Associate/Professor Dieter Hochuli – 'It's Only Natural: Discovering the Ecology of Cities'

Moderator: Welcome to the podcast series of *Raising the Bar Sydney*. Raising the bar in 2016 saw 20 University of Sydney academics take their research out of the lecture theatre and into 20 bars across Sydney, all on one night.

In this podcast, you will hear Dieter Hochuli's talk, *It's Only Natural: Discovering the Ecology of Cities*. Enjoy the talk.

Dieter Hochuli: Thanks (0:32). Well good evening and welcome to the Annandale Hotel. I'm really excited to be here. It's obviously got such a rich live music history. I decided I'd even stick a set list up here so I knew what I was going to talk about. So I feel this is the authentic academic rock and roll experience.

What I want to do is really talk you through the, the potential to start caring about the nature around us and really expose you to some of the stories that are going on around us in our daily life. When we think of, of nature and biologists wanting to work in nature, quite often you might say, "Well why would you want to work in a city? You can drive a couple of hours any direction from Sydney and find some extraordinary landscape, some world-class natural experiences. Why would you want to spend you time in this concrete jungle, looking at the animals and plants that are still trying to make a living here?"

Well the answer's pretty simple, really. One of the things that we don't often think about is that the animals and plants that are surviving in the city are often thriving as well. They're often making a really good fist of an unusual circumstance. It's a real challenge … it's one of the grand challenges for ecologists to understand how this changing world, this dramatically changing world, is functioning. There's a whole suite of novel ecosystems occurring all around the planet.

We're talking about things that are influenced by climate change; things that are influenced by global toxification; the massive landscape users; the massive movements of animals and plants around the world. It means there's a whole lot of things now occurring in places that they've never occurred before and one of the great excitements for people like us it to try and work out just how they're managing to do that successfully.

So I guess what I want to do is really walk you through this notion of city life and the sorts of things that happen in it. Now when I talk about disturbances, we know that disturbances in nature are real, they're common, and we know that whenever there's some sort of disturbance in nature, you end up with winners and you end up with losers.

So in the interest of trying to creating something for everybody tonight, I'll … for the optimists among you, I'll talk to you a bit about the successful animals and plants in cities, how they get past some of the real stresses that cities create and, and thrive in these areas. For the pessimists among you whose glasses, glasses may be half empty, I'll talk about some of the negative stories too. I'll talk about some of the real challenges we face trying to conserve diversity in cities.

And hopefully what I'll be able to do at the end, is have you walking out of here … even if you don't really like the animals or plants that I'm talking about, I'd like you to realise that it's in your self-interest to care about it. It's in your interest in living in a city to create liveable cities to try and make sure that we do make these things better.

So I guess when we think about living in the city, there's a whole range of problems that you might encounter. You know, an example might be … I'm not sure if it's getting to you, but noise. If you live in a city, noise it something that affects our life, it affects our wellbeing, and it's fascinating to think that it actually affects animals just as much. It really targets a group of animals that need to communicate with each other using sound.

So I'm talking about things like frogs and birds and even grasshoppers. I'm talking about these animals that need to be able to call out to their potential mates and yell out and say, "I'm here, I'm willing, I'm ready, come and get me." Those kinds of things that birds, frogs … I mean that's basically what birds are doing when they're singing. They're just basically screaming out for sex most of the time.

So one of the things that happens though, if that's your game – you need to make a noise to attract a mate – the noises that you might encounter can be a real problem. And there's some fascinating stories that are coming out with things like some frogs that have been worked on down in Melbourne. For instance, there's a lot of frogs whose calls are now masked by the sounds of traffic noise. And this is a problem. And you can be sitting there, screaming for a mate, and she can't hear you. This is a particularly big problem for big frogs. The big frogs with the, the frequency at which they call, the pitch at which they call, is very similar to traffic noise. So what the frogs have had to do is actually change the type of sound they're making to attract the females they might like.

And there's a group of grasshoppers in Germany that have taken that to even coarser extremes. These grasshoppers in Germany exposed to road noise, have actually evolved new songs in response to this very strong selection pressure. Now you know that nature works on variability and all those sorts of things, but essentially, these grasshoppers that grow up in very noisy areas, for repeated generations, have evolved a song, which now can't be used to attract grasshoppers from quiet places. So the grasshoppers are actually evolving in response to the selection pressures. It's one of the great sort of excitements of looking at evolution in cities and how it changes things.

So this notion of noise and how animals deal with it is really interesting and there may be a lesson for a few of you hear too. If you're single and you live in the city, maybe you just need to, to sing a different song, I don't know; sing louder; sing … whatever works for you. So that's just the notion of noise.

You think of cities in other ways and some of the negative consequences. You think of pollution, right? You think of the fact we've got all the cars coming through out here. We've got the industries that we've got. One of the really interesting things we see when we think about pollution is intuitively I say, "There's a lot of pollution in this area, a lot of car exhausts," your, your gut feeling would be, "Oh, that, that's not going to be good." I mean that's the normal thing that most of us would think.

The fascinating thing is that in some, in some parts of the world, car exhausts are actually creating high quality habitats for certain organisms, plants in particular. Some work in New York City's actually found that car exhausts produce all these nitrogen oxides that scavenge an oxygen from on ozone, so ozone is an O_3. What the nitrogen oxides are doing is stealing one of the oxygens from the ozone, creating low ozone areas, and actually creating high quality environments for plants, which means that plants growing close to the city in places like Central Park, are growing in a much more robust way than those plants when they're growing in their, in their more natural environment outside. It's a nice little paradox where some of the pressures we might encounter – the city pressures and the pollutants – may actually make things better.

Now I don't want to be an advocate for pollution, particularly, but it's worth actually realising that's not the common story. I think we're all aware of the consequences of high amounts of particular matter or air pollution for people. You're probably aware of those days when perhaps they're burning off on the North Shore and the smoke comes over and you get all those problems with respect to respiratory issues. Those sorts of problems can affect animals in various places too.

A really important piece of work, which I can probably allude to 'cause the work … person who did it's just sitting over here, has just found that honey bees exposed to highly polluted environments, start to forget the signals that plants are putting out to try and attract the honey bees to come and visit them.

Now the reason this is important is that plants have to go through a whole range of things to try and attract animals to go and visit their flowers; more of that a little bit later. But the point, with respect to pollutants, is that these honey bees are starting to forget the signals that plants are putting out and this has got the potential to compromise an awful lot of the important services that these animals are producing. So there's just two examples there from noise and an example from air pollution.

It's not all bad though. A bunch of animals have found that city life is pretty fine. You're probably familiar with a lot of them, things like maybe ibis or things like brushtail possums liking a lot of the environments we create. Some of them have actually decided that the sorts of things we're creating are much better than the natural environments that they have evolved in.

A great example of that is a little butterfly that's out at the moment called the Blue Triangle Butterfly. It's a butterfly that's really iconic. It's got a beautiful, vibrant sort of turquoise; aqua-y kind of set of wings and it's a native butterfly that's quite happily persisted in Sydney for ten of thousands, hundreds of thousands of years. But since European arrival, they've taken a real liking to camphor laurels. These are a plant, which is a renowned pest throughout the Sydney region. And what we're finding is by planting these street trees, these camphor laurels as street trees, we've got this animal that has no evolutionary relationship with this plant, that's actually deciding that that's a far better plant to eat than the ones they've actually evolved on.

So there's a nice little story that when we plant our gardens, we're actually probably promoting an awful lot more than just non-native things, or an awful lot more than just simple things. We're creating opportunities for biodiversity to thrive in our local environment.

The other thing that we often do is throw away rubbish. Many of us don't think a lot of the sorts of things that animals like do for us with respects to rubbish. When we think of rubbish, we might think of the rats that are scurrying around in our backyards that are hovering around our compost bins and the like. Some recent work in Ney York City has just found that ants – these tiny little things that are crawling around the streetscapes of New York City – through the, the verges, the sidewalks – are actually consuming something like 60% of all the food that is dropped around Broadway.

So you think, "Well, that's nice. Is that really important for us?" And the answer's, "Yes." If you think of having 60% more rubbish on your streets, you're going to get a lot more rats running around your areas.

If you think of the amount of money we spend on trying to manage waste in those sorts of areas, we can actually start looking at the services that are provided by a range of different animals and say, “Well actually, some of these things might be quite good.”

What’s important with the ants I’m talking about too is these aren’t your run-of-the-mill high quality ants, the ones that a classical ecologist might like. These are your run-of-the-mill, suburban, urban hanging around your house ants that are providing this vital service to a city of many million people

So what I’m trying to do here now is speak to you a bit about the services that nature provides for us. I’m going to speak to you about a range of different things that nature does. When know that when we look at the green space and a range of those sorts of things, we can look at say … urban wetlands might help us deal with water purification. We know that planting plants on streetscapes reduces noise and particulate matter. We know that having the right things nearby can help nutrient cycling areas. These are ecosystems services that we’re keen to conserve and preserve in these sorts of areas.

But they do a lot more than that. One of the biggest shows in town with respects to ecological interactions is pollination. I mentioned the bees getting forgetful when they were foraging in, in polluted environments. But it’s important to think about why pollination matters. And it’s important … when we talk about the pollination crisis, what we’re really talking about is a sex crisis. We’re talking about plants desperately needing to get their male bits mixed onto their female bits to find a way for these animals to reproduce successfully.

So, as you’ll know, a lot of plants have, have (12:47) say male and female bits to their flowers, or even male and female flowers. One of the challenges of reproducing if you’re a plant, is to try and avoid inbreeding, right? Inbreeding is generally seen as a bad thing. Yeah, yeah it is. Yeah, I’m a big proponent of outbreeding. One of the things that you need to do if you’re a plant … it’s very hard for you to move. You’re literally and metaphorically rooted. You’re stuck to the ground. It’s hard for you to get from one place to another. So how … if you’re a shrub over here, and you want to get your male bits to a shrub over there to encourage some outbreeding, how do you do it?

The way nature works is essentially, you get your pollinators in. You might think of them as honey bees or native bees or flies or wasps or butterflies, but plants see them as flying genitals. They’re a way of getting your bits moved from one side to another, and it’s really important to realise, this service is fundamental to promoting outbreeding in these things and trying to get these plants sustaining and producing the fruit and the seeds that they need to persist. So when we talk about the pollinator crisis, we’re talking about a lack of pollinators.

Now in the city, we have some specific problems. One of the things we find in cities is that we’ve lost a lot of our native pollinators, so the diversity of things providing the sex services to plants is no longer there. It’s all the one-size-fits-all model, which may work for some, but it doesn’t work for others. The important … is that certain insects provide specific services for certain plants and what we lose in our cities through fragmentation of habitats and degradation of habitats, is we get massive declines in pollinators and there’s an urgent need to try and return these things back to these, these, these areas. So we’ve got the pollination crisis becoming the sex crisis and we’ve got the, the loss of our small bees, our small native bees, and a lot of our wasps and flies in these areas.

But that's not all. We know that we, we fragment our habitats dramatically. We remove our habitats quite dramatically. One of the issues we face is it's not just these groups that fall out, a whole lot of other groups fall out. Now one of the things that happens when you, you degrade these once continuous areas into smaller areas, is you start to lose certain species, but you don't lose these species evenly. Certain species are far more susceptible to going locally instinct than others. And when we look at remnant vegetation in urban areas, we really get concerned about the loss of certain things like parasitoids and small insectivorous birds.

Now when we speak about parasites and parasitoids, sometimes it creates a bit of a visceral feeling in people. I'm not sure how you guys feel. I feel quite offended when people compare lawyers and politicians to parasites because parasites are really useful and important. What you are going to find is that they're a fundamental player in ecological interactions in many of the places we work with. One of the things that we're losing in our areas are things like … called parasitoids.

Now these are wasps and these are flies that spend their time, basically flying around looking for caterpillars, looking for beetles, looking for things that are eating plants. They find them. The female will pull out a great big prong from her abdomen; inject an egg into the live caterpillar, or the live beetle. That egg will hatch inside the animal, start eating the non-essential tissue to start with, and then eventually kill the caterpillar. And you might say, "Well okay, that's a pretty brutal lifestyle but I can see the use." We actually call them beneficial insects a lot of the time too, to give you a sense of how much we like them. They play an incredibly important role in regulating insect herbivores, regulating the insect pests that are eating a lot of our vegetation.

And one of the consequences of urbanisation and the ecology of cities, is we lose certain species. We lose cities with a … we lose cities … we lose animals with a particular functional role and by losing those animals; we get all sorts of ecosystem flow-ons. For instance, if you put your thinking cap on, you realise if we're losing a whole lot of small insectivorous birds that spend their life basically eating insects, flying around the understory eating the bugs that are there, if we lose these parasitoids, these, these bugs that are spending their time injecting their eggs into other animals, all of a sudden, you're losing the things that are eating the things you might consider pests and the consequences are dire.

The consequences for a lot of remnant vegetation in cities is this: We end up having widespread degradation of our plants and our vegetation. We get widespread degradation of the integrity of the areas we work with, and you get things like dieback. If you've ever been on say the ferry trip to Circular Quay through to Manly, you might notice when you drive through, you see an awful lot of sticks poking through the canopy in the forest through there. There's extensive dieback and loss of dominant vegetation all throughout many remnant areas throughout places like Sydney, and through a lot of cities globally. So trying to manage that vegetation requires that we actually start managing the biodiversity that's playing an important functional role with those sorts of things. So that's a notion of dealing with parasitoids.

Now I guess what I've talked about so far is some of the stresses with noise and pollution, some of the losses that we've had with respect to losing certain things. There are some really positive stories too. You might be familiar with a lot of the efforts that go around trying to say, "Well we know we've got a problem with the amount of green spaces in the cities that we've got. How can we fix this problem?"

And the answer's fairly straightforward. What we try and do is restore these damaged and degraded ecosystems by replanting them and trying to make sure that we can restore some, some semblance of naturalness to these sorts of places.

So restoration of these systems is fundamental to the strategies we use to fix our cities. Replanting our cities is one of the things we're trying to do to address some significant problems with respects to things like the heat island effects that we see in cities. The heat island effects I'm talking about is how cities operate at a few degrees more than the outside areas. They operate at that 'cause of the way that our, our hard surfaces trap the heat. And planting plants is seen as way of trying to address that.

But one of the specific things we try and do is try to plant these, these communities of plants together to try and return some sense of naturalness. And one of the things we could talk about is whether that actually works. Can we fix degraded ecosystems? This is at the heart of much of the work that we do. We've got a belief that we hopefully can. We've got an expectation that we can. If you listen to the, the sorts of policy things I'll allude to at the end here, there's a need to do it.

So if we go out to a place like say Western Sydney, which is a place that's been damaged quite dramatically by agriculture and urbanisation in the last couple of years, can we restore an endangered community? And the answer is, "Sort of." We've done a bit of work in Western Sydney to try and work out whether you can replant these areas and bring back the animals and the ecosystem processes that they provide into these systems.

Now the system that probably captures our imagination the most is a simple little system that involves ants and seeds. I suppose, you know, in a sense of national pride, I should say that Australia is one of the leading countries in producing plants that produce seeds that ants like to collect. It's not a big story but it's our story and we should celebrate it. And what these ants … what these plants do is they produce a seed that has a little fatty body on the outside. It convinces an ant to pick it up and then drop that seed about five, ten centimetres into the ground, in its nest. It protects the seed from fire. It protects the seed from being eaten by things like rodents and beetles on the surface. And what it does is it's a way that the plant can actually get some insurance of having its seed put aside. A measure of a healthy system is that these seeds are being moved around by ants and being buried. Really simple metric but it's a really powerful metric.

So we've done some work to go out to the areas that have been planted. We just go and see which ants live there and whether they're doing the things that we want them to do. And again, for the pessimists and the optimists, I've got something for all of you. For the pessimists: When we go to these areas, we find that our natural community of ants don't return. A small subset of them do return, but overwhelmingly, most of the ants that we want to get there, this … what we think is the natural community of ants playing this important role, don't turn up. But what does happen, is the few ones that do return, actually come back with the ecological function that we need. They come back and start moving these seeds around at rates that are really important, that start burying them around and create the opportunity for these plants to sort of basically thrive in these areas.

So the short version is: Yes, we can replant these areas, we can fix them, but when we fix them, the best we can do at the moment is really create functional ecosystems, but they certainly aren't ecosystems that mimic the natural systems that we naturally want to do. So it depends where you stand with this particular issue.

It's not what we started with - it's definitely not that - but it's certainly an awful lot better than what we had previously.

So I'm just … I am looking at my set list now so … I'll be dealing with some questions at the end so I've got to … I'm just trying to make sure I work through and read our guidelines today.

I guess in, in terms of the positive stories, one of things I probably should allude to now is the potential for us to look at planning processes and look at things that might make our systems a little bit better. Can we actually make a case for conserving things? I mention the ecosystem services that things provide. I will allude a little bit towards the end to the wellbeing benefits that these green spaces provide. But it's worth looking at some local case studies and get a sense of whether we're really looking after what we've got now. I'm going to try and have you walk out of here, knowing that we probably need to draw the line at the moment with where we are. We can't afford to lose any more of the native vegetation in our local environment than we've got now.

So if you ask if we're doing a good job of looking at out, at our place … after our place at the moment, I'd have to say, "No." We're really suffering intensive cumulative damage, where tiny amounts of land are constantly being reverted to housing or roads or all sorts of things, and it's literally, I think … I've got to have some audience participation here, we call it death by thousand …

Audience: Cuts.

Dieter Hochuli: Sorry, death by a thousand …

Audience: Cuts.

Dieter Hochuli: You're not pronouncing the 'N'. There are some really difficult … sorry, I'm at a pub so I'm allowed to say … well, anyway … yeah.

Male Speaker: (24:11).

Dieter Hochuli: Yeah. The point I want to make is this: We have a series of processes that don't do us a service. Probably … a good case study might be a little … a road project you might be familiar with going on in the Inner West. Have you heard of the WestConnex?

Male Speaker: Boo.

Dieter Hochuli: Yeah, I'm not going to … I mean I'm a big fan of poorly planned, no business plan infrastructure, but what I want to point out is that we recently lost a couple of hectares of bushland as part of the process. It's not seen as a particularly important piece of bushland. It was known to support certain species. But I just want to tell you the story of this bushland and the processes by which it was lost and why it's a problem.

So this land, this bushland, was over near Wolli Creek. It was a certain type of woodland that supported a few things. It had a few old trees. And it supported things like … so a Powerful Owl, this fantastic animal that flies through the city at night, terrorising possums, rabbits, rats, any small sort of mammal, and basically defying the odds to be a successful city dweller.

This area … we've recently actually caught one. One of my colleagues is here - who has been involved in this project too – tonight. We recently caught one in the shadows of Centrepoint Tower at the Botanic Gardens. This owl spends its nights flying over to Bondi and Nielson Park, using stepping-stones, using small amounts of remnant vegetation to move around. They're really extraordinary things to have in a global city. Anyway, it uses this kind of habitat. That area's gone now.

I just wanted to point to the processes by which those areas are gone. We lose those areas primarily though a series of planning processes that require … well say if we're going to sort of break these sorts of areas, you're legally obliged to go and either buy us a new place elsewhere or fix it up after you've used it. Quite often the latter's impossible, so you quite often have to buy things elsewhere. This is done under a process called BioBanking. It's under a process, which is meant to give you no net loss of area, essentially. It's supposed to give you the opportunity to say, "Well if you're going to break this area here, we'll buy you something just as good over here and we can then basically build our affordable housing here and there's no net loss of, of green space.

So Wolli Creek was cleared. It was made into the car park for the, for the development. Do you know where the offset was? Does anyone know roughly where they decided the like-for-like comparison was? It's about 100 kilometres away on the Central Coast. This is the equivalent of me coming to you, grabbing your gourmet burger, and then saying, "Hang on, I'm going to pop over there and grab you a burger at Macca's and I'll swap it for you." Actually, it's probably more that I'll actually give you a voucher. I won't even get you the burger 'cause we're not even getting a like-for-like. The point's really important. The point is we don't have the processes in places to protect the existing areas that we've got.

So I guess I want to finish off with a couple of points. One of the points that I think is really important … I wanted to share some stories about some of the unusual things that happen in the cities around us. I think it's extraordinary that we can have a whole bunch of frogs and birds singing differently, a whole bunch of bees forgetting where their flowers might be, a whole bunch of plants thinking that car exhausts are great. I think it's remarkable that things like a Powerful Owl, actually manage to persist in this city, let alone thrive in this city.

And what's really important is … I mentioned that your self-interest is at heart here. We know, overwhelmingly, that connectedness with nature and an opportunity to engage with green space is fundamental to wellbeing. Both creating a happy and a healthier city requires us to look after nature in all these kinds of different ways.

I'm not … I'm … I mean I don't think any of that's particularly new. There's some evidence that I could happily point you towards in the question and answer, but given that it's not particularly new, I thought I'd, I'd get close to finishing off with a Greek proverb. And I think … it really struck me when I first saw it and it really talked to this notion that: "Strong societies can grow when old men plant trees whose shade they shall never sit in."

I think it's a really important lesson for us with respects to planning in the future and stopping some of this cumulative damage. We know that nature can persist in many of these environments. We know that, that things will manage to thrive despite the things that we do with them. But it definitely needs a hand and if we can actually start doing that, we're going to make this city and this planet a better place.

So thank you very much for your time and I'm happy to answer some questions.

Moderator: Thank you for listening to the podcast series of *Raising the Bar Sydney*. If you want to hear more *Raising the Bar* talks, head to raisingthebarsydney.com.au.

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