

# SHOULD YOU WASH EGGS BEFORE EATING THEM

*We  
develop a passion  
for Teaching!*



[Marnie Chesterton] Shall we start with fried? Do you like yours over-easy or sunny side up? [Susan] Oh, sunny side up I think, yeah.

That's a good breakfast cooking sound, isn't it?

[Anand Jagatia] Hello and welcome to CrowdScience from the BBC World Service.

I'm Anand Jagatia. We're devoting a whole episode to chicken and egg problems, and no, I'm not talking about causality dilemmas, I'm talking about questions that are

quite literally about chickens  
and eggs. And that's why  
you can hear Marnie  
Chesterton  
frying up some breakfast with  
one of our listeners.

[Marnie] Susan, how do you  
think our egg is turning out?

[Susan] Well, our eggs are  
doing very well. I'm using a  
non-stick  
pan here and just a little drop  
of oil in it, and  
they're not sticking at all, as  
you can see. I'm moving  
them around the pan and  
they've  
cooked nicely no problem.

[Marnie] They look delicious!

They smell delicious! Mmm!

[Anand] CrowdScience is the  
show

that 'egg-splores' (sorry) your  
science conundrums,

and it turns out that over the  
years we've

had quite a lot of questions in  
the CrowdScience egg box,  
which is the special section  
of our inbox dedicated to egg-  
based inquiries.

So coming up, I'll be looking  
at what happens to  
eggs after they've hatched,  
and investigating  
some curious behaviours in

chickens, as well as working out how a cuckoo knows it's a cuckoo when it's been raised in another bird's nest. But first, Marnie is looking into some questions all about the science of cooking eggs.

And speaking of, how are you getting on with that breakfast, Marnie? I ordered two fried eggs sunny side up, please.

[Marnie] Thanks Anand, we'll get cracking with breakfast shortly.

Now I'm here at the home of

listener Susan  
in London, who's invited us  
over not only to  
answer her question about  
eggs, but also to do some  
cooking. So, Susan, what is  
your question for  
CrowdScience please?  
[Susan] Well, I find that often  
eggs that I  
buy have the remnants of  
chicken faeces on them, and  
maybe even bits of feathers,  
and that's the  
same whether they're free-  
range eggs or they're caged  
hens eggs, so before cooking  
them I often give them a good

scrub.

But I want to know whether  
we should actually  
wash or rinse our eggs before  
cooking or cracking  
them open, in order to lower  
the risk of disease?

[Marnie] I love that you've  
asked this question Susan,  
because  
you've actually landed on a  
raging international  
debate. And can I ask, you're  
not originally from the UK  
are you?

[Susan] No, I grew up in  
Canada.

[Marnie] OK well perhaps it's

not surprising, then, that you  
feel  
inclined to wash your eggs,  
because Canada, as well  
as the US and Japan and a  
small number of other  
countries, they do wash their  
eggs if they're  
going to be commercially  
sold, whereas over  
here in Europe, and also in  
Africa, Latin America,  
and Asia, we do not wash  
commercially sold eggs.  
Now, I don't know a lot about  
eggshells, so I  
spoke to egg expert Vincent  
Guyonnet, who's a

trained vet and poultry scientist. He's based in Canada, and he works with the poultry sector to try and promote the consumption of eggs, and I started by asking him a really basic question.

How does the eggshell actually get on the outside of the egg? [Vincent Guyonnet]  
Through the process, so you know the yolk is coming from the ovary and it's being expelled and it's going down the reproductive tract, and then you've got the different

layers that are being deposited. You have the, you got the egg white, and you got different layers of egg white, and at one point in the organism that we call either you know the uterus, that's the equivalent of the uterus, but it's also called the shell gland, that's where the shell is being deposited.

And you've got fluid coming, surrounding the egg white, actually the egg white and the membrane, because you don't want to

interfere, those membrane  
are being deposited, and from  
the outer egg shell  
membrane starts the  
calcification process. First  
the different sort of calcium,  
you know, crystals  
if you want to call them that  
way, starts to spread  
across originally, and then  
once they all touch  
each other and they have sort  
of uh, gather, you  
know, the whole surface of  
the egg, then they start  
growing sort of upwards,  
right? So that  
that's the thickness of the

shell. And it's done in,  
say, the hen is doing that  
every 20-22  
hours. It's amazing. [Marnie]  
That is astonishing. Because  
I...

I think I always assumed that  
there was some sort  
of mould that was egg shaped  
and then I couldn't  
work out why there wasn't a  
seam somewhere  
on the egg. [VG] Yeah, no,  
no, I mean everything  
is coming through the  
bloodstream and  
it's all, you know, also in  
liquid form, and it's

just being converted. It's the  
beauty of  
nature and evolution, right?

[Marnie] So now we know a  
bit more about eggshells, I  
think it's time to crack  
one. So, Susan, do you want  
to go first, or should I?

[Susan] I'll crack one, yeah.

[Marnie] OK I'm going to  
hand you  
some eggs. - Thank you. -  
Now, this egg is from the UK  
so it won't have been washed,  
but they do  
look clean? [Susan] They  
do, these ones look rather...

well, some of them are more  
clean than others,  
but this one looks very clean,  
so I'm happy to have a go  
with that. I'll just be very  
careful. So shall I give this a  
go? - Go for it!

Great. That came out without  
even breaking  
the yolk.

[Marnie] Lovely! OK, so  
those ones aren't particularly  
dirty, but I totally understand  
why

you'd want to wash them if  
they did have some poo  
on them, particularly because  
eggshell is porous.

But what natural protection  
does an egg have that  
means it's still safe to eat  
when it is unwashed?

I quizzed Vincent on this one.

[Vincent Guyonnet] By  
design, by nature over the  
years, you know that the hen  
has

developed a mechanism by  
laying on top of the  
calcium shell, the cuticle.

You know, a very  
small layer that is designed to  
really protect  
at the very end of the egg  
formation, and as the  
egg is coming out of the hen,

to protect from the environment. OK? And so that cuticle is basically there to protect the eggs from bacteria that could penetrate inside the egg. And it's around the egg, and it's very... that's why when you look at an egg that has just been laid, it's fairly moist, right? Humid. That's that little cuticle that has been laid on top of the shell. [Marnie] So that's a defence mechanism already on the egg because

that's what the hen does?  
[VG] Correct. I mean the nature... for the egg, nature has done it so beautifully. Actually, for a long time, you know, the cuticle, we did not really worry too much about what was the composition of the cuticle, but recent studies have shown that there's protein, there's carbohydrate, and some of those molecules actually have some antimicrobial activity. And you also have antimicrobial activity in other parts of the shell,

along the shell  
membrane, all those different  
things, so the egg  
is really... has been designed  
beautifully over the  
years to have a number of  
defence mechanisms  
against infection. Right?  
Infection, because  
as we know, the egg  
technically originally is to  
create an embryo and to  
develop a new chick, right?  
So the hen, over centuries,  
has developed  
all those different  
mechanisms that are  
deposited

on the egg, inside the egg and  
so forth. [Marnie] How  
clever is that? I'd never heard  
of the cuticle before.

[Susan] Neither had I, and I'd  
never really thought about  
how it happened, but it's  
absolutely  
fascinating. [Marnie] It's just  
one final finishing touch that  
the hen  
does, just to make sure that  
the chick  
inside it is a little bit safer. I  
wanted to  
know quite how effective this  
cuticle is.

Nature and the hen have already got this defensive layer, this cuticle, on an egg, and that stops the bacteria getting into the egg?

[VG] Yes, it stops at the early stages so during what we call the, you know, the ovary position of the release of the egg by the hen, and maybe for the first 48 to 72 hours, OK, the cuticle over time is going to dry out a bit, and also the cuticle is going to start to let gas exchanges

go through, so then  
potentially also bacteria could  
come through, so really the  
cuticle plays  
an important role, but not the  
most critical one,  
there's a number of processes  
that protects the  
egg from, you know,  
contamination, so that role  
of the cuticle is probably  
during the first you  
know 70-72 hours. [Marnie]

One other question that  
springs

to mind is, what happens to  
this cuticle when the

egg is washed, and does washing the eggs remove the cuticle?

[VG] Yeah, I mean that's what happens. If you wash the egg, you remove the cuticle, but at what time do you remove the cuticle, and also let's

remember that nature has given the hen that cuticle, you know, to coat the egg, but we have also a number of processes on farms to also avoid any contamination of the egg, so it's not that we solely rely on the cuticle

to provide safe eggs  
for consumers,  
right? [Marnie] I think this is  
fascinating.

So washing removes the  
cuticle, which is a layer  
of protection. So that's lost.

And then one of  
the side effects of that is the  
egg may become  
drier, because some of the  
moisture from inside the  
egg might get lost. So that  
means if you wash your  
eggs you then should keep  
them in the refrigerator,  
because that prevents the egg  
from losing water.

[Susan] Right. [Marnie] But what was gained by washing?

Well,  
as Vincent said, the cuticle's protection,  
it doesn't sustain over time,  
it's a really short-term thing, so if an egg remains uncleaned and in contact with some poo on the surface of the egg, then there might be bacteria like salmonella from the faeces, and that might get through the porous shell and contaminate the inside. Also if you have salmonella within the egg, it

will multiply at  
room temperature much more  
than at  
refrigerated temperature,  
making it more likely  
to make you sick.

[Susan] So even if you buy  
your eggs unwashed on  
ambient shells, it'd be a good  
thing to keep  
them in the fridge anyway? -  
Yeah. - Which is what I do.

[Marnie] Should you wash  
your eggs at home? Well,  
according  
to the US Department of  
Agriculture, that's not  
recommended, because it may

increase the risk of contamination because the wash water can get drawn into the egg through the pores in the shell, whereas when they do this in the commercial sector, they're washed in such a way to ensure egg safety.

So what are Vincent's conclusions after 30 years of working in the poultry sector? So you've been exposed to both the washed egg and the unwashed egg system.

Have you noticed any

difference in  
quality or safety? [VG] No.  
No, absolutely absolutely not.  
Really it's different way to  
look at things and both  
systems work quite well, as  
we know,  
right, from data that is  
available in terms of  
food safety for that product.  
[Marnie] What do you think,  
Susan?

[Susan] Well, I think my  
approach probably is  
the safest, because I buy my  
eggs in this country  
off the shelf, they're not in a  
chilled section,

they haven't been washed. I  
don't wash them when  
I bring them home, I put the  
carton in the fridge, and  
when I get them out to use  
them, just  
before I use them, I rinse  
them off, or if  
necessary scrub them a bit  
before I actually  
crack them, and that's  
probably because when I'm  
cracking them if the shell  
happens to  
fall into the pan and it's got  
stuff on it  
then it's going to contaminate  
it, so I make sure

it's clean just before I crack  
it. [Marnie] That makes  
sense because also you know  
there's... if you're going to  
wash it just before you use it,  
there's absolutely  
no time for any bacteria to get  
through the shell  
and contaminate the egg.  
[Susan] Absolutely, I mean  
you just... you just wash it  
and then you crack it. So that  
seems to work quite well so  
far.

I haven't got ill on it, anyway.

[Marnie] Congratulations!  
Shall we celebrate by cooking  
some eggs?

[Susan] Absolutely, let's go for it. [Marnie] Should we start with fried?

Do you like yours over-easy or sunny side up?

[Susan] Oh, sunny side up I think. Yeah. That's one... a nice clean egg... and another one.

That's a good breakfast cooking sound isn't it?

[Marnie] Since we've got these things frying, I thought it might be good to hear a question from listener Bob, who's in the US.

[Bob] Hi CrowdScience, and hi Marnie. I am Bob in

Olympia  
in Washington state in the  
USA. I often fry eggs  
and I'm wondering, what is  
the science behind  
the proper use of heat and oil  
in a frying pan  
so that the eggs do not stick? I  
find that if the  
pan and oil are properly  
preheated, the eggs fry  
nicely and do not stick even  
in the stainless  
steel pan. When I was a kid,  
my parents had an  
old stove on which they did  
not have good control  
of the temperature. It seemed

that the eggs would often stick. So what is the science behind properly frying an egg without it sticking?

[Marnie] So Bob wants to know about the science behind cooking a fried egg without it sticking. So um Susan, how do you think

our egg is turning out?

[Susan] Well, it's not sticking at

all, but I do have a non-stick frying pan I'm using and we just put just a tiny bit of oil in there

as well. [Marnie] They look  
delicious. They smell  
delicious.

Well, let's hear some science  
which might  
help us do even better on the  
next one. I spoke to someone  
who has 15 years of research  
experience into the science  
and technology of eggs.

[VL] My name is Valérie  
Lechavelier, I am a lecturer in  
the school of engineering in  
Rennes called  
Agrocampus Ouest, and I'm  
teaching the science  
of our food.

[Marnie] We have question

from Bob in the US. He said,  
what's the science behind the  
proper use  
of heat and oil in a frying pan  
so that eggs do not stick?

[VL] Well, when you add oil,  
you add a physical  
layer that prevents eggs from  
sticking on the pan.

Anyway, if you have a good  
pan, something like a  
Tefal pan, you don't really  
need this oil because  
the pan is already  
hydrophobic. What you do  
when  
you add oil is just to add a  
hydrophobic layer.

And the thing is that when you jellify egg, when you eat it, the proteins denature and they expose hydrophobic groups, and these can react with the pan, if the pan is quite hot.

And if you had the layer of oil, then it will prevent the protein with sticking on the pan.

[Marnie] So Valérie explained to me that when you heat the egg, the proteins in the egg white will denature, and their compact structure will change

and become more unravelled. So when we fry the egg, more of these proteins will denature, and they form, actually, a gel. That's what I think of as the cooked egg.

They form this gel because their unravelled structure forms networks, sort of a series of nets.

And so as this gel forms, the egg whites lose their transparency, and they lose this ability to flow about because they become more solid.

And the higher the

temperature, the stickier the egg white will become, so a lower temperature is better for frying eggs that won't stick.

[VL] Well egg white protein can denature about 63 degrees, so it's quite cold.

The higher the temperature, the more you denature protein and the more expose the hydrophobic parts.

The more you have the hydrophobic part, the more you are sticking. [Marnie] What Valérie's saying is, the more

you denature the protein, the stickier the egg will become. Now, as the proteins denature, they will expose chemical groups.

Valérie was talking about them as hydrophilic and hydrophobic. Now, good non-stick pans, like the one you've got Susan, will have chemical groups on their surface that don't interact with the chemical groups on the egg protein, so that means they won't stick.

However, if you've got pans that are not non-stick, or

they're a bit older and maybe  
bashed about a bit,  
the chemical groups on the  
egg white proteins  
may form bonds with the  
actual surface of the pan.  
So to avoid that, you need oil,  
which can act as  
an intermediate layer  
preventing the protein  
from sticking to the pan. For  
our next fried egg,  
we want to go with not too  
high a temperature  
and a good amount of oil, in  
order to prevent  
our egg whites from forming  
bonds with the pan.

Now, maybe we could do  
some scrambled eggs,  
because they're notorious for  
sticking to pans.  
So should we have a go with  
that?

[Susan] Definitely!

[Marnie] Susan, how do you  
like your scrambled eggs?

[Susan] Well, I like them both  
ways really. I sometimes like  
them quite dry, and  
particularly if I'm having  
them

just eggs on their own, but if  
I'm going to have  
them on toast, I like them a

bit softer, and so I  
might put a bit of milk in it.

But these ones we're  
doing very nicely, and they're  
just coming up nice  
and scrambled, they're going  
to be nice and dry,

but also creamy. [Marnie]

Susan, whilst you deal with  
the

scrambled eggs, I'm going to  
turn to boiled eggs.

Because we've had a question  
from a listener who's having  
some problems removing the  
eggshell.

[Steve] Hi CrowdScience, hi  
Marnie, it's Steve from

the Lake District in England.

Now, I'm here in my kitchen  
at work, and I'm preparing all  
the day's fresh  
fillings and soups, because I  
run a sandwich bar.

I've got a pan of about 50  
eggs on the stove,  
ooh, just coming up to the  
boil now. I'm going to cook  
them just for a few minutes,  
and then cool them under  
running cold water so they  
don't overcook.

Then we're going to shell  
them, we're going to  
grate them, we're going to  
mix them with a touch

of pepper, some lemon dijon,  
and of course  
some mayonnaise to make a  
nice fresh egg mayonnaise  
for the sandwich fillings. I do  
this every single  
day, 50, 60, 70 eggs at a time.  
And they're all  
cooked the same, they're all  
cooled the same,  
but when I come to peel them,  
some of these eggs,  
they just pop straight out of  
the shell, the other  
ones... painstaking. You  
have to take it shard by  
shard by shard, it's as if the  
shell doesn't want

to come off the egg. Why is it  
some eggs are really  
easy to peel, and others are an  
absolute nightmare?

[Marnie] We need to find  
Steve a solution, because  
struggling to shell 50-odd  
boiled eggs each day  
really isn't sustainable. I  
suspected the answer  
might be something to do  
with the age of the  
eggs, so I asked Vincent what  
he thought. [Vincent  
Guyonnet] A fresh egg,  
if you boil a fresh egg and try  
to remove  
the shell, it's going to be

extremely hard, right?  
Because you have the shell,  
you have those shell  
membrane, you know when  
you peel an egg you're  
going to see that little  
membrane just below, so  
that's the shell membrane,  
that's the membrane that  
is basically at the basis for the  
formation of the shell. And  
in a fresh egg, it's very  
much... very, you  
know, attached to both the  
shell and the egg white  
surrounding it, right? So it's  
very hard to peel.  
If you let the egg, you know,

age for about say  
seven days, then you have  
that exchange of gases,  
so the egg is losing a bit of  
water, therefore now  
there's more room, and that  
membrane is starting to  
detach a bit from the shell,  
and therefore when you  
boil them it's much easier for,  
you know, to do.

[Marnie] You've got the shell,  
you've got this membrane,  
and then you've got CO<sub>2</sub>  
that's inside the  
egg, in the albumin itself, and  
then  
you're losing the CO<sub>2</sub>, right?

[VG] Right.

[Marnie] What's that doing to the membrane?

[VG] It's modifying the pH by losing the CO<sub>2</sub>, right?

So the proteins, and the membrane is rich in proteins and different, you know, binding between different proteins, the structure of the molecules change, right?

The conformation of the molecules. And therefore, that membrane starts to be more loose, and that's how you can, you know, it's easier to peel. [Marnie] So

there you go, Steve.  
Vincent recommends that you  
leave  
your eggs for seven days  
before boiling them, as  
this should give them enough  
time to lose a bit of CO<sub>2</sub> and  
water, which causes the shell  
membrane to  
become less attached to both  
the shell and the egg white.  
Now, Susan and I each have a  
boiled egg. Shall  
we try and see how easy these  
ones are to shell?

[Susan] OK, I'll have a go.

[Marnie] These ones are only  
just bought, so they

might be quite fresh, and so a bit tricky.

So while we struggle with this, let's check in with Anand, who's looking into a case of curious chicken behaviour.

[Anand Jagatia] Well, good luck with that fiddly task Marnie, and thanks to Susan, Steve and Bob for your questions. This is CrowdScience from the BBC World Service, where we're unscrambling the science behind your questions about eggs. That is the sound

of chickens that belong to one  
of our listeners,  
Laurie in France. He wrote to  
us because he noticed  
something rather strange  
about the behaviour of  
two of his chickens after they  
hatched. [Laurie] I've had  
chickens for the last 10 years  
and  
finally one became broody a  
couple of years ago  
and started sitting on her  
eggs. But obviously,  
because I only had hens, I  
knew those hens  
had... those eggs had not been  
fertilised.

So, my sister and her  
boyfriend have chickens with  
cockerels, and so I swapped  
my non-fertilised eggs  
for them to eat, and they gave  
me their possibly  
fertilised eggs, which I put  
under Mary. She's  
called Mary because of virgin  
births, obviously. [Anand]  
OK, so Mary's the chicken,  
yeah?

[Laurie] Yeah, so Mary's the  
chicken  
and Josephine was her sister,  
as it were,  
and, um, when she did the  
three weeks of sitting,

two of the eggs hatched, and  
she's white, and  
so is Josephine, but the two  
that hatched,  
one was black and one was  
brown, and that's  
because my sister has a lot of  
black and brown chickens.  
And when the chickens were  
real babies,  
they'd all sleep in the coop  
together with two  
adults, but as soon as they  
were able to fly, they  
flew up into the tree above  
when they wanted to  
roost. And that's what my  
sister's chickens do,

they sleep in the tree. And the  
daft thing is,  
they get up in the morning  
and when they want  
to lay an egg, when they're  
three months old, four  
months old, they decide to lay  
an egg,  
but they sleep in the tree and  
they still use  
the coop to lay their eggs. But  
the two babies,  
one is Chicken Kiev and the  
other one's Coq Au Vin...

[Anand] I bet you had a lot of  
fun coming up with  
those names! [Laurie] Oh  
man, that was my nephew's

fault.

[Anand] OK, so Chicken Kiev and Coq Au Vin came from

different chickens, but they seem to have the

behaviours from their biological parents, and not from Mary and

Josephine? [Laurie]

Precisely. Precisely.

The last time these chickens met their parents was

when they were in the egg, and literally less than

a day, they were still warm from being laid, so how on earth did they get the

nature characteristic of  
their parents, meaning they  
flew up into the tree,  
when the only two chickens  
they'd ever met always  
slept in the coop? [Anand] So  
you're wondering where this  
behaviour has come from, if  
it's not been taught,  
if they haven't learnt it from,  
you know, their parents  
that do fly up into the tree,  
because they weren't... you  
know, they weren't hatched  
there, where's  
it come from?

[Laurie] Indeed. The nature  
versus nurture thing's always

really interesting, but how on earth does that happen? I mean if I'd never seen a game of football could I suddenly be absolutely wonderful at football because it just so happened that my grandad was George Best, even though I'd never met him and I'd never played football before? Because that's what's actually happening. [Anand] Yeah, maybe some chickens are just naturally, you know, maybe there's variation in how brave or how curious different

species of chickens are,  
and some of them might want  
to stay, you know,  
relatively safe inside the coop  
and not fly away, and others  
of them might just have a  
tendency  
to do that, and maybe you've  
got a...  
you've swapped them in for  
some more bold,  
more adventurous ones?  
[Laurie] One French farmer  
told me  
that the brown ones and the  
black ones actually  
come from up in the  
mountains, and they all sleep

in the trees, once you get past  
a certain altitude,  
they all sleep in the trees, and  
he said he thought  
it was because there used to  
be wolves up there  
and their predators were all  
on the ground,  
so they started sleeping in the  
trees, like  
from day one, up there.

[Anand] Well I think there's  
some probably some really  
fascinating avian science in  
there, so yeah, we'll have to  
find out for you, Laurie.

[Laurie] That sounds  
great! [Anand] Yeah, thanks

so  
much for sending in your  
question, I love it!  
So, to recap: Laurie took two  
fertilised  
eggs from his sister's farm  
and put them underneath his  
own hens, Mary and  
Josephine,  
who have always slept inside  
the chicken coop.  
When the eggs hatched, these  
adopted chickens,  
Kiev and Au Vin, flew up  
into a tree to go to sleep,  
just like their biological  
parents.  
But they'd never met these

parents, so how on earth did they learn to do this? Sounds like we need to speak to a chicken behaviour expert.

[SA] My name is Siobhan Abeyesinghe, I'm a senior lecturer

at the Royal Veterinary College in London, and I am also, hopefully, an expert in particular in chicken behaviour and cognition and welfare.

[Anand] So we sort of filled you in on Laurie's situation with his chickens.

What do you make of that situation? What do you think the explanation is for that? [SA] It's a really good question actually, I really was happy to see it. So effectively, the perching behaviour in chickens is at least in part genetically programmed. So chickens will automatically have a motivation to perch, and this is because the ancestor of the chicken, the red jungle fowl, was a bird that had predators that were

ground-dwelling,  
and predators that were in the  
air, and they  
evolved perching in trees as  
an anti-predator  
mechanism, because it's  
harder to get at them.

One thing that's going on,  
then, is that the  
chicks that hatched will have  
had an instinct  
to want to perch, but there's  
also a developmental  
aspect, both in terms of  
learning, and in terms of  
physical development. So as  
birds age, it's only  
after about the first week that

they start to get...  
that they're fully feathered  
enough, and have  
their tails enough, to kind of  
get off the ground,  
and so once they can do that,  
they will start  
perching on initially low  
heights, and then  
increase their height, sort of  
develop their  
musculature and motor skills,  
but at the same  
time, it seems that they really  
need to have  
some kind of complexity in  
their environment  
that involves 3D space and

perches and items at  
different heights for them to  
be able to develop  
their spatial  
awareness. [Anand] Right.

OK, so chickens  
have a sort of innate potential  
that means  
that they can jump up and fly  
up onto perches  
like, you know, like trees in  
Laurie's case, but in  
that case then if perching is  
an instinct, then  
why do you think Laurie's  
original chickens, Mary  
and Josephine, prefer not to  
sleep in the tree and

stay in the coop? [SA] We obviously don't know about the history of Laurie's first two birds, it may be that they didn't really have much experience of these perches or elevated structures when they were younger, and so they didn't really develop either the motor ability or the spatial awareness to get up on the perches. But we also know that there are some differences between strains, in motivation and also

physical ability  
to get on the perch. If they're  
heavier, they may  
find it's harder to get up from  
the ground also.

[Anand] So really then,  
actually it's... even though

Laurie  
was quite amazed by the fact  
that this difference  
in behaviour seemed to play  
out in his garden,  
it's actually not surprising that  
his new  
adopted chickens sleep in the  
tree, because it's  
kind of this anti-predator  
mechanism that's

been around for a long time?

[SA] Yes, absolutely. Even  
within

chickens, they're all  
individuals, they're  
all different, so you know,  
there is room for them to  
have different preferences  
about how they  
use their environment. It  
seems like his new chicks  
were potentially a different  
breed as well, who may  
also have had a different  
propensity, if you like,  
to perch to the original birds  
also.

[Anand] So it seems like Kiev

and Au Vin were actually just  
acting out a very common  
chicken instinct to fly up into  
trees

to avoid predators. Perhaps  
the real question is  
actually, why don't Mary and  
Josephine do this?

Well it could be because  
they're of a breed that's  
less likely to perch in the first  
place, or because of  
differences in the way they  
were brought up.

When I was talking to Laurie  
about his chickens,  
he said that they made him  
think of another bird. [Laurie]

Cuckoos are very similar,  
does a very similar thing.  
She lays the egg, and she's on  
her way back  
to Africa before that egg  
comes anywhere  
near hatching, and yet when  
it hatches and becomes an  
adult it flies to Africa.  
[Anand] And we've had a  
question all about cuckoo  
behaviour from another one  
of our  
listeners, Tod in Australia.

[Tod] Hi, my name's Tod. I'm  
from Canberra in Australia.  
I'm a bit of a bird

fanatic, and like taking photos  
of a lot of birds,  
and the question occurred to  
me as to cuckoo  
species. We have quite a few  
cuckoo species in  
Australia, including one that's  
uh rather  
loud and annoying called a  
koel. So these koels  
in Australia, they're like large  
black birds, the  
males are, and the females are  
a sort of brown bird,  
and they're really quite big  
birds compared to  
the host parents that usually  
raise the chicks.

It occurred to me that um, you know, how do they know that they're cuckoos, and how do they know that they're not the bird that raised them? How do they know to kick other eggs out of the nests, those sort of things? [Anand] As Tod mentioned, cuckoos famously lay their eggs inside the nests of other bird species, who then raised the cuckoo as their own. But how does the baby cuckoo know how to act like a cuckoo, and not like its

host species? To find out, I  
spoke to Dr Ros Gloag  
from the University of  
Sydney. [Ros Gloag] I am a  
biologist,  
I work at the University of  
Sydney in Australia,  
and my field is evolutionary  
ecology. And I  
have worked, and do work, on  
brood parasitic birds.  
So that includes cuckoos and  
other things  
which are not cuckoos but  
which have the same  
reproductive habits, so they  
lay their eggs in the  
nests of other

species. [Anand] So Ros,  
cuckoos have this,  
uh, you know, they're famous  
for this behaviour  
where they lay their eggs in  
other birds nests  
and then, rather brutally, the  
cuckoo  
hatches and kicks all of the  
other birds  
out of the nest. What's going  
on there? What is  
that, what's going on with that  
behaviour? [RG] Yes, so this  
is a behaviour that we'll refer  
to as brood  
parasitic, and the parasitism  
part is because

the cuckoo is getting a free ride, and we can think of it as kind of parasitising the parental care behaviour of another species, so another bird. And so yeah, cuckoos have completely lost the ability to build a nest and rear their own offspring. They are completely reliant on these other species, the host species, to rear their offspring for them, and they've evolved this whole kind of suite of behaviours that go along with that.

[Anand] So our listener, Tod,  
who is also based in  
Australia, and where there are  
lots of cuckoos  
near where he lives, he was  
kind of wondering  
how this behaviour works,  
like  
how does the cuckoo know  
what to do, essentially.  
So when the cuckoo actually  
hatches in the first place,  
what happens to it then,  
and how does it know it's a  
cuckoo and not, you  
know, um, it doesn't belong to  
the species of the  
brood that it's hatched into?

[RG] Yeah that's a really good question. I think it's tricky to start talking about what a cuckoo knows and doesn't know, but it's perfectly sensible to think about well, you know, wouldn't this cuckoo run into problems later? For example, if it grows up to an adult cuckoo and, for example, instead of, you know, trying to court the females of other cuckoos, it makes a mistake and is attracted to, you know, the host species or

something? You can see  
some downstream problems  
if they kind of imprint on  
their host  
or if they start acting more  
like their host than  
like a cuckoo. But these  
things are not the  
problems that I think we often  
assume they are as  
humans, you know, we're...  
we as humans, a lot of our  
behaviours are learned, and a  
lot of them learned,  
you know, in our childhood,  
so when we're young,  
but that's not true for many  
other

animals, including cuckoos.

So really their... their  
'cuckoo-ness' is hardwired  
into them.

It's what we would call a kind  
of innate

or instinctual behaviour. And

a cuckoo is going to  
grow up to do cuckoo things  
and act like a cuckoo

irrespective of the nest or the  
species that

they are reared in for those  
first few weeks of their life.

[Anand] OK, so it's about  
instinct. One

of the most kind of famous  
behaviours that the cuckoos

will exhibit is pushing the  
other  
birds out of the nest. So that  
behaviour, then, is an  
instinct?

[RG] That one absolutely is  
also  
an instinct, and it's quite  
interesting. I mean, I should  
start by saying not all cuckoos  
do  
this, but quite a few do, uh  
this very, um,  
very kind of stylised  
behaviour that they  
show in the first few days of  
life, where they  
push and they wriggle, and if

they come into  
contact with something else,  
it might be the egg or  
a previously hatched chick of  
the host  
species that's in the same nest  
as it,  
it just kind of keeps wriggling  
and arching  
its back, and with a bit of  
persistence it'll manage to  
toss them out of the nest. And  
maybe it  
all looks very deliberate if  
you see it on film,  
but in fact it's really just  
going through  
this kind of stylised motion,

almost like a reflex,  
and even if there are no other  
eggs in the nest,  
you might see a cuckoo kind  
of arching its back in that  
way, or if you put things in  
the  
nest that are not other chicks  
or cuckoos,  
you can see it will have the  
same behaviour.

And it's also, interestingly,  
something that is quite short-  
lived, so when the cuckoo  
gets  
to about four days, kind of  
post-hatch,  
it stops doing that. So if it's

failed  
to evict a host chick by that  
stage,  
it will just put up with it, so  
that kind  
of reflex just disappears. And  
you know it's  
not so unusual, these kind of  
reflexes  
which have very specific kind  
of temporal  
component, where they just  
appear during a  
certain period of life, and  
humans have these  
too. I have a newborn baby,  
and he shows this  
kind of really classic um

moro reflex, or startle reflex, which all human newborns have, and they'll start doing it, you know, from birth, where if they kind of get a bit of a shock, they throw their arms up. But that startle reflex just goes away after a few months of age. What the cuckoo chick is doing, that kind of reflex, that classic behaviour, wriggling to get other chicks out of the nest, it's temporary and it's absolutely yeah hardwired in there as an

innate behaviour. [Anand]  
Right, OK,  
and it can, I suppose it seems  
like  
a really complicated  
behaviour and outcome,  
right?  
If we kind of frame it in  
human terms, and say,  
'oh well, the cuckoos have  
evolved to learn to push  
other birds out of the nest,' it  
sounds, you know,  
quite nefarious, and it kind of  
implies a certain  
amount of, like, agency and  
all the rest of it, but actually,  
when you break it down to

the behaviour,  
it's just, well for four days  
they just wriggle  
around until they bump into  
anything, and then keep  
wriggling, then you can see  
how actually quite  
a complicated set of  
behaviours can emerge from,  
you  
know, probably a behaviour  
that's pretty simple to evolve.  
[RG] Yeah, I think that's  
right. Yep, I think  
that's right. [Anand] As  
humans, we have long  
childhoods,  
so a lot of our behaviour is

learnt across that  
time. Many birds, on the other  
hand, like the cuckoo,  
rely a lot more on instinct,  
which can actually  
control some pretty  
sophisticated behaviours.  
Thanks to Tod and Laurie for  
your 'egg-centric'  
questions about eccentric bird  
behaviour.  
Now, let's get back to Marnie  
and see how her and listener,  
Susan, are getting on with  
those eggs.

GLOBAL ENGLISH  
PODCASTS