high school, you don't know what to do.

Marine biology science, cool.
The plan was to go off and spend my life swimming with dolphins and whales
and patching seals or whatever, whatever marine biologists do, who knows.
But then I don't know, I think once I got in there and started studying,
they were just a little bit too trendy.
You know, everyone loves dolphins and whales.
And there's, I think there's something in me that always roots for the underdog.
And so when I started hearing about all these little creatures hidden in the undergrowth,
living these miraculous lives right underneath our noses that we don't know about,
it was just so tantalising.
I had to go in there and start studying it.
So these tiny little powerful dramas that escape our notice nearly all the time.
That's not what we see.
There's two broad categories of spiders.
You've named them as the araniomorphs and the migelomorphs.
If I said that right.
Migelomorphs, that's one of those things.
Maybe, I don't know, maybe we've never seen it written down.
What's the difference between these two broad categories?
So the migelomorphs are maybe the ones we picture as the big, spooky spiders.
These are your big tarantulas and funnel webs who walk along the ground.
They have fangs that point directly downwards.
They sort of pin their prey on the ground underneath them.
The araniomorphs are the much, much more common, more diverse.
There's more araniomorphs and these are your web builders, essentially.
They're much smaller, much prettier.
And the main distinguishing feature of them is, again,
their mouth parts point in towards each other.
So they sort of have pinching mouth parts.
So their mouth parts are grasping tools then?
Yeah.
So if you picture being a spider on the web,
you're not going to push down into your prey because there's no ground there
to press against it and you can't put force on them.
They need little grabby mouth parts to get them from either side.
If I may be so bold, I think it's fair to say that you're favourite kind of spiders.
I know you're not supposed to have...
It's like having favourite children, isn't it?
But if you're favourite kind of spiders are the jumping spiders.
This first group, and you call them the gateway to a spider addiction.
When we say jumping spiders, what kind of a jump are we talking about?
Are we talking about leaping spiders or are these smaller jumps than that?
They are kitten pounces.
So these are tiny little things.

They're very, very furry.
They can often be quite colourful and they're very cute and endearing.
We talked about the spider before not having very good eyesight.
So spiders that don't have good eyesight have little tiny eyes.
You can hardly see where they are.
Jumping spiders are the opposite.
They have very, very good eyesight.
And what that means is they have two big sort of doe eyes that face forward.
And I guess something in this triggers our little parental instincts.
We see something with little cute puppy-dog eyes staring at us.
Yeah, they're like big and black and glossy.
And they look vaguely sad, too.
It's like, won't you be kind to me?
I mean, this is anthropomorphising, I know,
which is something I shouldn't say in front of a scientist, I know.
But nonetheless, they do look kind of...
Those big, gigantic, glossy eyes do look kind of sweet, don't they?
And whenever I'm talking to people at spiders and they go,
oh, no, I don't like any spiders.
It's guaranteed I can jump on my phone,
look up a picture of a jumping spider.
And I haven't had a single person disagree yet.
Everyone goes, oh, OK, that one's pretty cute.
So I'll give you that.
Can they see...
You mentioned the ones who are sitting on the web can't see very well,
but are the ones with these big black eyes, are they good eyes comparatively?
Yes, they're kind of like mini telescopes inside their heads.
So they don't have circular eyes like we do.
Their eyes are tubes.
They go back into their head.
There's a particular species of jumping spider.
It's been studied really well called Porsche.
And these have the best eyesight of any spider,
perhaps any invertebrate that we know of.
They can sort of hyper focus onto objects far away
using these kind of telescopes.
And they kind of work just like telephoto lenses.
They have multiple lenses along this telescope
that let them focus at different depths.
Have you been in a room with one of these spiders
and watched it looking at you, looking around the room?
Yeah, it's kind of eerie.
So we're studying these Porsche spiders

and we were actually doing an experiment
looking at how they hunt other spiders.
So we'd put them in a chamber with other spiders
and give them a choice of different types of prey.
And so we're sitting in this sort of featureless lab with them
and have this Porsche spider in a jar
and put it out on the table in front of me
and just sort of let it go and make its choice.
But more often than not, the spiders would,
when I let them out of the jar,
they would just turn and look at me
and sort of, it's almost like they were looking me up and down,
judging me on this spot.
Who is this bearded man who has dead put me in a jar?
What do you think they're doing
when they're looking at you so closely?
So these Porsche spiders are also really intelligent.
They become models for very, very, very clever invertebrates.
So as far as I know, they're actually just assessing me
and what is this thing?
Is it interesting?
And they can't really turn their eyes
so whenever they want to look around,
they have to turn their whole body.
They have this sort of very endearing,
head cocking, up and down glance they do.
Again, like you said, we shouldn't anthropomorphise,
but you just can't help fall in love with this little creature
just cocking its head and looking at you so endearingly.
So it actually turns its whole body around
and to check you out totally.
So you're the rogue element in the room in its mind
and a threat to it in that sense?
Pretty much.
Well, I don't know if it even did seem as a threat
because they would then turn around and then go about their business
and I would walk away from the experimental arena
and do its own thing.
But yeah, they definitely take in a lot more of their world
than I think we realise.
You say they are the brainy end of the spider family there.
Why are they considered to be brainy?
How do we know that they're brainy,
apart from having this unnerving ability

to check human beings out like that?
We think they're brainy because they have to hunt other spiders.
So to hunt another predator, you have to out with them,
especially these guys.
They're not the biggest, strongest things on the planet.
They're half the size of your little fingernail.
So they're going to use their wits to take down other spiders.
Oh, they're that small?
Half the size of a fingernail?
All right.
So they can take out bigger spiders than them?
Yeah.
So they can take out these big orb web spiders
we were talking about before.
They can take out sort of thicker house spider looking things
and how they do that depends on the type of spider.
So they can actually look at a spider
that they've never seen before,
never encountered before and just assess it
and figure out the best way of taking it down.
So that might mean figuring out that,
okay, this one doesn't have great eyesight.
I'm going to sneak up to it from the side
or it does have good eyesight.
I'm going to come at it from behind
or it's sitting in a web.
I don't want to walk across the web.
Maybe I'll climb up above it
and lower myself down
a la Tom Cruise mission impossible
and jump on it from above.
So you're saying it's got very different strategies
for different kinds of prey?
Yes.
And it comes up with them on the spot.
This is a creature, as you say,
because half your fingernail,
it must have a tiny speck for a brain.
It does.
How does it do it then?
We don't know is the short answer.
So we always thought
that to make these sort of complex calculations,
you had to have a big mammal brain

whereas these guys have a little tiny spider brain.
So this sort of information is challenging
how we understand animal cognition,
how we understand computation
to be able to make these sorts of calculations
with such relatively simple brains.
Well, I've had a conversation with a bee scientist
who wanted to study how it is.
A bee can seem to unerringly fly through
like the centre of a broken window.
It won't go anywhere near the edges.
It somehow is able with its kind of
equally minuscule brain able to find its way.
And his theory was that
it can see the landscape rushing towards it.
And it has this kind of stripped down,
sleek, fit-for-purpose brain
that can only do a few things but do them extremely well.
Maybe this is what applies here,
but then you say there's all these different strategies.
This is quite fascinating.
I don't suppose we know the answer
of how a spider is such a tiny creature
is able to compute so many different approaches.
No, and they do the kind of intelligence tests
with them that they do with rats
and other larger mammals that we think are being intelligent.
We give them mesas in the lab
and actually ask them,
how do you navigate from this point to that point
and give them all sorts of obstacles in the way?
I think we're really just scratching the surface of these guys.
Perhaps the feature spider of this family
is the peacock spider.
Tell me the story of how that became an internet phenomenon.
So what have been about 2010, 2011?
I guess the advent of things like social media,
things like YouTube and digital photography.
A guy called Jurgen Otto, an Australian guy,
started putting up videos in YouTube
of these peacock spiders that he'd filmed.
And what he actually started filming
was the mating dance of male peacock spiders.
Now you can probably guess from their name,

they're called peacock spiders because of this dance.
They have this abdomen that's very, very flat
and very, very colorful.
And they'll lift up this abdomen and wave it around
and shake it just like a peacock would shake its tail.
Like when you say colorful,
what kind of colors are we talking about?
Iridescent, blue, reds, greens, oranges, white, yellows.
They actually have really black blacks,
which is really interesting.
They've measured how black peacock spider blacks are
and they're blacker than black.
It's hard to describe it sounding like
I'm doing a spinal tap a bit.
It actually sounds like those kind of color bars
you get on old TVs for the old test battens
by the sound of things.
It's that iridescent.
And do they use those colors to attract a mate
the same way male peacocks will show off
their plumage to attract a mate?
Yeah, so it's only the males that are colorful
like these, the females or a dull mottled brine.
So this is a courtship signal for the females.
And how tiny are these spiders?
Again, these are sitting happily on your little fingernail,
tiny, tiny little things.
And these are Australian icons.
We don't get them anywhere else in the world.
These are Australian animals peacock spiders.
So we can have as much pride in them
as we do our koalas in kangaroos and platypus.
Could there be some in my garden that I just can't see?
Can we get them around Sydney?
Yeah, they're very, very, very hard to find
because they're so small.
So you got to spend a long time looking for them.
Have you found them in your garden?
I've always been looking for peacock spiders.
The people that work on them just have an eye for them.
They hear you on a bushwalk and just spot them left, right,
and center.
I don't have that eye yet to the very first one.
I found it was a couple of years ago in my garden.

And I know that we're just learning so much about peacock spiders.
People are finding new species left, right, and center.
And I don't know anyone that works on peacock spiders
up where in the area where I live.
So I thought I'd probably find a new species.
I bet you there's a new species.
So I got it in a jar, I brought it inside, got out my camera
and got in your zoomed in and got some macro photos.
Got it.
It's beautiful.
Plumage actually called it on the back.
Jumped online, looked for photo references.
And I find that, no, it wasn't a new species.
I'd already find what they call the common peacock spider.
Oh, the common one.
Oh, really?
How insulting.
Nothing common about it at all.
Given that most of us, I think,
when we have a picture of a spider, a generic spider in our head,
we're thinking perhaps of a tarantula or perhaps even
some of us might go far to think of shilob.
In Lord of the Rings.
Would you rather, when people think of a generic spider,
if they're going to be proper patriotic Australians
to think of the peacock spider,
this cute, furry, colourful, sweet little thing instead?
I think so, yeah.
Or at least a jumping spider.
I mean, statistically, our stereotype spider
should be a jumping spider.
There are more species of jumping spider
than any other type of jumping spider.
And the ones we're probably most likely to come across
are the little jumping spiders in our garden.
So, yeah, they should be our stereotype spider,
a little cute, fluffy, kitten-like spider.
Do spiders sleep?
Yes, they do.
And we think they also dream while they sleep.
How could you know such a thing?
As much as we can know such a thing,
we look at other mammals
and we know that they go into REM states,

rapid eye movement states,
where they move their eyes side to side in their sleep.
And this is what we do when we dream.
And so we see other mammals do that and go,
okay, they must also be dreaming
and sort of processing all this visual information
in their minds.
Jumping spiders do the same thing.
They have rapid eye movements when they sleep.
They've studied it where spiders sort of sleep,
hanging upside down from a piece of silk.
And their eyes can do these little side to side movements
during their sleep.
Now, if they're also very visual animals,
it's safe to assume that they would also need to process
this information cognitively.
And as far as we can tell, spiders dream.
The dream lives of spiders.
Who knows what they're thinking about?
That sounds like young adult fiction to me.
That sounds fantastic to me.
Who knows what they're processing?
The intensity of the day that they're sleeping off.
There's a spider you refer to called the bolus spider.
I've seen this spider at work in a David Attenborough documentary
and it's pretty amazing.
Tell me about these spiders.
They eat moths.
We know that.
They eat moths.
How does the bolus spider prepare to trap
these airborne targets of theirs?
So they catch these moths with silk.
Lots of spiders use silk,
but they use silk in a very, very particular way.
So these spiders hunt at night when moths are flying around.
They'll climb to the tip of a branch or a leaf,
and then they'll start releasing a pheromone.
And this pheromone mimics female moth pheromones.
Right, so they're luring the male moth in
with the chemical smell of a female moth.
Yes.
It's just sort of floating around them.
Yeah.

And then what do they do?
So these pheromones are just sort of floating in the air.
The moths are going to be flying somewhere around the vicinity.
The next step is to try and catch those moths.
So these spiders release a single thread of silk
that's weighted down with a sort of a glue droplet on the end.
Like a little gob?
Yes.
And then they just start spinning it around in circles
like a picture of a cowboy with a lasso, you know,
spinning it around and around.
Well, with their little spidery leg, they...
Yeah, right.
So they spin it around like a sticky lasso then.
Yeah, it sounds ridiculous,
but it's exactly what they do.
And there's circles that you get bigger and bigger
and bigger and bigger until it intersects a moth.
And the glue sticks to it.
The silk sort of wraps around it.
They pull it in and eat it.
So once it's stuck to the moth, they just keep swinging
so it spins the strand of silk.
Well, I guess the moth sort of stops the spin
and it's too heavy and it falls.
But by that stage, it's tangled up in that thread of silk.
And then they can pull it up and then wrap it
in a little cocoon of silk like every other spider.
Like Frodo in Return of the King, right?
Yeah.
Spun it around.
So that's it for the moth.
Again, when you look at a big female orb web spider
sitting in her web,
tell me how a male would approach the female to mate
and what's at stake for the male
as it tries to mate with the big female
in the middle of her orb web?
Their lives are at stake to put it bluntly.
So the big spiders you'll see in the backyard
in these big ones are probably going to be the female.
The males are these little, little tiny things.
Oh, they're much smaller, aren't they?
Mm-hmm.

Than the females, right?
Yeah, they're little pinprick-sized things.
But to get to that female in the middle of her web,
he has to walk on her trap as well.
So this female sitting listening out for vibrations,
if he creates any vibrations he shouldn't,
she might think he's food.
So instead of just tiptoeing and hoping for the best,
these males can actually signal their intentions
by playing a song to put it bluntly.
What do you mean?
What do you mean by playing a song?
What, by plucking the web like a guitar again?
Exactly, yeah.
Really?
There's a kind of a vibrational music
that appeals to the female spider through the web?
Precisely.
So think about how attuned these spiders are to vibrations.
That's the world.
They're not singing the world like we are.
They're hearing the world.
So that female can hear the wind blowing through her web.
She can hear a leaf falling onto her web.
She can hear the difference between a fly in her web
or a grasshopper in her web.
And so she can also hear this little song,
this little strumming that the male does
as he approaches signaling his intentions.
This is a very high stakes cultural moment
here in the world of spiders.
So the music's got to be pleasing to the female spider
and indicate that it's a potential mate as well.
Yes, precisely.
Right.
Because if the music's not good,
she will eat him.
She will eat him, will she?
Yeah.
She will eat him, right?
Even if she's just not interested in meeting that day,
she'll happily go, all right?
I'll have this.
So it's sex or death for this male spider.

So if the music is pleasing to the female,
what does she then do?
So she will then just wait for the male to arrive
and do his thing, essentially.
Other male spiders use a different strategy.
So some of these large Gordon orb web spiders,
rather than singing to the female
or playing her song there,
they're a bit sneakier
and will wait for the female to be busy eating.
And I'll sneak up on her.
Pretty much.
Once her fangs are busy dealing with a moth or a fly
or something, they're not going to be busy dealing with a male.
And so you'll have all these males sort of waiting
around the edges of her web,
waiting for the perfect moment to just dart in,
get the job done to put it politely,
and then quickly leave again.
I have to ask, how do they get the job done?
How do they actually impregnate the female?
So they have these little pair of special legs
underneath their head.
They're called Pettipelps.
Picture like a little pair of boxing gloves
under a spider head.
This is what they all use to transmit sperm.
So they'll actually put a little droplet of sperm
on this little leg.
They've got a bunch of tubes in there
that will suck up the sperm.
And then they will quite literally reach over
and place it in her.
Afterwards, he will sometimes leave
a little bit of himself behind as a parting gift.
She doesn't capture his heart so much as some other part of his anatomy.
Is this true?
Yes.
If you're a male spider and you're mating,
you want to make sure that you're the one
to be fertilizing those eggs.
And not the other dudes hanging around.
And so one way to do that is,
I'm trying to think of ways to put this delicately,

you need to clog her up.
I believe the phrase is used in your book is a genital plug.
Yes.
Right.
And so sometimes that can be a little bit of a waxy secretion.
You leave there,
other times you just rip your arm off
and leave it there.
Okay, that doesn't seem very kind.
Nonetheless, both creatures there.
Afterwards,
won't she just eat him anyway?
Yeah, and for the males,
this might not be such a bad idea.
So think about if you're a male
and you've only got two of these little arms.
If you've mated twice, you've lost both your arms.
You can't mate again.
So you may as well just think,
what's the point in living?
Right?
You may as well just give up and be eaten.
Is it true that she might even devour him
while he's having sex with her?
Yeah.
So Australian redbacks are actually famous for this.
So they do this thing that they call it,
they call it a somersault.
So as they're attached to the female
as this little arm is inserted,
the male will sort of cartwheel from where he is
and just plonk his abdomen right in her mouth,
just sort of volunteering to get eaten.
And so as he's finishing his job,
she can just start digesting him.
Right.
And is she puking all over him while this is happening?
Yeah.
So spider feeding,
we might think of it as them using their fangs
to suck up food,
but the fangs are just used for venom.
They're actually just puking up digestive fluids
with their mouth and sucking it up.

It's a hard life out there in the wild.
You've got a lot to say about the phobia
that a great many people have towards spiders.
And this is quite a widespread thing.
Now you've taught zoology classes at uni
to students who are not normally squeamish people
to begin with.
I mean, what kind of things are you asking them to do
before you bring the spiders into the room, James?
Oh, we've dissected animals,
we've dissected pig fetus,
we've gone digging through compost
to look for soil invertebrates.
There's all sorts of strange and wonderful things
you can do in a university biology lab.
So that's pretty powerful in the old olfactory senses.
That kind of work.
So these aren't squeamish people at all.
What happened when you brought live spiders
into these classes?
I brought in some webs of leaf curling spiders,
kind of thing we get in our gardens as well.
Put them down in front of the classroom,
didn't really think about it.
And then there was this audible squeal,
a very high-pitched squeal that kind of signalled
who in the class was squealing.
Weirdly enough, in this class of very, very go-get-em students,
it sounds a terrible de-stereotype,
but all of the girls and women just hit at the side
of this spider being brought out and put in front of them.
Right, it was really gendered like that, was it?
Yeah, surprisingly so.
You don't think they were genuinely, like, disgusted,
because they're not squeamish.
No.
They're not the women or the men in this.
What do you think was producing that reaction?
I think it's what they thought they had to do.
I think it's one of these sort of behavioural short-hands
we use to talk about something that we don't know much about.
I think about, you know, when you get stuck in a lift
with someone you don't really know
and you feel like you have to make conversation,

you immediately go to, oh, hot outside, isn't it?
And then there's nowhere to go from there.
We see spiders, we don't really know what to talk about them,
so we revert to this Ugu-Bugi spiders,
and it tends to be very gendered,
and this is something that comes out in the research as well.
Spider fears and phobias are much, much, much more common
in females than males,
and seeing these sort of things happen in the lab
makes me kind of think, all right, this is not genuine.
This is some sort of ritual we're going through.
Yeah, my daughter hates spiders, hates and fears them,
and she won't be told by my wife and I
that they're harmless, the spiders that are in our house,
and we should just release them to the garden,
and she's like, we've got to kill them,
because she actually kind of, she argues,
only half ingested, they're actually full of malice
towards humans there.
So why don't we like this?
Is there something more deep-seated than socialization here?
I mean, is it something to do with the way they move,
the fact that they scuttle?
That seems to produce an adverse reaction in people.
So psychologists have studied this a lot,
because spider fears are more common than any other type of fear
in the world.
More than heights, dog snakes, flying spiders come out number one.
So they're really interested in finding out
why these little tiny frail benign things can generate such fear.
And it's really interesting, the kind of things
that get reported are things like hairiness,
kind of things like legginess.
Nobody ever kind of says that the fact that they're venomous
makes them scary.
It's just this sort of the general vibe of them.
But dogs are hairy, and they've got legs.
So do cats.
We love those guys.
Why not spiders?
Do you just think it's some kind of strange cultural idea
that's been passed on that some of them might be venomous,
and so we have this adverse reaction to them
because of that or something?

Yeah, whenever you ask people,
where do you think your spider fears have come from?
They never say, I was bit by a spider as a kid,
and it was very traumatic, blah, blah, blah.
What people will always say are things like,
oh, my mom hit them.
Oh, my partner hits them.
It's always this sort of shared story between people,
and you hear this happen whenever you have a group
of people talking about spiders.
It kind of turns into this group session
of sharing weird, creepy stories
about how big and hairy things were
and how freaked out that person was.
Yeah, and there's quite a few myths around spiders
that you've exploded.
Tell me about your teenage encounter with a huntsman spider.
Yeah.
I would have been maybe 16 or 17,
and I woke up in the middle of the night
and had a sudden sensation of something on my cheek.
Yeah, yeah, yeah.
That's causing a reaction in me, yeah, yes.
And just sort of instinctively with that thinking,
I just swiped at it with my hand,
felt a big thwack.
It must have been a good, decent-sized huntsman.
You mean it went thwack when it landed?
Thwack.
I just saw this silhouette, this big, leggy silhouette
shooting across the room.
Goodness knows where it ended up.
I never found it again.
But yeah, I'd woken up with a huntsman on my face
and when I thought this was hilarious
and went around for the next couple of days
telling people, guess what happened to me?
I was that person telling this spider story to all my friends.
Some other people thought it was hilarious,
but weirdly, some people looked at me very seriously
and said, oh, you know why it was drinking your saliva.
I'm going to get in front of this.
No, that's a myth.
It's a myth, is it?

It's not real.
I see, I haven't heard that one before,
but is that quite a common myth, is it?
Yeah, I see it a lot on the internet.
NICE, some sort of made-up statistic
that the average person swallows 12.3 spiders
in their sleep type of thing.
Again, there's nothing to this.
Not sure where it's come from,
but it's just this weird myth
that seems to prevent you.
No, it's this specific number.
12.5 spider sounds about right, doesn't it?
So they're not after our saliva,
when, of course, they could just get it
from a little puddle of water in the bathroom
if they really wanted to get it from somewhere
or even from the toilet, I suppose.
It's a little bit egocentric thinking something.
Loves your saliva so much it wants to drink it up, yeah.
It's vaguely vampiric as well.
Can you just also explode the myth
once and for all about white-tailed spiders, please?
Yes, it's been busted many, many times before.
You might have heard that they cause necrotic lesions
or gangrene or whatever.
Yeah, you get the bite from the white-tailed spider
and bits of you start falling off like a leper,
essentially. That's the myth.
Yeah.
That's just not true.
Absolutely nothing to it's been studied extensively.
They've looked in the chemistry of the venom.
They've gone back and looked at all the medical records
and get their hands on.
Absolutely no evidence that white-tailed spiders
are harmless in any way, really.
There's no necrotising bite from the white-tailed spider.
No.
What about the story that daddy-long legs spiders
are the most venomous at all,
but they just don't have fangs long enough
to penetrate human skin?
What about that one?

Again, nothing to it.
As far as we can guess, it might come from the fact
that daddy-long legs webs are pretty good
at catching other spiders.
So maybe someone has seen something like a redback
caught in a daddy-long legs web
and thought, oh, well, if it's tough enough
to take down a redback,
it must be more venomous than the redback,
but that's not actually how venom works.
Chances are it's actually just the web
that tangled the redback there and left it there.
The daddy-long legs venom is really, really benign.
The research they've done actually shows
it doesn't even work very well on insects.
It kind of just sort of makes them a bit dopey
and sleepy as opposed to killing them.
There's absolutely no harm from daddy-long legs.
Let's talk about the mygalomorphs, mygalomorphs,
the tarantulas, the trapdoors,
and the funnel webs.
Trapdoor spiders, what is this trapdoor that they build?
I don't think I've always known about trapdoor spiders.
I've never been able to tell the difference
between that in a huntsman or whatever else.
The trapdoor spider builds?
So trapdoor spiders are essentially a type of tarantula.
They live in a long cylindrical burrow they put in the grind,
and they can stay in there for life.
They don't go around building burrows with them.
It's their permanent home,
and they'll put a little door on the top.
It's just a little circular flap.
Sometimes it's even attached with a little silk hinge
that can open and close.
It's a silk door, is it?
It's also made of sort of dirt and sticks and debris
and sort of held together with silk.
And so their prey just simply is walking across the terrain
and steps on the trapdoor and falls in, is that how it goes?
Yeah, so they can often have silk sort of spanning out to run
from the entrance of their burrow,
and so they're also listening to that silk with their legs
and grab them.

The kind of weirdest one is that these purse web spiders,
they have these burrows that are lined with silk,
and the silk extends out to form this sort of,
well they call it a purse, it's like a flaccid sock,
or something that just sits on the surface,
and they'll actually sit inside this little purse of silk
and wait for creatures to crawl across this silk purse
and nab them through the silk.
They're bizarre little creatures.
Funnel web spiders that are prevalent in Southwest,
Southeast Australia.
When I was a kid I was always told that these are the most deadly
of all the venomous spiders, is that true?
We actually say they're the most venomous,
but not the most deadly.
Yes, so I think the deadliest title goes to the,
maybe the recluse spiders over in Central America.
It's good to know that they're recluses, isn't it?
And that might simply be because they're finding
very, very remote places in Amazon where people
don't have access to doctors in hospitals very easily.
Here in Sydney, even though we have the most venomous
spiders, we have easy access to healthcare.
So no one's actually ever died from a funnel web
since the 70s, I think, since we've had anti-venom.
But yeah, they hold the title for most venomous.
The venom that spiders carry, it's typically a cocktail
of neurotoxins.
Is that right?
And what happens once the venom enters its prey?
So it can be a couple of different things.
There are chemicals in there that can burst open cell walls
and yeah, as you said, there are other chemicals
that can mess up your nerve cells.
Sometimes this means switching the nerve cells
in an animal off.
So it messes up the, I guess, the chemical pathway
between nerve cells and paralyzes that animal.
Disturbingly though, sometimes it works the opposite way.
It can actually turn nerve impulses on.
So it gets, the chemicals get in between the nerve cells
essentially and stops them from being able to turn
their signals off.
So picture, imagine you're a little tiny fly.

You have every single muscle, nerve cell in your body
or not at once and you can't turn it off.
So every muscle is pulling every which direction possible.
Picture now that your fly spray works in the same way.
So it turns on nerve cells and they can't turn off.
So picture the way when you hit a fly with fly spray,
it just starts frantically buzzing.
It's just sort of tortured until it shuts down.
And might a spider bite do that to a human as well?
It can.
Sometimes most spider bites are very sort of benign
and innocuous.
And the spider venom is not made for defense.
It's made for hunting.
So it's not, not for us.
It's for other things.
Oh really?
It's not a defensive thing.
It's just a hunting thing.
Yeah.
Yeah.
So the fact that spider venom works on us
is kind of just a weird,
unlucky coincidence that we have similar nervous systems
to lots of other animals.
It can affect similar different chemical pathways in us.
Then why would it bite a human?
It doesn't think we're prey, does it?
It can be a sort of last resort tactic, essentially.
If they feel in danger, they'll lash out.
So that old sort of adage of if you leave them alone,
they'll leave us alone is true.
What would happen if your average suburbanite was built,
bitten by a, something like a funnel web spider?
So if you think you'd be bitten by a funnel web,
definitely get to hospital.
What makes funnel web venom so potent is the fact
that it's really fast acting.
So these other spiders that are,
are of what we call medical significance.
Their venom can be quite slow.
It can take hours, maybe days to work.
Funnel web venom can fully escalate within an hour.
Now, if you do suspect you've been bitten by a funnel web,

there shouldn't be any ifs and or buts about it.
One of the symptoms of funnel web bites is immediate searing pain.
You'll have very large bleeding puncture marks in your skin.
It's really ambiguous.
The sight of the bite will that sort of flare up and grow or.
Localized swelling, inflammation, that kind of thing.
If you're unsure, if you've been bitten by a spider
or what that spider is, no matter what,
the best thing you can do is actually catch that spider.
And I mean, that particular spider you think's bitten you,
not just some random spider you find on the wall,
not, oh, I'll, you know, put a bandaid on
and find that spider later.
If symptoms sort of advance and you need medical help,
you want to take that spider to the hospital, the doctors,
they can look at it and say, oh, that's a funnel web.
Let's get you in a hospital bed.
Or they can say, oh, that's a black high spider.
That's never going to happen.
That's never going to happen.
I mean, that's no one's going to have the presence of mind to go,
oh, I've got to catch that funnel web now.
I mean, if you've bitten bitten,
the first thing you want to do is keep it right away from it.
I'm, I don't suppose that hardly ever happens.
Then people bring the spider in the, the mental hospital.
No.
And it's what makes understanding spider bites so hard
because you just don't have good data on it.
And because people are so worked up about spiders as well,
we often suspect spider bites when there haven't been, you know,
to definitively say, yes, this condition is a spider bite.
We need to have the spider.
We need to have it identified.
The bite must be witnessed and there must be symptoms from that bite.
But instead what we often see are people turning up to medical centers
going, I've got this red welt.
I think it's a spider bite or a sore spider on my arm.
And now my ear hurts.
I think it might have been bitten by a spider.
It's really, really hard to get good medical data on spider bites.
Spider silk now.
The other extraordinary thing that they excrete,
the stories of them, of the silk being tougher than Kevlar protection.

That's, that's a thing that's bandied about.
Is that true?
Yeah.
So wait for wait.
You can measure spider silk strength and also its ability to absorb energy.
It performs steel and it performs things like Kevlar.
It performs rubber.
It's a miraculous material.
There's some, I mean, I've got an open notice when I,
in Queensland, the golden orb spider there seems to have a,
it's a whole different thing to walk into that kind of a web accidentally
than it is to walk into a daddy long legs web view.
It feels almost metallic, which spider has the strongest kinds of silk.
Well, overall things like those golden orb spiders,
that group has the strongest silk.
Cause they build these big webs sort of between trees.
There's one particular spider that I performed any other spider.
It's called Darwin's bark spider.
It's found in Madagascar and it doesn't just build webs across pathways.
It builds webs across rivers.
So there's going to be five, six meters wide.
And when they've measured this spider's silk.
What? How far?
Five or six meters.
Wow.
So it's spanning across rivers.
They're just kind of your normal large orb spider,
but they're probably catching big insect prey like dragonflies,
beetles, moths, that kind of thing.
And when they eject the silk,
do they eject it like Spider-Man from these little kind of wrist things
or is it just, or do they have to pull it out?
Yeah, they have to pull it out.
There's no sort of muscles there to project it.
You'll watch them with their legs just reeling it out from their abdomen.
And having done so, if they're going to have a strand of silk
that covers such extraordinary distances,
so they just sort of let it blow out in the wind
and see what it catches on.
Is that what happens?
Pretty much.
If it's a smaller web that they're building amongst tree branches,
they might sort of anchor a piece to one twig,
walk around, find another anchor point,

and sort of pull it taut that way.
Given the strength and elasticity of spider's silk,
particularly of the Darwin-Buck spider,
I think you said there,
we get silk from caterpillars and that can be woven.
Has anyone tried to weave spider silk?
Of course.
People have been trying this for centuries.
The earliest attempts to try and use spider silk was to use it,
I guess, like we would silkworm silk,
getting a little spider, they call them cocoons.
We have the silk and egg sacs,
and seeing if we can essentially make felted things from that.
That kind of advanced to people actually trying to reel spider silk
directly from the abdomen.
This is something you can even do in your backyard.
If you really want to, if you see a spider releasing silk,
you can sort of get a twig or four steps,
kind of get that strand of silk from them
and just very, very gently pull,
and you can sort of even reel it onto a spool if you want to.
Have you done such a thing?
Have you done that?
Yeah.
I've worked in many a spider lab,
and they just keep producing silk,
sort of the more you gently pull.
If you don't pull too hard, it just sort of keeps coming.
Is it like milking a spider?
Yeah, I guess.
Have they got a silk milking or something?
I have heard referred to as that.
Yeah.
Wow.
Does the spider mind?
I'm sure they do.
But if people have been trying to do this,
why aren't we wearing clothes out of spider silk?
It's really, really laborious and hard.
So people have gone to ridiculous lengths to try and make this work.
So my favorite story is of a Jesuit priest from France
who went doing missionary work in Madagascar.
And while he was there,
I don't know, just in his spare time or something,

engineered a complete spider silk harvesting
and manufacturing facility.
So they would harvest silk from spiders.
We, I guess, spin that silk into threads,
get so much thread that they can then weave it into fabrics
and then make it into textiles.
Now, this all happened in the late 1800s.
There's reports of the 1900 World Expo.
They're apparently a full set of hanging bed curtains
on display made entirely from spider silk.
But whatever was made then doesn't exist anymore.
We have no samples of it.
There are no pictures, no drawings.
You have to imagine what it's like.
Well, I actually know we don't have to imagine
because a couple of years ago,
an entrepreneur and a textiles maker
found these records,
thought that sounds so crazy, it might just work,
went back and actually replicated the methods of this priest
and it's possible.
You can weave textiles from spider silk.
And what does it look like
once you've woven this into a garment?
So this is the silk of these golden orb web spiders.
They're called golden orb webs
because if you catch the silk in the right light,
you can see it has this yellowy sort of sheen to it.
And what they find is when they wove it into fabrics,
it was bright shimmering golds.
If you see these fabrics, you can look it up online.
It looks like it's woven from gold leaf.
And this is the natural color
of the silk is bright shimmering gold.
But this is a very difficult process
given that there's only one of these things in existence.
Yes.
And that one thing took, I think,
five or four or five years to make.
Hundreds of people, millions of spiders,
that it's just not cost effective, I guess.
Can it be produced artificially?
Yeah.
So once we had the,

once scientists had the gene for spider silk,
they thought, great,
we're going to get this,
start putting it into other animals that can,
we can rear a lot easier than spiders
and get the silk proteins from them.
So some of the earliest things they tried were
to put it in a coli bacteria
and we can essentially brew up big vats of a coli.
And as these bacteria are metabolizing,
they're also spitting out spider silk proteins,
try putting it into yeasts,
try putting it into rice plants.
This is so sci-fi.
All of this.
Yeah.
What about animals?
Okay, so the idea was we want more silk
and we want it quicker.
So there is this,
a bunch of Americans who took
a very American approach to this,
thought, right, we want big silk things.
We got to get these proteins,
put them in big animals,
and then went straight to goats
and they put spider silk genes in goats.
Oh my God.
They didn't,
they didn't work the way up through mice
and rats and rabbits.
But straight, straight to goats,
they put the gene in the part of the genome
associated with milk production.
So we ended up with these genetically
modified goats that when they made milk,
they also produced silk proteins.
So you could go up to this goat,
milk it like you would any other goat.
And in that milk was spider silk.
But again, this clearly hasn't worked
because we're not living in a world of spider garments, are we?
No.
So it took all the logistics of catching

and rearing and harvesting spiders
and just replaced it with running a dairy farm.
Yeah.
That sounds easy, but clearly,
the goat just couldn't deliver enough spider silk.
So the silk is, it doesn't,
I don't want you to picture milking an udder
and having it shoot out of web.
The silk proteins are dissolved in the milk.
So then there's this whole other chemical process
of isolating those molecules
and processing them and spinning them.
It's still very, very laborious,
but people are still doing it.
There's their startup still working with a coal iron things
to try and make artificial spider silk into something.
Whenever we say it's tougher than Kevlar,
people imagine you might make bulletproof vests
out of spider silk.
It's not possible though.
Tell me why that's not really possible.
Because spider silk as well as being strong,
it's also very elastic.
So people have worked on it.
They've made bulletproof plates
out of artificial spider silk
and the way the lead scientist phrased it at the time,
I think, was, yes, we can make a plate
that will absorb, that will stop a bullet in its tracks,
but that bullet will be on the wrong side of your torso
by the time it stops.
So it's strong, but it's still very stretchy.
You also write that spider silk
has these other amazing properties.
It's antibacterial, hyper and allergenic.
Tell me how it's thought that it might be used
for surgical implants.
Yeah, so you can put spider silk,
you can implant it into animals
and it doesn't seem to elicit an immune response
like many other artificial things
you put into people would.
So people are eyeing it off as maybe something we can use,
maybe we can use it as a scaffolding

for cell growth and tissue regrowth.
Maybe we can make artificial tendons out of it.
There's actually been a study in rats
using spider silk, artificial spider silk
as a coating for silicon implants
and how it reduces sort of recovery time
because it doesn't cause as much inflammation.
So we could soon be having spider silk
silicon implants put in us.
Something as particular as that,
you could even, I don't know, are they looking at 3D printers
working with spider silk to produce such things?
Yeah, so we always tend to think about
spider silk as being made into fibers
and what we can do with these fibers,
but as you think about it more, we're kind of realizing
maybe we actually don't want to replicate spider silk.
Unless we're going to be building spider webs,
why would we want to replicate it exactly?
We can take the properties of this
and adapt it and modify it and to do other cool things.
So you can process these spider silk proteins
to do different things.
They can form sheets.
They can form capsules.
You can form mesh and webs.
So they can be used for all sorts of medical applications.
There have been five space missions.
Yes.
Count them, five whole space missions
where spiders have been taken aboard a space shuttle
or put into space stations and the like
to see how they build their webs in microgravity.
What has been learned from these five separate
spiders in space missions?
So they've told us we're bringing spiders into space
to do this important research of what
the effect microgravity has on them building their webs.
And that's sort of the public rationale for doing this.
But I think what we've really learned
at the end of it is that spiders are cool
and that people are fascinated with them.
Yes, they've brought spiders up into space.
They've seen that they can really, really quickly build webs.

They really quickly adapt to microgravity.
But it's not the best spider science that's
ever been done on the planet.
And it never was supposed to be.
The point of these missions was to get people
interested in space travel.
So post the moon landing, NASA was faced
with this problem of where do we go now?
How do we make space even cooler?
And they thought spiders, everyone loves spiders
apparently.
And if it says a lot about our natural fascination
with spiders, if rockets and astronauts in space
travel is not cool enough, we need spiders to amp it up.
So each one of these spidery space missions
has been part of a public outreach program
in partnership with the school or an educational
organization.
And they're sending data back to Earth.
They're streaming videos with astronauts pointing
at these spiders in space.
It's been completely brilliant having this conversation
with you, James.
I've enjoyed it so much.
Thank you so much.
Thanks so much for having me.
You've been listening to a podcast of Conversations
with Richard Fidler.
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