

Paul Kirtley's Blog

Wilderness Bushcraft • Survival Skills • Outdoor Life

Paul: This is the Paul Kirtley Podcast, episode 18.

Man: The Paul Kirtley Podcast. Wilderness bushcraft, survival skills, and outdoor life.

Paul: Welcome, welcome to episode 18 of my podcast. And I'm really quite excited about this episode's guest. It's somebody who I have wanted to speak to in this format for some time. Mark Hines is a professional adventurer. He's a well-regarded endurance athlete, and he has a professional background in exercise physiology and biomechanics. And he's also a writer and it was his writing that first got me interested in talking to him. He's got quite a diverse range of interests that all tie together but they are diverse and they overlap with my areas of interest. So I was very keen to get Mark on and talk to him about these areas.

Now, we cover a wide range of different subjects in this podcast. It's wide ranging. Some areas are a little bit dense, other areas are amusing, other areas are certainly very informative about how he approaches his outdoor life and some of his endeavors in wild places. And I think you'll find all of that very interesting. As I said, it all ties together. Mark has spent time researching in labs, he's written books on health, fitness, and his adventures. He is always plotting the next thing that he's going to be doing and he's definitely got some interesting things coming up.

And what we started talking about was some of his endurance events. He has become known as an ultra-athlete. He has run the Marathon de Sables, he's run ultramarathons in the jungle, he's run ultramarathons in the Arctic cold in winter. And we start off by talking about that and we then range off into many different subjects along the way. It's quite a long one this time but it's well worthwhile. And Mark is just a thoroughly nice chap and very, very selfless in giving his knowledge and experience and sharing that with us here.

So without further ado, enjoy my conversation with Mark Hines.

All right, so I'm sat here with Mark, Mark Hines, and we're in a little office in London. Hopefully, there's not too much background noise but if there is, then that's what people can hear.

Mark, this is the lab that you've got access to and you use. Tell us a little bit about what you've been doing here and we can rewind on how you got here. Just a little bit about your background for the listeners so they've got some context because I think we're going to be quite wide-ranging in what we talk about today in terms of very different areas of interest that you have and in different areas of interest that I have in what you've done. And I think that's going to cover quite a lot of ground. So I think, to set the scene, it would be good to give a bit of context to start off with.

Mark: Sure. Yes, I have worked here for approximately five and a half years as a lecturer and sort of interim heading up the research and academic departments for the college. So, started back in 2008 and left early 2013. And that was due to contract issues. I was being supported through a Ph.D. for a few years part time. And when that contract ended, I was sort of in a position where financially it would be very tough and most importantly my boss had told me I couldn't have another month of work to go fussing around in the Arctic and I needed three months off. So that was the end of my lecturing career here.

Paul: And the college...we haven't said the name of the college?

Mark: Yes, this is BCOM, that's the British College of Osteopathic Medicine. So I was the physiologist and taught a lot of the academic side and the research side. And then they would have all their clinical work elsewhere in another building. So yes, it was academics physiology, lots of exercise physiology, rehabilitation of sports injuries, and the student's dissertations which would be lab-based. So I would supervise them in a physiology lab that we have here. And I was later really just given a desk in here and told that I could stay on as a researcher while I wrap up the Ph.D. and I'd do a little work supporting students who were on a conversion course that's based out in Italy. So I often support them via email, and that keeps me linked into the college, so it gives me a useful base when I'm in London.

Paul: Interesting, okay. So you've been doing a Ph.D., as well as supervising students. What's the area of the Ph.D. that you're working on?

Mark: So the Ph.D. is mostly biomechanics. There's some physiology in there too, but specifically, I am looking at low back pain and how that influences the body. We know that it affects how people move and we want to know are those changes something that happens specifically in the muscle or is it a nervous impulse? So the body is avoiding fear or...ah, sorry, fear of pain, say, or stress, something like that. And so it was a Ph.D. to try and get into that and build equipment, do some analyses. And almost all of that work took place elsewhere at the University Of Roehampton. I build the equipment here and did some of the partner work here but the bulk of it happened in a big biomechanics lab over there.

And that was all new to me. So my background was predominately exercise physiology at undergraduate and master's level. And then I was just given the opportunity to do a Ph.D. in Biomechanics which was something that really interested me but I was very ignorant of it. It's lots of math and physics and writing code and sort of levels of analysis and testing of equipment that you wouldn't get in most exercise physiology labs. So it was a good learning curve and I'm just about at the end of that now. I've got about one month of proper work left and waiting to hear back from supervisors. So that's also my anchor to the UK. So once the Ph.D. is done then I will have much more freedom to do longer journeys and so on.

Paul: Okay. Well, since you mentioned journeys, let's go onto the journeys. And we may jump around a fair bit here but I think we'll build a patchwork of context for people. So journeys, I know you've been involved in doing ultras in warm places and, more lastly, doing ultras in cold places. Let's start off with how you went down that avenue in the first place because I think even though a lot of people are more familiar with the concept of people doing ultramarathons now, I think it still is a little bit beyond most peoples can, as it were, in terms of why you might end up doing those. I've never done one myself but I have friends who have, and I think I understand it. But I think for the listeners, it would be useful to understand your evolution from wherever you were to a point where you decided to do your first ultra. That would be interesting.

Mark: Okay. We'll probably have to go back to the millennium actually. So it was 1999, I headed out to Cairo for a concert at the pyramids for the millennium. And that was my first trip to Egypt. It was just as my master's degree was coming to an end and one of my fellow students was Egyptian and had recommended I go over and see the concert. So I

went there for that. That was my first visit and I made friends with someone out there who would then bring me back sort of year after year up until 2006. I was visiting his family and we would go out into the Sahara Desert, sometimes riding horses, sometimes walking them, so you've got someone more interesting to talk to. And occasionally I'd just had out by myself. So I had a certain amount of experience of being out in the Egyptian Sahara, including when it got very hot, somewhere through 50 Celsius, sort of low 50s.

And then in 2005, I watched a television documentary with Ben Fogle when he attempted a Moroccan race, the Marathon de Sables. And on the documentary he was walking the whole thing until the last day. So he sort of ran the last 10 kilometers, at least as far as we could tell from the footage. And there was a lot about this being the toughest race or whatever. And I didn't have any background in running, really but I always liked hiking, cycling, sort of aerobic exercise from when I was fairly young. I hadn't done anything like that in years. I got into strength training and kickboxing when I was still at school and throughout university. So I didn't consider myself a runner by any stretch of the imagination. But seeing that this chap had walked almost all of it and having my experience in the Sahara, I felt...well, sorry. I should add in that because I'm an exercise physiologist, I thought that I stood a chance of at least training myself up to run some of it. But if not, I was confident I could hike the whole thing. So hike it all and then run wherever I could.

And so that was it. I decided. I signed up in 2005, and the first time I could get in was for 2007. So I started running over that sort of two-year period, improving my fitness. Breakfast the morning after that desert race, some chaps were talking about another event in the Amazon in Brazil, specifically, and saying that that was harder than the desert race. And I thought, "Well, actually I'd love to go out and see the jungle." And suddenly the ultras were presenting themselves as a way that I could experience a lot of the natural environment and the extreme environment, which I was interested in from the physiology background.

And it was very condensed as well. So looking at 135 to 155 miles spread out across a week. But in those environments, that's quite a lot of ground to cover. So 130 odd miles in the Amazon Rainforest, it's some really interesting terrain. The desert as well, you're covering a lot of different terrain over 150 miles. By the time I finished the jungle race I was already signed up to do a 430-mile race in the Yukon. So that was sub-Arctic. It was Arctic climate.

Paul: So what time period are we talking about here in terms when you did the Marathon de Sables when you did the jungle when you did the Yukon?

Mark: So in 2007, I'd raced the Marathon de Sable. That was early on in the year. That was springtime. And then that autumn I went out to the jungle as support crew because although I had the experience in the desert, I had none in rainforest and I didn't know how my body would respond. So I went out as support crew so I could walk some of the trail and just see how it felt to be there. That was 2007. I raced it in 2008 and I raced in the Yukon in 2009. And then every year there's been a race wherever it was in the Alps or the Himalayas or back to the Yukon or Alaska.

Paul: So do you set yourself a target now or a goal of doing a race per year or is it just how it has happened to fall?

Mark: Yeah, so originally everything had to work around my holidays from work. Being in a college, that was challenging because it had to coincide with when students needed me the least, which is often just before the start of the academic year. And then having to arrange a lot to get away in February for the Yukon races and have people cover my lectures or switch lectures around...and so that was quite difficult.

And then since I'd stopped working full time and already really started working for myself through writing and trying to finish up the Ph.D., I've obviously had more freedom and so I've become more ambitious. I have been doing the races each year but they're not the focus anymore. They're not the main goal. I'm more interested in spending longer out in nature and having these experiences. So hence the Yukon this year. That was an expedition that lasted 39 days and that was much better for me.

I enjoy the racing. There's a hard work element to it, sort of the endurance component there, the extreme fatigue of only sleeping a few hours a night. But the environment is so much more pleasant to the experience when you're not racing, you know, you're enjoying rest and not feeling that sort of pressure. It's a different type of event. And I enjoy both but in particular, being able to enjoy being out in nature for longer is a bonus for me.

Paul: Yes, absolutely. That makes perfect sense to me as well, perfect

sense to me. If I could rewind a little bit, you went from somebody who didn't consider themselves being a runner to doing the Marathon de Sable, which a lot of people hold up as an aspirational goal. What training did you do? Can you remember what training you did? I mean, some people are very fastidious about keeping records of what training they did and other people just go out running sort of to see what happens.

Do you have an idea about what you did that worked and maybe what didn't work? We can go on to, you know, races after that and how you've maybe modified your training regimens but what did you do to take you from sort of zero, as it were, in it terms of having done anything like that to doing the Marathon de Sable? And also what was your experience? Was it was horrible? Was it good? Was it physically more challenging than you thought, less challenging than you thought? How did that whole process go for you? That'd be interesting, I think.

Mark: Okay. So, similar with the approach when I'm doing sports injuries work, you consider the person as they present themselves, as they are at that moment in time and you look at exactly what's required for them to achieve their goals. So with the sports injuries, it's getting back to full health and whatever they personally need to do, whether they are ordinarily sedentary and move around the house or they're an athlete that has very specific requirements. And similarly, with fitness for an event like this, it was a case of, well, I didn't really have any base fitness at all. So I needed to go from that to being able to run for seven days consecutively, distances up to a double marathon with most days being less than a marathon. And I needed to be able to carry a rucksack which had all of my equipment in it, so maybe 10 to 15 kilograms of kit. And obviously the desert environment as well. And whilst that can't be replicated, the rucksack and the training mileages can be. And then you just compromise with the terrain and just trying to do trail running off road.

As it happens, the Sahara Race isn't full of sand dunes, as many people might expect. A lot of it is very hard ground. It's rocky, it's a barren landscape with dried up riverbeds, and mountains, hills, and some very tough sand dunes to get through but they're not the majority. They're a very small portion of the whole route. So actually, it was good to mix in road running with trail running. And hardening up the thing feet is an important one. There are all sorts of hideous things that people do to their feet and I just think the best way is to have minimal cushioning in training sessions. Your feet naturally harden up over time. And I'd go out

sort of over weekends, just do big distances, and my feet would often be battered at the end of that. And that would be the first time I did it and then the subsequent times the feet it would be harder. So that was a component.

I was running with a rucksack from the very beginning and the first time I was out of breath after I got down the stairs, I think, before I'd even started running. And did a 5K and was in absolute bits at the end of it, just a mess. After that, I sort of managed things a little bit better and sort of decided to build up the weights in the rucksack. And distances built up until I was running half marathons or thereabouts, say up to 15 miles every night, six nights a week, just to get as close as I could to what I needed for the event. As I said, carrying a rucksack for all of it. A lot of that with road running as well and then going out on weekends. Just doing the big distances to try and get me fit for the double marathon section.

Paul: Was that every weekend, or were you sort of during a sort of rotation where you sort of build up? Or how...was it particularly structured or were you just getting in what distance you could on the weekend?

Mark: I think the goal was recovery, really, and making sure that I would be fully recovered at the end of one week so I could train again the next without risking overtraining. I was actually working in a health club back in 2005, 2006, and 2007 as it happened. I was an operations manager for a health club, so was doing shift work or very long hours. So I was training along the Thames [SP] Path or around London. I was just trying to do more walking to get to work, running home in the evenings, any way to get those miles in. And then yes, if I wasn't working a weekend, that would be the weekend I'd get out. If I was working, then it would be the shorter distances. So it might be that I do big distance only one or two weekends a month but I'd be training most days and really prioritizing recovery. So that was the training.

I think the only mistake I ever made really was trying to adjust my running pattern and trying to make it more economical by thinking about it, which is just the wrong thing to do with running. And I was quite naive at the time.

Paul: In terms of your stride or how you landed your feet, or...

Mark: Yeah, just how I was landing. It sort of stressed one of my calf

muscles a bit, which forced me to be out of running for about two weeks. Often I was just walking and doing very little while that recovered. It wasn't a full-blown injury, by any means. It was just slightly adjusting my running technique. And the thing is if you are uninjured, your running pattern is highly variable. And I suspect it's the same on long-distance walking as well.

And then what happens is when we pick up injuries, our running patterns becomes very rigid, which is the body trying to prevent a lot of stress going through the point that has been injured, whether that's through the joint or muscle or whatever. And so everything sort of firms up and becomes stiffer and you might then be open to other overuse injuries. But, yes, if you were to watch someone run a half marathon and you were to monitor their running technique, it would be very variable, which is the body's natural way of reducing stress by diverting it however it can. And that's the thing. So you naturally increase your speed or decrease it. You don't, or you shouldn't actually try and alter the technique, it will happen naturally. At that time I was...

Paul: Right. Just for people listening, and that's kind of reassuring, I think, for a lot of people that. I think, they don't need to overthink it but what about things like mobility issues? I mean, you're sort of presumably working from a point of view of having built the mobility that you needed to have that range of different running patterns. So a lot of people don't have good mobility to start off with, [inaudible 00:21:35] in hip flexes and various things because they sit too much or they don't run to start off with.

Mark: I am putting a book together, it's as good as finished on sort of the science of running. And it deals with this a lot because people try to overcomplicate matters, often because they have a commercial interest in it. So the classic example is if you go into a running shop and someone puts you on a treadmill and looks at what your feet are doing...I'll try to rein in just how arrogant I'm about to sound, but...

Paul: No, go for it.

Mark: I used a biomechanics lab for my Ph.D. where we were monitoring gait. That one of the big things we could assess how stress was moving through joints. And we put 35 reflective markers over areas of the body, which were then captured by 9 cameras at a rate of something like 100 Hertz. So 100 pieces of information a second from those, stored, digitally converted, and then I wrote some quite extensive

code for doing specific analyses on the hip and knee joints. And for any one subject, you could spend days analyzing.

And what I had to bear in mind through all of this is there was no software that existed that would do the work for me. I had to write the code because biomechanics is advancing at such a rate that you cannot produce a software fast enough. You work out what you need from the publications available and then you produce your own model of whatever it is. You adapt it, you modify what's out there and you write it all yourself. And with all of that information, I cannot tell someone how they're supposed to run or how they're supposed to walk. I can assess to a point where I can see where there are differences. One leg might be doing more than another leg but we do not have an established understanding of what normal is.

So a big part of what I was studying was the passive components of muscles, so the inherent stiffness of a muscle outside of what the nervous input is. And actually, we found out that there's very little that changes there. You can stretch a muscle or you can strengthen it, you can do whatever you want. It takes months to make any change in that. Most of the changes are coming from the central nervous system. And the idea that someone isn't doing something the way we think they should and therefore they need to be stretched or strengthened, there's a lot of assumption in there.

And what we can say is that if someone starts doing a new activity, whether it's coming from walking to running or they start doing yoga, or whatever it is, their body will adapt to what they are doing. So all those, the stiffnesses within specific muscles will adjust. And if there are injuries in there, then those need to be treated very specifically. But because we don't know what normal is, we can't just come up with a recipe and say, "You need to have 30 degrees of hip flexion when you knee is at 170 degrees," or anything like that. What we know is that for a population, you'll have such a diverse range from tall people to short people, people who are very overweight, obese, to people who are very, very skinny, people are very muscular, and all of them will move a little bit differently because of those factors. Gender will make a difference, the skeletal structure will make a difference, all of these things.

Working in a college such as this, I hear clinicians talking about how you need to have a certain amount of dorsal flexion in the ankles. You should be able to move the foot through a certain range of motion over the ankle. And it doesn't make sense if you consider the needs of

someone who is very, very light and has very short limbs. And he puts very little stress through their ankle joint, through their lower limbs, compared to someone who weighs maybe 20, 22 stone and has very long limbs that bring a lot of stress through their joints. And if you could just put your hand on their foot and move it around, then I think there's something wrong with that person because their ankle, their Achilles, their tendon, all that need to be so stiff to be able to manage that person's weight efficiently in terms of what muscles and tendons do which is absorbing, storing, and releasing energy.

If there is any deviation the chances are, yeah, there's something wrong with them. But you can't just have a recipe for two people who are very different. And because we don't know what the normal is, we can't say it. But you can go into a running shop and they'll tell you what's wrong and they might tell you what shoe you need or what insert you need. And actually, if you were to ask for evidence on it, it just wouldn't be there. And the chances are...and this is going into a rant, whatever is happening at the foot and ankle when you're walking is probably an effect of something going on elsewhere in the body. So we know if we get someone walking on the treadmill and then we inject saline solution into their back to induce pain and see how the body responds to that pain, they will start moving differently because of something at the back and that would change how their hip moves, it would change what the knee does, and it will change what happens at the foot.

And if you're only looking at the foot and you're trying to force the foot back into some hypothetical normal or correct position, you will have an influence elsewhere on that chain. You'll cause stress on the knee, or stress on the hip, or stress on the lower back. And you're not fixing the cause of the problem, you're trying to fix simply an effect, i.e. the foot is doing something unusual. And you could put all of that equipment on that I was using for my Ph.D., you can measure them and you can see all of the usual things going on, and you still couldn't say what normal is.

So from the background of someone who arrogantly here says he almost has a Ph.D. in biomechanics, I can't tell anyone how they're supposed to move. So I do have reservations about the quality of observations that take place in running shops and people who make insoles and so on because whilst people are trying to do the right thing and they're wanting people to be better runners or injury-free runners, they're being told that they have the skills to do that despite the fact that the courses don't exist to pass on that information because the information isn't there. So they're being told it from somewhere.

And I used to teach people to be personal trainers, that was one of my first jobs. And on such a short course that we were delivering...say, within two weeks they would be qualified to be personal trainers, they would have a lot of confidence that they understood physiology, nutrition, injuries, health in general to the point that some people would not recommend doctors because they felt they understood health better. Possibly some of them were right but people had a lot of confidence because they could only see a very small amount of the possible information. And the more you look into something, the more you realize we don't know. There's a lot more uncertainty than certainty.

So whilst I praise anyone who wants to help people be a better runner, I have to add the caution that we just don't know yet. I'm trying to write chapters for my book where I explain how you do mobility work to free up stiff muscles and how you can correct these issues where, okay, perhaps you have limited movement on one hip compared to the other. How can you increase that mobility very efficiently say during a run, whatever? And it's very difficult to put across because I know that there isn't an absolute recipe for the most effective techniques or even how you do the self-analysis. All I can really put into the book is, "We're really close. We're working on it, but we need to be doing objective studies of the analyses and the interventions to find out what effective means.

Paul: More data basically?

Mark: Yeah, much more data. And that's often the thing with research. There's so many publications now where the conclusion is we need more data.

Paul: But that's part of the process is of learning what you don't know about something is, like you say, until you get to that point of knowing what you don't know, you can't get beyond that little circle that makes you very confident in the middle way, you've still quite blinkered. [SP]

Mark: Yes.

Paul: Interesting. So to flip that back, you basically are saying people, provided they're relatively injury-free, if they want to train for an event, just start going and doing some fairly specific training?

Mark: Yeah, people would hate me for saying it because there are a lot of different types of exercises out there. I've been to races where

someone told me that they have never been as strong before in their lives as they were sort of on the start line of that race. I said, "Well, that's lovely for you and if you enjoyed the strengths training good for you but it's a race." It's an aerobic endurance activity.

The rationale for doing strengths training can be injury prevention. And that can be quite legitimate in that, if you are risk of injury and then you strengthen all those connective tissues, they become more robust. So you have to do more to injure them. That makes sense.

Paul: But the connective tissue takes a lot longer to strengthen than the muscles, though, don't they? Most people focus on building muscle, whereas it takes about what, three or four times as long to strengthen them?

Mark: Yeah, it will take 10 months, and really quite a serious approach to strength training to get those gains. And many people would benefit perhaps from plyometrics in a similar way in that it can improve strength around joints. But that is specifically for injury prevention. There is then an assumption that if you do this stuff, it will make you better at endurance work. And that is an incorrect assumption to make and an obvious reason for that is that, if you're building muscle tissue, then you're going to be heavier, which means you have to put more effort into running. If you look at some of the research on barefoot versus shod running, the reason that barefoot appeared to be more efficient was because you weren't using as much energy because of the weight of the shoes.

Paul: Well, it's always been known in hiking. I mean, one of the best things you can do to improve your efficiency and distance when you're hiking is get lighter hiking boots.

Mark: Yes, absolutely. And that's why Ferro [SP] running shoes have become quite popular amongst distance hikers now. And that's one side of the strength but the other thing is your body adapts specifically to what you do. I noticed that you do a lot of the canoeing and kayaking. I'll bring in an example from that. But just on the strength side, if you do strength work, you will change your muscle fibers to be predominantly better at strength work. So if you want to be an endurance athlete and you want to be the best endurance athlete you can possibly be, by doing strength work you are taking away from your endurance capacity and you're converting some slow twitch Type 1 fibers into Type 2 fibers which are more for strength work. So you're decreasing your endurance

capacity.

Now, that is only for people who really want to be the best they can be. Many of us, myself included nowadays, want to have a more well-rounded fitness. We want to do the strength work and the endurance because it makes us a better all-around athlete. But if we want to win races, then we would advance better without detracting from what we're doing.

Mark: So just to clarify, do you mean do no strength training, at all? Because there's, I used to do a lot of cycle racing back in the...you know, a long time ago. And there was this concept, when you got more serious about having a sort of annual cycle where you did some strength training and you did some cross training in the winter and you did some strength training for maybe three months, and then you got back to sort of aerobic build up. Is that...are you saying, "Don't do that?"

Mark: What I'm saying...if you reduce the amount of cycling you're doing and replace that with strength training, then you're gonna change the physiology of your muscles to get better at strength. And then you've got to undo that, you got to reverse all of that process to make you better at cycling again. So I'd say you're giving yourself more work to do. Now, where the balance is, for, say, the injury prevention side and performance, we don't know. There's no data on that at all because it's a hypothetical case that you can probably manage a certain amount of strength training and you can do aerobic work without it having a noticeable effect, purely for injury prevention purposes. But if you try and do a lot to actually develop your strength, become stronger, then it will detract. And even if you were a cyclist wanting to do well in races, if you were integrating running training, that wouldn't help. Nothing will make you a better cyclist than cycling.

And, with the example of my friend who had never been stronger at the start line, this was in the Yukon where she was gonna be hauling a sled. So there was an assumption because it's a heavy sled she needs to be stronger for it. And so she was, therefore, doing deadlifts and all these kind of strength movements. She was doing power movements, and she was training her muscles to be good at strength work, not endurance.

Now, if you go out as a hiker and you've got a heavy rucksack on, you do not suddenly start using your Type 2 fast twitch fibers, you use more slow twitch fibers. So a muscle has a certain number, most of the time you don't use very many. The heavier the load, the more muscle fibers

you recruit. But it's specifically for endurance, the slow twitch fibers because you're using more of those. So doing strength work is wrong. What you should be doing is loaded endurance work. So if you wanna get better at hiking, have a rucksack on.

Paul: So doing volume with a load rather than doing low reps with a huge [inaudible 00:36:16] weight.

Mark: Absolutely. And even if you need to integrate strength for whatever other reason, then fine but you should always be aware that what will make you better endurance is endurance work and specific. So if you were cycling, and there are studies that support this, if you are cycling and you integrate running as well, you will not gain any benefit compared to if you were just cycling. And the reason this comes around is some people will add in cross training of some kind to avoid over training. And it doesn't work like that. If you push the total volume of your training into an area where you're overtraining, it doesn't matter what you're doing. If you're cycling, rowing, running, whatever, you will still over train. And that's why it's much better to just keep on the endurance for the specifics that you want to do.

Paul: So with the overtraining, even if you're cross training, that's about load on the system as a whole then, is it?

Mark: Yes, definitely. And just the kayaking example, it was one of the first research papers I ever read on the specificity of training programs. This was for sprint kayakers, and they were given a resistance training program using cable machines for the shoulders. They had paddles attached to the cables and they were doing a movement that replicated the rowing movement that you do in a kayak. And they had groups doing different speeds. So from fairly slow controlled, typical strength approach, up to as fast as they could possibly go. And then they were comparing which one was the most effective for sprint kayakers. And it was the second fastest of the four, it wasn't the fastest discipline. And the reason being was that it was the second fastest that was most closely related to the actual speed the paddle moved through the water.

And we'll see that if we do strength exercises in a laboratory and we test people over different speeds if we test them at different speeds but we only give them training at one speed, they will become best at that speed. There'll some carryover, of course, to the slower speed bump, or faster, whichever it maybe, but most of the gains are specifically at the speed that they trained at and then you're looking at reduced benefits

elsewhere.

Paul: So this might put you're on another rant or...?

Mark: Let's hope so.

Paul: So just while we're on the subject because they've become more fashionable, you know, things like CrossFit that's beginning to...and there are other training regimes of...you know that's just a brand name but people associate that style of training where they're doing deadlifts and all those sorts of things and they're doing sort of aerobic work at the same time. And to me, that was always an anathema because even when I was doing a lot of training for a particular sport, it was always the case that you separated strength work from aerobic elements anyway. And so I've found it kind of quite interesting to watch from afar that there is this fashion fit, sort of, mixing it all in.

Mark: Yes, I agree with that in that it makes sense to me that you do the very sort of serious strength work when you're more injury prone. The aerobic working technique is very important, of course, and the benefits of doing those sorts of exercises, doing them explosively thing is fine but then promoting recovery so that you are able to have the correct technique, that makes more sense to me and then doing the aerobic work separately. I understand the sort of evolution of it from circuit training and there is a place for it, which is, for those who perhaps don't have time to do either of the other things well.

And I've met enough people when I worked in gyms who didn't want to get bigger or stronger particularly. They just wanted to do the very non-specific thing of toning up, whatever that means, but it's usually this combination of getting their muscles a little bit tighter from the strength works. They're starting to adjust to that while simultaneously losing weight. So that's kind of where it all fits in.

But taking it to this CrossFit level, it's rare that I hear of people doing it well. I suppose it's the social media as well, where it's easier to share people doing things really badly. But I know, for example, there is a weightlifting club somewhere where they've introduced CrossFit and the people there obviously have their technique as good as it will be anywhere and then they just integrate the aerobic component of it. And I imagine that's sort of the gold standard of how you do CrossFit.

But the message coming over from the U.S. is a very unhealthy one,

anyway. They have their mascot, it's based on rhabdomyolysis, the idea that you need to cause as much damage to muscles as possible to get a physiological benefit, which is complete nonsense anyway.

Rhabdomyolysis is the destruction of muscle cells where the cell membranes rupture and then proteins within the cell and many other cell contents access the blood. And then they go round to the kidneys where the kidneys can't eliminate them fast enough and people are going to first stage renal failure. So anything where you're promoting kidney disease, renal failure and it's a deadly condition, it's not a good thing. And people suffer with it in ultra-endurance running as well. I've had people ask me why their urine is suddenly turned black with cola colored and asking me what's going on there. And it's, "Oh, that's rhabdomyolysis. That's first stage renal failure and you really need to stop and get medical attention," because it's one of the few things that will kill ultra-runners along with hyponatremia, heart attacks. Those were the big three, and then the temperature dis-regulation.

Yeah, that's the mascot for CrossFit, so that that's all I need to not have any real respect for it as an activity but I think they tend to take things a lot further, a little more to the extremes in the U.S. and it's far tamer over here and perhaps closer to how it should be for health. Personally, I think it's better to do each one properly. But that's just my view, and that's not necessarily a scientific view.

Paul: Fair enough, fair enough. But there is definitely...so back to, back to your training. So you did specific training for the MDS. You went and did that. How did it that...what was the experience there from your first ultra? Did the training...what data did you get back on your training? Was it effective, was it not effective?

Mark: It was enough. I held back during the race because the goal was to finish and so I finished kind of just within I suppose the top third, just out of the top quarter, I think, which wasn't too bad. So I was running flats and I running down hills. I was walking uphill because that's what had been recommended to me and I could have done a lot better.

I think it was, the first few days I found quite straightforward and I was moving very well. You see a lot of people even after the first day whose feet are in tatters and very badly blistered, and I didn't start getting blisters I think until maybe the end of the third or the fourth day. And that was probably more to do with not having the best socks and perhaps some sand getting in there as well.

Paul: It's more abrasive then.

Mark: Yes, it was, and that caused a lot of pain actually. Another factor was not having shoes that were big enough. My feet, they're a 13 and half to get so it's quite different to get shoes that are big enough and there wasn't space for them to get any bigger with the heat ,and so I had problems there.

And in the jungle, I had similar problems which was just, not blisters underneath my feet in the jungle, it was across the top of the toenails. It was just from abrasion at the front of the shoe impact and so on where there was just nothing between front of my toe and the front of the shoe. So that will resolve itself when, I imagine, manage to get some bigger shoes. Simple thing.

But yeah, there was a lot of pain and hobbling in the last bit of the double marathon and the last day of the race. That could have been better for me. The blisters caused problems and then trying to run differently to reduce the stress on my feet, everything started seizing up. But the first four days I suppose were fine and it was after that the issues came along. And that was my first proper race, I hadn't done anything before then. And I think all of us in our tent, there were six of us sharing a tent, I think we all did pretty well. We were spaced out from the guy who was the last Brit. And I think I was the one who was doing the best out of our tent. All of us seemed to look after ourselves really well. I didn't have chafing issues which are quite common in ultra-running.

But there were people at that start line who had would never been in the desert before. And that's sort of forgivable, even though I would say someone who wanted to do a race like the Marathon de Sables, like at least go out to a hot environment to run in.

Paul: South of Spain or...

Mark: Yeah, anything. And people do that. They go out to the islands and sort of do running there. Many people had never run with a rucksack, which to me was just completely negligent. I mean, just not even thinking about what you're getting fit for. Some people had never packed their rucksacks before and so they were out there in their tents where they had to return their suitcases with all the additional paraphernalia that they'd brought with them. And suddenly they had their rucksacks and realized they couldn't fit all their kit into it. It's just

those sorts of things where I would look at that and think that's just...

Paul: That's just basic training. Whether you're doing a pleasure trip or a race. I mean, that's just basics.

Mark: Yeah, exactly. And I would always, before any of these events, just write down what I needed to do to finish and then just think, "Well where am I now? How do I fill in those gaps?" And it is about the kit as much as anything else and...so to me, it was bizarre seeing people who'd never worn a rucksack to run in. And even after the first-day people were...there weren't many people who dropped out after the first day but they were walking around in real agony. And many of them toughed it out and got through to the end, which is fantastic. And actually, there are research studies looking at how people finish these big races. And when they look at things like discomfort, overuse injuries, blisters, vomiting, generally feeling poorly, the people who've finished have experienced that more than the people who have quit. So there is something in them being able to put up with it more.

And that is from a research study, so I'd say that's a legitimate finding and probably holds truth. Many people will understand that when the desire is enough, they'll push through. Other people will quit either because they just cannot handle the discomfort or they have another event coming up and they don't want to be sort of ruined before that. Or because they do the events for the pleasure and they think when things start to get that bad and they're miserable, they just don't want to be there anymore. So there's sort of understandable reasons why people might drop out of an event.

But yeah, it certainly isn't because of the blisters or vomiting, feeling poorly. People kind of finish with those. Certainly, if it's a serious overuse injury like a fracture or something, then it's time to call it a day. However much you might have the capacity to go on, there is no reason to get a permanent injury and then ruin your career or your future even as an amateur. It's just that doesn't make sense to me.

Paul: So you were spurred on by that and you went on to do the jungle race later that year. So you went...so you went to help later that year and then went back the next year?

Mark: That was fantastic, just walking around the jungle with a machete and sleeping in a hammock, just such a wonderful thing to do. And being able to problem-solve, as well, for other racers where people

might arrive at a checkpoint and then tell me there was some safety issue out on the route and I'd go and cut a new path or try and pull people up from some ravine or something they got stuck in. And I had a whale of a time just being support crew and then went back and raced and still really, really enjoyed it.

And I finished that race and again, my feet had swollen up a lot in the shoes and they were blistered and I was getting my toenails refined. So something was burning through my nails to release the blood blister underneath it. And there abscess so there was soreness quite a lot towards the end of the race. And the last day I ran barefoot, which was fine until I kicked a rock and then knackered a nail and had to pull that off raw which smarted quite a bit.

But it's not the pain, I had dysentery after the longest stage of that race. And I had finished it early enough so I effectively had a day off to recover and just take a party pack of Imodium to get through the last day, which was about 20 miles, I think. And that was beach running, I wasn't wearing my shoes. I know that felt more comfortable but these problems come up. And probably the most pain I felt on that was getting bitten on the back of the head by a bullet ant, which was just an insane amount of pain when it happened. And then this thing of, "Well, do I carry on? I've got a few kilometers till I get to a medical checkpoint and they then can look at me and just check," and I was gutted that there was really no sign of it. Yeah, it throbbed for about eight hours after that, so it left a good souvenir that way. But that's the thing I suppose with the jungle. You expect it. Fire ants are just a real pain and a distraction at first and then after a few days you get so used to them they're just a mild irritant and they don't bother you so much. Sort of the environment hardens you up, which is really good.

But yeah, the jungle, I just loved it and we had some excitement when I was there on the support crew when there was a jaguar somewhere close to the trail and it'd been growling a little bit. And it got on the trail, it left a really clear print behind the last racer. So I'd backtracked from the finish and came across one of the other support crews, guys from the other end and we just had a racer pass us. And it was amazing that the jaguar had gone between us. So he kind of stepped out on the trail, and then into the undergrowth, and it's [inaudible 00:52:09] judging by how fresh it was and the fact there was no prints over it, it was behind that girl. And so we both started legging it back to the finish safely.

Actually out in the Yukon this year there were mountain lions pretty

close. And again, those were aggressive and you sort of play the odds. So many wolves, so many wolves, hundreds of wolves out there. And you just know that the chances of an attack are so remote that you can just say it's not...

Paul: I mean, they're out there. It's the odd cases of taking small people on their own, but...

Mark: Yes, that's it. It's weird, I'm sort of [inaudible 00:52:51] thinking, "I'm not moving very fast." With the mountain lions, that was after I had broken ribs and I was thinking, "For goodness sake, just don't look like there's anything wrong."

Paul: Don't look like the weak one.

Mark: Yeah, you'll probably be all right. Yeah, the race is when people are towing weight around with them where they're towing all their food. They're possibly a candidate, but nothing has ever happened. So you hear sort of the random case of a chap who was walking a long way to get home, he was drunk or whatever it was and had a wolf tailing them, and then someone came and scared it off. I've certainly had wolves come up to me to sort of smell me having smelt my kit and there's lot of beef that I'm dragging with me, so they like smelled that and it's appealed to them and then they smelt me and it appeal to them a lot less, so they just go on.

So nothing ever happens but it's an interesting thing to go through the mind. So yeah, the jungle was the first environment where they were predators out there and it all added to the excitement. And just such a wonderful place to be, snakes, and so on, anacondas out there, which I've missed. And spiders which we saw some spiders but because of my height, I was with clearing cobwebs and not seeing them for the most part. Then you have the Yukon. That time of year when I'm racing out there everything's friendly.

Paul: Yes, the bears are asleep.

Mark: They're asleep, yeah.

Paul: I mean, you said earlier on about having an interest in the physiology, the effects on the body of the extreme environment. So does that come from a particular area of your work?

Mark: I've done some data collection looking at fitness of individuals who've gone out to do Jungle Marathon and never published any findings from that because we needed more numbers and it's really difficult because so many people dropped out of that race. Fifty percent dropped out. So what I could see from looking at the data was that fitness had no effect on whether people finished or not but there was a trend towards the fitter people finishing better, which I suppose is what you'd expect. So many things can go wrong. So we had the fittest guy who came in for testing was one of the first to drop out.

Paul: Interesting.

Mark: But then when you look at their sort of aerobic capacity, that was associated with how quickly they'd finish, but not whether or not they'd finish.

Paul: Yeah, so how quickly they'd finish, if they finished but not what...yeah, okay, interesting.

Mark: So there was that. But I have a good friend who's an environmental physiologist over at Roehampton where I've done the Ph.D. We had a look at various things because he would do far more active research on that. That is his area, whereas for me it's something I'm interested in but I've far less data collection. We're often brainstorming what studies we can do. But from my interest, when I wrote books on my races, I've produced books on the Marathon de Sables, the Jungle Marathon, and the Yukon Arctic Ultra. For each of those I thought, as I'm an exercise physiologist, one thing I can add to the book so I'm not another runner to give it something else was a chapter on the physiology, so actually go into it.

And the first time I did an ultra, which was Marathon de Sable, we had a chap die from a heart attack after the long stage. So I wrote a long chapter on the athlete's heart. And that's gonna be updated the book that I'm writing on running fitness because a lot more data has come out now. And there used to be, even at the time that I wrote that initial review, that there was this idea of athlete's heart, which is a generic term, but there are specific alterations that can occur in athletes.

But it was always considered physiological and the only time that there were problems was if somebody had an underlying disease or perhaps a congenital heart defect that would affect them in their late teenage years or early 20s or as a veteran athlete, so sort of coming back in the

'50s. If people have a serious effect, it tends to be then. And often there aren't assessments of runners. People don't get ECGs as a standard assessment. So when someone has had a heart attack or sudden cardiac death, the information isn't really there and you sort of look at the heart and say, "Well, there's nothing anatomically wrong with it."

But actually we're doing a lot more work now and the Italians have been fantastic for gathering research on this. And that you can get changes in marathon runners and be able to do more than the marathons. It's more as you get older and it's related to fitness. The fitter you are, the less likely you are to have problems on one side. But on the other side, there's a training volume issue. But the heart can get scarred and that scarring can affect the electrical activity. And we don't really know enough about it but the scarring is permanent. And if you've got scarring of muscle tissue in the heart, you've blocked how the heart transmits the electrical signal and those muscle cells are very elastic and they allow the heart to contract. So those cells won't contract, so they won't pass on the electrical signal. So we are now aware that an athlete's heart isn't something that can just be dismissed. It should be investigated. It will take a while before the medical world sort of realizes that because people who do a lot are in the minority. And it's really down to individual athletes to try and get checked on that, really sort of look at their ECGs, and if there are concerns, get a proper assessment and fight for that.

But that was the first assessment in looking at how the heart responds specifically during running and how that relates to hydration, as well. And then for the jungle, I looked at exercise in the heat because it is, in effect, a hotter environment than the desert. Just because it's so humid, the body becomes hotter, much more at risk of heat injury in the jungle than in a desert environment. And for the Yukon, it was the cold environment, so reviewing all of the data on that.

Paul: And that's all in those books. I know they're on your website and I'll link to your website in the show notes underneath the podcast, but we can link to those.

Mark: Yes, and the original reviews are actually up on the website. People don't need to buy the books just to get those or at least a good portion of those review chapters.

Paul: Okay, that's kind of you. I think people should buy the books.

Mark: Well, I agree.

Paul: So you've been to the desert before you did the MDS. You went to assist and do support crew on the jungle before you ran the jungle. Did you do anything to prepare for the Yukon Ultra?

Mark: Not really. And that was the big one.

Paul: Then tell people what the Yukon Ultra is. Because I know what the Yukon Ultra is. A friend of mine is interested in doing it at some point, so I'm sure he'd be very interested what you have to say about it but other people probably have no conception that it even exists, in case people are gonna do it.

Mark: Yes, so there are two big dog sled races in the world. So these are where 14 dogs get harnessed up to a sled and there's a musher and they race. And the two big races are the Iditarod and the Yukon Quest, and they're both 1000 mile distances. And the Yukon Arctic Ultra is a race that covers a section on the Canadian side of the Yukon Quest route, which is between Whitehorse, the capital, and Dawson City. So people can run a marathon, or 100 miles, or 300, or 430.

Paul: So there are different lengths that people can run.

Mark: Yes, so there is also a race for the Iditarod and people will do these two races either on skis, on foot, or on fat bikes. Running the fat bikes has become really popular now. So the Iditarod, which I did last year, is 350 miles for rookies and then once you've done it once, you go back and do the full thousand. There wasn't a full thousand option for the Yukon race, just the trail is there that the dogs use, so I [inaudible 01:01:16] someone out there went out this year and just did it by myself. And the foot race, I've done three times. I did it once just to see if I could, then I fell in love with the Yukon. Went back to try and improve my time and the third time I was hoping for a bigger expedition up in the Arctic and so I did it the third time just to get the sled-hauling practice in.

And just had a diverse range of weather conditions on those three years and felt that that gave me a certain amount of confidence in terms of understanding what could happen, and perhaps not necessarily knowing the recipe for how you respond to each eventuality, but simply knowing that every time something happens you use your initiative. You don't need to have the perfect piece of kit, you just work out how to fix the problem with what you have. So with that you can rest, you can move on along the trail, but ultimately you will keep making progress day to day.

So I had those experiences and had the confidence to go back there this year and do the full thousand. So the race is supported. There's support crew out there. There are checkpoints. There are guys on snow machines coming along to break trail. There's medical cover. And then the full Quest route, I just did that one myself.

Paul: Well, we'll come on to that shortly but just again, just to paint the picture for people, the distance that you're doing on the Quest race, did you always do the same distance?

Mark: Yes, the 430 having never done a cold-weather race before. And my attitude there was, if I said I want to do the 300-mile distance, and I got to 300 miles, got the medal, got the T-shirt and then felt that actually, I still had another five miles in me, I would feel regret that I missed out on that section of trail. I was much more interested in the experience of being out there in the wilderness on that trail than I was getting the medal. So for that reason, I went for the biggest distance, not really expecting to finish it the first time. And then half of us did finish it and it was the first year anyone had finished.

So I've never been more nervous at a start line. There had been an attempt two years before, and it's every other year for the big distance because it has to go the same direction as the dogs so we don't get in their way. And in 2007, there's a chap, Andy Heading, phenomenal athlete, he was within a hundred miles of the finish and the temperatures plummeted to below minus 60 and the support crew were instructed to keep him at a checkpoint. And he was probably going to be the only finisher that year but they kept him in a checkpoint in one of the coldest spots of that section and it didn't warm up and the race kind of ran out of time. So that was unfortunate. He was really unlucky. He almost certainly could have finished it had they let him carry on. They didn't for safety reasons.

In 2009, when I went back, I was attempting a race that no one has finished before. They'd done the other distances but no one had finished the 430. So I was kind of crazy nervous about that. And in the months beforehand, I'd read all the books I could on people who lived out there, lived in cabins and had those sorts of experiences because I wanted to make it seem normal. I wanted to appreciate that this was a place that people called home and therefore wasn't this really hostile environment where people couldn't survive. People thrived there, they had lived there. And there had been the great gold rush in the 1890s, where people had attempted their journeys, they over-wintered and they had

really struggled.

But understanding that nowadays we have all the Gucci kit and we've got the SPOT tracking devices and there are checkpoints. We can give them water and some hot food every day or two. So it was almost glamping when I looked at it that way. And that helped, but I had a real fear of the unknown. I didn't know what it was that I didn't know. I didn't know it was that thing that was gonna somehow stop me putting one foot in front of the other. And that was a real fear, I struggled to eat the night before the event because of that. And it was just accepting that all I had to do was put one foot in front of the other. Ever since then, we've been fine. And even once I'd moved over the start line, absolutely fine on that race, just really started enjoying it.

And once you got through your first break to have some food, and you've got through your first night where you set up camp, and you've made progress on the trail, you've done everything you need to do. So the whole race is just that. You just keep repeating, but once you've done that first night you've done everything. So you just keep doing it to make the distance.

Paul: Now, I think that's interesting, psychologically how you break it down. You mentioned earlier about making a list of things that you need to do to finish and there you say, "Well, psychologically I've done everything I need to do here to finish. Now I just need to repeat it." That's so useful, and certainly, that doesn't have to be a race. I mean, whether it's an expedition or...I'd mentioned I've talked to survival psychologists in an earlier podcast. And again, that's one of the things that differentiates people who get through difficult situations. We can call them survival situations afterwards if people survive but when things get difficult, if people can break it down into manageable sections and to prioritize and do one thing at a time and then know that, "Okay, once I've got that done, I can do that and I can do that, and that's going to get me to the end," I think that's really, really important. But we...I don't think people are always very good at doing that generally in their life and then when they go over to doing things in the outdoors, they kind of take that fuzzy thinking with them.

Mark: Yeah, I think there are probably a few ways that we can go into a bit more. And one of them is sort of the example, if you've got that psychology where you know that you can take a break, you can get food in and you can get water in, you've gone through that evening where the temperatures have dropped, and you've managed to put the warm

clothing on, and then you've gone through your night's sleep, and you know you've got that. And then you also know that you've got everything with you that you need to survive. You've got enough food, you've got the means to get water, well, from the Yukon but I think this applies anywhere.

So then you get to the mountain and it's a really steep climb up that mountain and it's kind of dangerous, and if you slip things could go wrong really fast. But you don't have to worry about anything else. You just have to think about getting that next step. And then once you've got that step then you've made progress on that mountain, and you keep going at that until you reach the top. And I've been at the top of mountains in that environment where there's been blizzard conditions but I've always known, "Well, if things get out of hand, I can just set up my camp. And even if my bivy blew away, even if I didn't have that for any reason, I could still build a snow hole with my hands, if I needed to. And if it won't...because I know that, I don't need to stop. I don't need to hide out of these temperatures, these conditions, I'll just keep going while I can." And then, every time, it passes. The blizzard ends, you start descending, you get the cover from the trees, and everything becomes all right again. And then you can add that up, "Well, now I've done a blizzard. Now I've done cold temperatures. Now I've done a mountain crossing." And you add that to if but for the time you're there, you're really just focusing on the moment.

And that's important, not just for the event you're doing but I think it really helps manage stress in everyday life because suddenly you realize, "Wow! There was that time I was going up that mountain and it was hideous and I thought I was going to slip off or get injured or I was going to die or whatever it was but I made it through. Oh, I've got a phone bill." And for some people that phone bill will be the biggest stress they have in the month going well, "I can't do anything with this phone call. I've got to wait until I get paid." And every day they haven't been paid, they're building up stress about it. The credit card, whatever it is, or the traffic. They're finding all these things to be stressed about but I think once you've been out there in a wild environment and you've struggled in some way or you've had an element of danger that you've had to deal with and overcome, nothing else really bothers you after that. And I think that's a really good grounding experience.

And just the other thing I wanted to sort of add in there is as well as the psychology of accepting what you've achieved, it's looking forward as well. Now I could never do that 1000 miles I did thinking I had to do

1000 miles. That wouldn't have worked for me because to me I would have seen a thousand miles is an impossible distance. It's too much. There are so many things that can potentially go wrong. It would just be overwhelming and overbearing, just not something to consider. And I never really even entertained the idea that I was gonna finish it until I was in the last couple of days. It was just a dream, a goal, something to work towards. All I was doing was looking after myself every day. And that got difficult towards the end because the temperatures were warming up so much going into the spring that my feet were getting sweaty and then I was at risk of blisters. And that was becoming more of a problem for me than anything else in the cold, and I never actually had any blisters because I managed to look after myself. And that was a matter of reaching some cabins along the way and drying my feet out there but always managing. "Am I going to make that cabin or do I need to stop here and get a fire going?" And it's sort of useful.

There's a poet, Robert Service, who was in the Yukon shortly after the great gold rush, who wrote a lot about it. And there's a quote from him that I always keep in mind which is, "It's not the mountain up ahead that wears you down, it's the grain of sand in your shoe." And that's what people need to be aware, as well. I've seen so many people in races who get these hot spots on their feet or small blisters, and they're, "Well, I can just make the next checkpoint." And they don't realize how long it will take them to get there and how much greater the damage will be by the time they get there. If you can fix it, fix it there and then.

And that's what I was doing to some extent. I was changing my socks as much as I could and then those would get wet and so I'd change them again so I didn't have any more socks, I'd say, "So well, okay, I'm going to be at this...", as it actually was always gonna be night in the next hour and then it's gonna cool down and my feet would be okay again and I just need to make that cabin. And it came together through that but always, I'd just think about the people who messed it up by pushing themselves, always thinking that they were gonna make it somewhere and that they weren't going to pay attention until then.

It was like me in the Iditarod last year, I remember crossing a lake in mountain range and halfway through the day my feet were soaked, and it was because the shoes started getting damaged because they'd been through freeze-thaw cycles and then snow starts creeping into little gaps in the fabric and then that melts and then you get water in your shoes and then they start getting sweaty in that water environment as well. Yeah, just stopping.

Paul: It might be worth you talking about the footwear that you use with these because, I think, people, particularly in the cold environment, people would find that maybe slightly counter-intuitive. And I remember you telling us recently about a conversation you had with some locals about your footwear when you were doing the thousand mile journey. They were saying you had the wrong footwear.

Mark: Yes, it was bizarre because people who live there but haven't necessarily lived there for a long time, they might have an assumption that because they know how to look after themselves day to day that they know that environment really well. And one of the first things someone said to me from the Yukon Quest race was, "That Chris McCandless doesn't get a lot of respect around here." And this was coming from someone who did the quest in the past. So somehow he imagined that doing it as a musher with 14 dogs was somehow completely different doing it on foot holding a sled. And to me...well, we're both out in nature. If anything, I've got it easy because I don't have 14 dogs to look after. I'm aware if I'm getting injured and I can deal with it but a musher might not be aware of when their dogs start to suffer. They don't know until it's too late and then have to react to it.

And then also thinking that I was doing something athletic. I was doing a sled-haul journey and that somehow was a parallel to Chris McCandless who just wanted to exist out of air, very different. So he immediately came to me as someone that I didn't have an awful time for. But then he was judging me for my footwear, and he didn't start that by asking what my experience was. And by that time, I had already raced sled-hauled more than 2000 miles in that environment. And he hadn't. He had done a lot of dog mushing. So he was used to standing on a sled where he needed really well-insulated boots because he wasn't moving very much.

And I've known people who've tried to do sled-hauling on foot, who are used to being on skis and not doing very high mileages each day and then trying to do big clumpy boots for a bit of sub-Arctic, Arctic environment, and your feet just aren't moving very much in the big clumpy boots. So it takes a long time for your feet to get warm. And you can't do a high mileage because your feet are too restricted in them.

So most people, in all of the races, except for the occasional imbecile, will do in trail running shoes. And trail running shoes aren't perfect because they're not designed for the increased range of motion you get

in the snow. And they're not designed perfectly for the conditions in that if you're going through freeze-thaw cycles, Gore-Tex will split. Mesh won't but mesh will allow snow in. So if it's gonna be relatively warmy, you're better off with mesh. If it's gonna be a coldy, you're better off with Gore-Tex. And I did the 1000 miles in the same Gore-Tex shoes and they were fine. There was a little bit of tears in the last 150 miles but on the whole, they were absolutely perfect.

So I wear those and usually a pair of Injinji's which I get on with. Not everyone does but I like those. And then when it's cold, just a pair of thick hiking socks or Arctic-style woolen socks or seal skins even. And those are fine at temperatures between minus 20 and minus 50 and I have been in temperatures a little below minus 50 and I've been okay. I don't stop for very long to take a break. I often stop for 5, 10 minutes to get food and then keep going. But my feet will start to get cold and minus 50. But then 100 meters down the trail, your feet are warm again because the range is so much better with trail shoes than with hiking boots or clumpy Arctic boots. Your feet really warm very quickly because you're using so much of the muscle. And people on skis because their feet aren't moving as much and they tend to have more rigid boots, they're the ones who get the frostbite on their toes, not the people doing it on foot.

And the fact that all of the races are in trail shoes sort of shows that those are the right things. And I spent time with people who do Arctic survival training with the military up in Norway, in the Arctic Norway, and they're saying the same thing even completely independent of the fact the foot race is going on, just saying that they find that, up in the Arctic, if you're wearing trail shoes and you've got a trail where you can move quickly, they're ideal because your feet will warm up very fast. Boots, they can take a long time.

Paul: I mean, if you look at traditional mukluks, they're not particularly substantial and they're very flexible.

Mark: Yes. And this was it. It was a great feeling of relief when I reached...there was a farm 300 miles from the end or thereabouts, just under 300 miles from the end. And the chap who was there, he's lived in that environment all his life. And his point was, "Yeah, we would wear trainers to go to school in the winter because we're moving, we're not stopping. Our feet are generating warmth." So not particularly warm socks, just running shoes and that's how they go to school. So they know that. And these are people who live out there, and, you know, their

home, or their cabin, their heated car, their heated foot pockets on their snowmobiles.

Paul: Well that's the thing. If you spend...you know, even if you're a dog musher and I think dog mushers...I've not spent enough time with dog mushers in North America but I spent time with dog mushers in Scandinavia who've been up to Svalbard and they tend to be standing still quite a lot. As you say, and the same with snow machines, you know, your foot on a metal foot plate. And it might be heated on some of the Gucci machines but you're basically stood still or if you're out ice fishing, you want a bit of a rubber boot because the water's gonna come out of the ice hole. But that's different to walking on a snow machine trail or a dog sledding trail.

Mark: And it's the same even for people who go hunting out there. They will wear something like mukluks. It would just be the thinnest of insulation on there and that is perfectly adequate because they're not relying on it. They're just moving and using their body to generate heat. And in the same way, our faces are exposed most of the time. We don't cover up the faces until it's about minus 20, minus 25. Or even colder, maybe minus 35 before I would properly cover my face. And you've just got so much heat from your body.

Paul: Yes, as long as you've got some nutrition and as long as long as your circulation's working properly. You're hydrated and you've got some nutrition, then you're good and you're moving, of course.

Mark: Yes. So it's just...or having more problems at the moment of your feet being too warm in that environment.

Paul: That's interesting.

Mark: So it's more a case of, "I've got the Arctic socks with me. I've got the Injinjis. But now the inside of my shoe is wet. If I put the Injinjis on, they will be soaked through in a second, the Arctic salts will absorb some of that sweat and some of the water from the snow melt but then my feet will get hot. So, yes, I really needed something in-between this year. And that's it. People ask me, what's the best sled setup? And it's well, you've got different options but I don't know what perfect is. It depends so much on the route and conditions that year and distances. So I can look at pros and cons but I don't know what perfect is. And people sometimes get surprised by that. If you don't know, how is anyone to know?

Paul: Well, I think whenever you've got some experience in a particular environment...and I get these sorts of questions as well, people want a prospective answer. And it's either because they want to benefit from your experience and they trust your judgment and that's good, but also it might be about not wasting money on the wrong thing. But yeah, but people are surprised when there isn't a defensive answer to these things.

Mark: And also I haven't used every set up because, my distance now, I've done 3000 miles or thereabouts of sled-hauling and yet I've only used three or four different sled setups. So out of all of the probably dozens of potential possibilities, I've tried a select few because they work for me so I was happy to go with them and make little changes here and then. I don't have that much experience of different things. I have a fair amount of experience with very specific items. But from a recommendation point of view, that's...

Paul: Well, you're approaching it as a scientist, that's the thing. You know, you're approaching it as a scientist where for most people, if they had that experience they'd go, "Well, I use these shoes, and they're the best shoes [inaudible 01:22:11]."

Mark: We see that a lot on the race blogs and Facebook pages. And it's sometimes the people who failed or did really badly, worse than they would have expected, who were the ones who are most vocal of their recommendations. And I really hold back on making recommendations because I don't know...again, some of it does come down to the experience. I've seen things go very wrong for people, things go wrong for myself, and I can't predict what it's going to be like in any given year.

Paul: So one thing, it sounds to me like generally, things have gone right. You know, the MDS went well, you placed well, you know, first ultra, the Yukon, you had no experience in cold but you went and did the longest distance. And you've gone back and repeated that, and you've gone done a thousand-mile on your own. So what things have gone wrong? What dramas have there been? You know, we talked about psychology as well and how do you deal with, in particularly in extreme environments, when on your own or when you're out on the race on your own, you know, you're not with loads of other people. How do you deal with that? And what have you had to deal with and how do you deal with it? How have you dealt with it?

Mark: Okay, so there have been probably near misses in terms of animal encounters, the most dangerous being moose. Well, it's always been the case of just sitting down and letting them get bored and go off and do their own thing rather than continuing towards them and creating a dangerous situation. So there have been near misses there that have simply been a matter of sitting down, letting the time pass. But actual things going wrong would be superficial frostnip. And I always find that it is frustrating and embarrassing because these things happen when we're careless, not because we're being intelligent. And I've had situations where I've allowed myself to be vulnerable, thinking it would be short-term and it's become longer than I expected. And that's usually where it's gone wrong. So I was doing a trip up in the White Mountains in Alaska where I was moving from very closed woodlands to an open section further couple hundred meters and there was very strong wind conditions that actually froze one ear partially.

Paul: That's coming from one side.

Mark: Yes, it was just being hit by the wind from one side. Got to the other side, couldn't find the trail anymore because the conditions were as they were. Stamped down an area of snow which was almost up to my chest anyway, put the bivy in there and got in. And I was gonna have a kip. I wasn't gonna make the cabin I'd been aiming for. So I just called it a day there and then spend the next couple of days walking around. As soon as I lay on my side, felt this brittle ear and I was just so angry and annoyed with myself but immediately just started packing it with clothing and insulation. And what made it worse was that there was a chap who'd finished the Yukon race just after me the year before whose ear had become very bad and it blistered and was dripping for days as it reacted, and I just didn't want to be like that. And in fact, it wasn't. It was a small couple of blisters either side and it was fine within a few days. And it recovered within minutes of me realizing it was a problem. But really angry and frustrated that I allowed that to happen. I've often had frostnip across my face, in particular around my cheeks.

Paul: Little white spots.

Mark: Yeah, very small. And that is almost sort of a gambling side of it because I don't want to cover my face because I find that really uncomfortable and I get too hot. But then you just get this, perhaps a little slight breeze or something, and well, that is going to allow frostnip, and I'll monitor that. If it starts to become waxy and I think it's more serious, then I'll cover it. But this is often...it's the level I don't notice until

I look in the mirror. It doesn't feel bad. And if I'm in a cold environment, I'll routinely be checking my face with my fingers and making sure it doesn't feel bad.

Certainly in the Yukon this year and in the past, I've had a little bit of superficial frostnip that's healed up in no time.

Paul: I think the little...the white spots on the face is not for people in those sorts of cold environments. And my understanding is if you look at old photos of Inuit, one of the reasons that faces were often pockmarked was all the years of superficial frostnip.

Mark: Yeah, so let's look at when it got worse. First of all, the worst experiences tend to happen when it's not that cold for me because I'm more likely to be experimenting with different clothing strategies. So I've never had a cold injury at minus 40 or minus 50 because then I'm fully protected, I'm taking it very seriously, no chances. Everything is by the book. So there was an occasion where I wanted to try something different in terms of my underwear. So I was usually wearing sort of natural fiber boxer shorts or a tight fit. They were fine with tight running shorts over the top, then a base layer and then Vapour-rise trousers. And that worked for me whenever it was cold. But when it got warmer, it was too much.

So I tried experimenting there and there was something I changed one year when it was warmer. It was 2013 and the result of that was a frost-nipped penis, which was, yeah, something that was extremely alarming. You really don't wanna be getting frostbite there.

Paul: Yeah, 50%, or more, of the audience are now wincing, crossing their legs.

Mark: Yes, it felt like there was a block of ice there against the bottom of my stomach, top of my legs and I was going...sort of stuff that buffed down there.

Paul: Sorry, I shouldn't laugh, but...

Mark: And I was just going through everything I could think of to create warmth down there, including thinking of things that might get a bit more blood flow in that direction, as well. It was just absolutely anything. And then putting on the extra layers, when I realized it warmed up a little bit with all the stuff I was throwing down there and trying to do... and then

the next day, it was just no chance. It was back to the system that works for me and taking no more chances. But that took six months to heal.

Paul: Really?

Mark: Six months and all I could say is that my girlfriend at the time commented that it was ribbed for her pleasure. It was a really kind way of putting it. But it took six months before it fully healed. And that was a mistake that was maybe half an hour in the making, as in half of now me being aware that there was coldness there.

Paul: So was that, again, strong crosswind, or what condition was there because you said it wasn't as cold as it could have been.

Mark: It was only about minus 15. It definitely wasn't minus 20. So that was the sort environment where I was happy to experiment. And it probably was an issue. I wasn't wearing anything as a windbreaker because the layers usually are sufficient for that. So I think I changed the base layer I was wearing and probably changed the underwear that I was wearing. And I have never done that since. And actually this year in the Yukon, it was really warm and it was going to above plus 5, even plus 10 in the middle of the day and then minus 20, minus 25 at night. And even with it being that warm in the day, I was taking no risks so I actually just cut my spare pair of base layer bottoms and I just cut them into shorts which was, "I am happy for it to be too hot down here." But after that, I'm just taking no more chances.

So that was the worst cold injury, I think, until this year in the Yukon. And there was a night, after I'd come down from a mountain where it'd being cold. And I wanted to take some photos of the northern lights and just I couldn't bear to have my hands exposed for long enough. So I was aware it was cold, got in the sleeping bag. Next morning, went through the normal routine of packing everything away. Had to put the snow shoes on because of soft trail and because it was warmer, or it had been warmer, the trail was softer. So the snowshoes had to go on. And there was a problem with one strap of the four straps on each of the snowshoes that needed a bit of a fiddly approach to get it secure. So it took maybe 10, 15 minutes longer than usual for me to actually get moving. And after about 30 to 40 minutes of progress, I realized that my fingers weren't warming up and stopped then for breaks, swore at myself...even used the C word, I think. I'm not someone who usually shouts or gets angry with themselves until something has gone wrong in that order.

But literally I'd taken the mitten off, I took the inner glove off to look at the hand and there were white patches across three fingertips. And it wasn't a huge area but for me, it was a case of, "Well, this could be...what follows? It could get worse." And so, I was, again, angry that I'd allowed that to happen. And I think it was just not being aware that it was colder than I realized, just cold enough that I...

Paul: Well you were also stopped, as well, if you're fluffing with your bindings and you're not generating heat and you're pulling blood back to your core.

Mark: Yeah, which is why giving minus 30, minus 35 where you don't need snowshoes. You just [inaudible 01:32:13] shoes off, and the trail is harder and you're moving faster. So I noticed the frostbite. It was deep enough that it was affecting the nerves, it was beyond purely superficial frostnip. And I was aware I was, I think, 100 miles at that point from a cabin that was used by the Yukon Quest. And I had no idea if there would be people there or not. So I was 100 miles from possible help and I was trying to get a modicum of panic down and to just think rationally.

And so I unclipped the harness and I went back to my sled because I thought if I'm gonna stop and think, I'm gonna have some food. Clearly, progressing along the trail isn't warming the fingers up, so I need to do something else.

Sat down, again just took the glove off, put my hand into my underwear which I decided it was gonna be the warmest place for them. And then with the other hand, I was having food. So I was getting the food in and I was having a think and just trying to be sensible. I knew I had a SPOT tracker and I could call for help on that. However, the thought of pressing for help and then just standing around and saying, "Well, my fingers are pretty cold and I'd like them to be warm," I couldn't justify that because I wasn't in serious danger at that point and I felt I should only do that if the fingers deteriorate into a point where I felt that it was gonna be serious.

So I had to break. My fingers started feeling a lot warmer for having them in a warm place, and the other hand, it was going to the armpit area. As I started moving off, I suppose a combination of rewarming the fingertips during the break, of really concentrating on gripping the trekking pole which was always my thing to keep the fingers warm, anyway, and temperatures rising, just as the day was warming up, all

meant that the fingers started re-warming properly. And that was agony. That really, really hurt. And I descended, I went onto a river which was a cold spot. And for the next two days, the frostbite didn't worsen. I still had those sort of cold, waxy patches there but they weren't getting worse. The real problem was that I was struggling to unclip the harness to access my kit. And all the things that required dexterity. I couldn't really get the fingers working properly. And at that time I thought that it was over.

So I could look after myself but I couldn't be in a situation where, if things got worse, if the temperatures plummeted and that frostbite worsened, I wasn't allowed to go into a situation where I couldn't put up my tent, I couldn't put the extra clothing on, I couldn't do those basics. So that's what I was really aware of more than just the health of the fingers themselves.

Also, I knew it was a daily issue that, at the end of each day when my fingers were inside the sleeping bag, they were healing because they were in a warm environment for several hours. And when I reached that cabin, it was actually a homestead. There were people who lived there. So I arrived at night. I was warm, I was given food, I was given a bed to sleep in and then told I could stay another night if I so wished. So all that will be fantastic because it really will give me a full 24 hours or 30 plus hours.

And so I went with that and then I was looking online, I sent out an email to people following me saying, "Look, I'm gonna have to call it a day when I reach Dawson City," which was 60 miles further, 70 miles, I think. And then the weather forecast showed that it was gonna start getting closer to freezing or it was going to be above minus 15 every day. So well, minus 15, I can't really go wrong in that. Even my backup pair of slightly warmer mittens will still be fine and I would never normally wear mittens at minus 15 and actually mainly clothes [SP] would be fine for that.

But for those next few days, I was wearing the mittens and my hands were sweating and I was absolutely okay with that because I'd be sweating all through the day, plenty of blood flow. They were healing. There was never a situation where that sweat was gonna freeze because it wasn't gonna get cold enough and they would always be managed.

So when I reached Dawson, the forecast said that the temperatures

were going to continue to stay warm. So for me, that just meant, "Well, gotta keep going now. I'm not gonna get this freak minus 40, minus 50," and even if I did at that point, I had the dexterity back in my fingers.

Paul: So they were improving?

Mark: Yes. By the time I left that cabin, actually everything was back to normal in terms of feeling. And yeah, the fingers were blistering and they were uncomfortable but they were out of harm's way. So that was obviously something that had the potential to be quite serious but just managed to pull back from the edge just by being aware and reacting. And then the next issue was just a slip when I reached the checkpoint. It was a race checkpoint, it wasn't at the point I arrived. It was just a cabin and there happened to be some people there. And there was a lot of ice outside the cabin and it was night when I arrived and there was so much bright lights from inside the cabin that I couldn't see the immediate area leading into it. And I just slipped on some ice and fell over backwards and my back landed on a slab of tree trunk that was used for splitting wood for the stove. And so I hit the corner of that with my back and it fractured a few ribs. And I became aware of when I tried sleeping that night, just lying flat back on the fractured ribs and then trying to breathe just caused so much pain.

And I gave myself a day of rest in that cabin to rule out anything serious. The people at the cabin left the next morning but they gave me an option of going out with them to go back to Dawson City and getting medical aid. And the thought of being on a snowmobile, being bumped around, like, badly...

Paul: Yeah, on a trailer or even a snow machine.

Mark: Yeah, even if I was laying in the back of the skimmer with all the sleeping bags, that would be agony. And they would only tell me that, "There's nothing that you can do." As long as there was nothing serious, there was no internal injury, there was nothing that could be done for it. And I monitored myself for the full day. There was no swelling, no sign of any sort of internal bleeding, no blood in my urine to suggest kidney injuries, so...

Paul: Lungs were all right.

Mark: Yeah, lungs were all fine. It was quite low down, as well. So I was aware there would be a problem if I fell over again and landed on that.

But on the basis that I hadn't had a fall yet during the actual route, I'd had a fall outside a cabin but not for the 650 miles up to that point, I'd been sold on the trail. So I argued with myself that I could probably get away with it. If things did go bad, I would be calling out for help with that SPOT. But I felt that the only problem would be sleeping because I couldn't sleep flat on my back, which meant I couldn't get into my very small tent I was using, which was a sort of a glamorous bivy bag. So I wouldn't be able to get into that at night. And I really used that day at the cabin to try and brainstorm that and just think, "How am I gonna sleep?" And just decided that I would make a spruce mattress and try and force myself up against a tree trunk to brace myself there.

And that's what I did for the next two nights before I reached the farm. I was sleeping outside, big, thick, spruce mattresses, some extra wood, whatever I'd cut down, I'd use to sit myself up with. And it wasn't comfortable but I knew I would hurt wherever I was. And if I quit and was taken out, I would still be in pain because of this stupid accident. And if all I had to do was walk and sleep and eat, those were the things I would be doing whether I was there or not. So the thing that hurt the most was breathing.

Paul: Yeah, [inaudible 01:41:14].

Mark: Well, [inaudible 01:41:16] pain anyway. And after those, it took three days, two nights to reach the next cabin, my friend's place. And I stayed there two nights because I had to do an out and back for the trail. And I was sleeping in a bed there and that was quite comfortable relatively. And I just improved from then on and was able to sleep in the tent again after leaving there. Although I didn't always, sometimes I just slept out under the stars because it was a nice thing to do. And the temperature was swinging then. We had plus 10 in the middle of the day and minus 25 in the middle of the night. And it was all fine for those last...it was a week and a half, I think, it took from there. Something between 7, 10 days.

And yeah, it hurt a lot but it wasn't serious in terms of there wasn't an internal injury that I needed medical aid for. And the treatment for ribs is downhill. So there were those things, one which was related to the cold and one that was just a silly accident that could have happened absolutely anywhere. And you sort of tot those up to experience and say, "Well, I've had that. I wouldn't ever want to have it again but I got something from that experience and dealt with it." And yeah, I felt all the better for doing so.

Paul: So 39 days, 1000 miles.

Mark: Thirty-nine days. and when I'm racing that route, I think the last time I did it, it was about 9 days for 430 miles. And that's the difference between trekking about 10 kilos and trekking about 40...probably 45 at the start and then just dumping gear as I went, leaving fuel at a cabin in one place, leaving some food with the trail guys for the race to another cabin. And probably got it down to around 30 to 35, closer to 30, getting lighter each time because of the food that's been taken out.

Paul: So you're taking all your food for that journey in the cold. What are you actually eating? You eating a lot of fats and proteins? What were you eating?

Mark: It's a good mix. It's a balanced mix of everything. The main source of nutrition was South African dried meat, so Droëwors, and a bit of biltong, as well, but always ask for the fattiest cuts they can find for me because I just find I'm naturally craving fats when I'm out there. So the dried meat...I have dried fruits, as well so I get a bit of fiber but definitely, I didn't get enough. More fiber would have been preferential. And I make chocolate truffles because of Richard Weather [SP] up at the top of Canada does a lot of Arctic work there. And I looked at his website and his shop, and he sold chocolate truffles. I ordered those, and they were about the size of half a tennis ball, and they have really high energy. And then that inspired me to make some. And there was lots of coconut milk, coconut fat and dark chocolate, honey, and...

Paul: How were you consuming the coconut fat? Did you realize [inaudible 01:44:34] temperatures and you were putting it to drink?

Mark: It's almost...that all go into my chocolate truffles.

Paul: Oh, right.

Mark: So that's part of the recipe.

Paul: That's part of the recipe, right. Okay.

Mark: Yeah, and just because I prefer that as a source of fat to, say, dairy. So, yeah, I get on really well with those and just having short-chain fatty acids, they're easy.

Paul: Is that the reason, or is it just the not-fat, not-dairy? We can come on to that conversation of not-dairy in a minute, but is there a particular reason that coconut works?

Mark: Coconut is a really good fat in terms of how your body uses it. I would happily...I did olive oil or other things in there. But just from experience, I know that does...it becomes more solid. It doesn't freeze completely so you can still eat the things without breaking your teeth. And that's it. I have tried limiting dairy. I don't get on with having a lot of it in one go. I just feel healthier with coconut milk and that just seemed like a good option. Tried it, it works. So I've kept doing that since. But that's it. It's a very basic, almost boring diet of eating the same thing virtually every day unless I happen to be going through a town like Dawson City and can stock up on some other things. But it works for me and even on the last night I was still really enjoying that food and eating as much of it as I felt I could.

Paul: So you're not cooking. You're just eating the dried meat, you're eating prepared truffles, dried fruits.

Mark: Yeah, and that's from the racing, as well, just because of the time involved in melting snow. The fuel weight, as well, I suspect there's probably a balance somewhere between the duration of the journey and how much energy you get from the freeze dried stuff compared to the wet food. I prefer having real food then freeze dried, I feel fuller for that because I think the level of processing probably breaks it down so much that with the freeze-dried that it doesn't feel as fulfilling.

So there is that, the weight of the fuel, the time spent. It's minus 40. I don't wanna be sitting outside melting snow, taking a break for 30, 40 minutes, when I can just do a 10-minute break, put all the food in and keep going. And that way, I always had a treat whenever I stayed in that cabin and there was a wood stove, then I'd use that and I'd make stew from the dried meat, and the dried fruit, and whatever was floating around. They often had hundreds of packets of gravy that people had just left there.

Paul: Packets of soup.

Mark: Yeah and I had cups of soups with meat. I had enough cup of soups with me to have one a day and then just decided I couldn't be bothered with the hassle of heating up water. So I sort of got it down to about half a dozen of those treats and that was when I got to cabin and

used it as a gravy.

Paul: That makes sense, yeah. So that kind of segues nice nicely into...I've got this book of yours in front of me, which was from quite a while ago. It was in 2008?

Mark: Yeah, I think so.

Paul: So Human Evolution, Diet, and Health. Well, first of all, again, you know, given what we've talked about, how did you come to write this book in the first place? Then we can delve into the content.

Mark: Sure. I was really interested in the relationship between human evolution and biomechanics and how we came to be upright bipedal apes. And that was just purely out of interest. I'd gone along to some fitness-related conferences where people were talking about that and saying all these things about human evolution. I thought, "Well, I'll see what there actually is published." So I was spending a lot of time in university libraries going through research papers on human evolution, specifically to find out about the bipedalism. And you just cannot find anything on that topic without finding out about diet as well because it all worked together. It was our change to being on two legs seems to be a reflection of increasing our daily ranges in search of food. So it's more economical to cover a big distance on two feet rather than on four limbs if you're ape-shaped.

So the existing apes that are quadrupedal mostly don't go near as far as we believe or we think our ancestors did. So it was tied into our nutrition and then how our diets changed. We then became related not just to the fact we were upright but also to the length of our guts and the size of our brains. So it all seemed to work together. And as I was trying to research biomechanics, I was finding out so much about diet and health side that I felt that there was a book there.

And so then I started reading books on paleo as they were back in sort of 2000 and 2005, and Loren Cordain's book came up, which was The Paleo Diet. And in that, he'd written something quite early on which really vexed me which was a sentence along the lines of, "Based on work that I have done in my lab, everything that I'm now gonna write is reliable." And I had read the work that he had done in his lab, so I knew that what was going to follow would be reliable but it really grated with me that you would write in a book, and I felt that you were asking people to trust you. And I don't like that. From a scientific perspective, I would

rather say, "Here is the resource if you want to know more."

Paul: Yes. "Here's the evidence, here's the reasoning." Basically, yeah.

Mark: So I wanted to write a book about diet and health but I felt that in doing so I needed the background information but the background information was a book. So I wrote Human Evolution, Diet and Health as that precursor to another book which is Our Natural Diet which is about how you obtain healthy food nowadays with what's available and isn't complete focused on the paleo side .but that's kind of...the background is the understanding where we've changed from an evolutionary sense to the processed foods that we have now where they're not necessarily as healthy for us as less processed foods.

But the first book, Human Evolution, that was all the details I could find at the time that was well published. And there've been more since. So that book covers sort of the hunting, scavenging side and looking at the fact that we were hunting mammals, we were hunting predators as much as omnivorous, herbivores. And what that meant for changing brain size and how it all works as well for what the gut could do because with a more high-quality diet, we do need a very long gut. So look at mammals that have a lot of grass in their diet, lots of fiber, they tend to have longer guts so they can digest that whereas we've evolved from eating very high-quality fruits and insects to bigger animals, some amount of meat. We see chimps eating meat in small amounts than other monkeys. And kind of going from there. So we know from the fossil evidence of bones found in caves, where there are cut marks made by humans. and we know that we were scavenging some remains from other animals, we were accessing the bone marrow and the brain cases that most other carnivores couldn't access. So we were getting that after they had had a go but we were also accessing some before. And, again, that's sort of shown by tooth marks where we've got stone tool marks first and those have been overlaid, suggesting that we've discarded carcasses and other animals have then gone for them.

So all of that went into that book, which isn't the sort of thing that you really need in a normal diet book but it's sort of...

Paul: No, I find it fascinating. It tied together for me a few things...few sort of disparate areas that I was interested in. And it also seemed to tie in with another book that I've read Richard Wrangham's Catching Fire, which is a popular science book. But again, there's an argument there about the fact...his arguments about our relationship with fire and our

ability to cook. And again, shortened...smaller gut size allowing more energy to be allowed...to be used for a bigger brain. And it's actually almost...there's a segment in your book somewhere there which sort of pretty much dovetails into that. So that works. That was all very interesting for me.

Mark: One thing that I touched on but didn't go in enough because of what was available at the time was there is more interest now on marine sources of nutrition. We know that people lived around Lake Turkana. There's lots of evidence of us eating shellfish and there is a real difference now between the kind of focus on whether we were getting most of our nutrition from animals or whether we were getting it from marine sources. So those two different sets have evolved...and it's all coming down to the brain and nervous system, and understanding the omega-3s and the lipid profiles of the brain which match very well with marine sources. So we know that we had both in the diet. But the interest really is from which population did we evolve? Was it one that had majority seafood or was it majority sort of Savanna-living [inaudible 01:55:07]?

And that's quite interesting for me because the debate for the marine stuff is really hard to back up with solid fossil evidence because those fossils don't really exist, whereas animal bones do. They last for a long time. So the supporting case for marine sources really comes from the brain itself and the lipid profiles and saying, "Well, the omega-3s must have come from seafood sources, tropical fish, and so on," whereas the case from other animals is it could be from lipids within the brains and bone marrow. And also there's quite high omega-3 content in insects which, I think is interesting, especially going back to the bushcraft side of it.

Paul: Also, one of the other guests that I had in my podcast a while ago, Alyssa Crittenden, who's an anthropologist and she spent time with the Hadza and she has a particular interest in honey and people's relationship with honey and scavenging for honey. And, again, a little bit about evolutionary biology there, as well, in terms of where did that fit in our diets and when did we...? And, you know, certain tribes in Africa have this relationship with the honeyguide, bird indicator. But the fact that when, rather than us getting a pot of honey now, which we've started seeing is like some uniform substance, when they go and get the...you know, they raid the bees nest, and they're eating...there's wax in there, there's some other grubs in there, there's various different oils and fat profiles, as well as the carbohydrate-high that you almost get

from...which would be very difficult to get anywhere else in nature.

But it was interesting there's actually quite quality sources of fats in there, as well, as the honey. So, yeah, there's probably...I mean, to me, it seems as though the diversity of the diet that we may have had at certain points in history must have given rise to sources of some of these things that we need that maybe we're not thinking about.

Mark: Yes, and it all shows how good we are adapting, as well, and circumstances have changed so much for the tribal population of Africa because of farming now because they've lost so much of their normal hunting ground. That's been lost. So they're adapting. So using the resources, the foods they have available, as have come together populations in Siberia and the population across North America by whichever group it happens to be, there's a...regardless [SP] first nations in Canada and then different groups across Alaska. And just their diets can be very, very different and they all just show how great we are adapting.

And unfortunately, that can be used against us by people saying, "Well, we're so good adapting, it doesn't matter that all these highly-refined foods, all these heavily-processed..." Ultimately we may well adapt, and we have adapted, in some ways, to the very sweet foods that we eat because people from Europe tend to be much better at tolerating sugar than people who don't have a European heritage, which is why we're slightly more resistant to diabetes. But that's not really the measure of health, being slightly less prone to a disease. And just looking back on the human evolution side, the sorts of wild fruits that we used to eat was so completely different to what we can access now. Which is why, in some ways, vegetables are healthier because they don't have such a high sugar content as many modern fruits are made contain. Ultimately variety is great and the refined foods can be in there for whatever reason. But trying to have a diet that has more of the healthy stuff obviously can be beneficial.

Paul: Adaptation...people like think of adaptation a little bit like, you know, you go the gym and you build muscle and you're adapted, whereas adaptation could mean lots of people dying until you get a population of people who are resistant to cancer and heart disease. And, you know, it's like the ones who don't know of these things are the ones who...so that's not necessarily an attractive solution to the refined foods, is it? It means we have to go through generations of people dying from ill health before we have a population of people who can cope with

it.

Mark: Yes, I think we have to use the research available and just that interpretation of it. Well, we must have adapted over millions of years with particular diets and then this sort of slower adaptation changes in gut length and brain size. And then all of a sudden, we're not having those foods anymore or we're having very little of them. So the gut isn't long enough to process some of the grains or seeds that we're eating anymore. So people get really preoccupied with nutrition labels, "Oh, there are these excellent fats in these seeds. Somehow, that's fantastic for the seeds. How much do we digest if we're not birds?" We haven't adapted on a seed-based diet. We can have some, we'll absorb some of the nutrients from it but we're not gonna be absorbing 100%. And, yeah, it's gut length from things like fibrous foods where it's not that long so the fibers from fruits and vegetables are much more easily digested than whole grains, for example. But, of course, the fruits and vegetables are really dense in other nutrients whereas whole grains are refined to the point that they're, they don't have that nutrient density. But it can still have useful properties but it's not as good. So if you're giving someone a diet, he can have more of the fruit and vegetables and a little less of the grain foods, that is probably going to be healthier for you.

Paul: Cultivated grains in our diet probably don't go about more than, what? Ten, 12,000 years.

Mark: Yeah, we're seeing evidence for its inclusion around that time.

Paul: Yeah, first [inaudible 02:01:47].

Mark: Yeah, but it's about how much of it we're actually using. It was something to help the diet, like a natural staple and not something that people suddenly have in higher amounts.

Paul: And then if it's closer to a natural grain rather than the ones that have been bred over years to have a higher yield of a certain nutrient, as you say, in earth and make more white flour, and less in terms... It's interesting, it's interesting. In terms of how that path...just to bring things full circle...I know we've got limited time, we're going two hours now, in terms of how that comes full circle to how...you know, you talked about you take the meat and whatnot on the Yukon and cold environs. But, as a general rule, how much does that inform...and so the research that you've done into human diet or now evolution and diet and then also how to get healthy, the second book you mentioned, how to get a

healthy diet from the foods that are available to us now, how much does that then inform what you eat when you're training, what you eat when you're doing events?

Mark: Yes, it comes down to wanting to have a healthy lifestyle, so trying to include those healthier foods. And from experience, whether it's racing or just everyday life, I just feel a lot better on those. But occasionally, because I like cooking, I'll make something that isn't that healthy but it's nice to eat. And then I'll probably regret it the next day and feel like I've been hit by a bus or something because just the shock of my body having to deal with something that...

Paul: Has [inaudible 02:03:30] before?

Mark: Pieces.

Paul: Pieces?

Mark: Yeah, because I'll buy a whole chicken and then use all of it. And, you know, the carcass will get used for making a stock. And from using the bigger bits of chicken, I'll just take as much as I can off the carcass and still want to do something with it. So by the end, I've got a little bit of chicken left and that is perfect for a pizza topping, so once a week or once a fortnight. And so then I'll make...I'll make it myself so it's not filled with vegetable oil horribleness, but just that amount of wheat which most people would probably have and be fine with. I'm less fine and I do feel really sluggish and tired after that. And it's just my body isn't used to it. it's used to just processing fruits and vegetables for the fiber and something like that will just, it will move more slowly through the gut and it has a big effect on me than most people would have noticed.

But I need to recommend that as a test for people who just don't have any cereal grains for a couple of weeks, and then just have a day full on and see...

Paul: See how you feel.

Mark: See what that does to you. The whole gluten thing has become a bit of a myth now but there certainly are aspects of cereal grains that aren't that good for us.

Paul: How do you mean that gluten has become a myth?

Mark: Well, the person who did the original study to show that people had tolerance issues with it has since done follow-up research, looked into it more closely and found that it wasn't because of gluten. So the problem is with cereal grain foods, in general.

Paul: All right, so general gluten intolerance, or celiac disease, or all of it?

Mark: With celiac disease, that is very specific. But many people kind of jumped on the gluten-free bandwagon when, it fine to say, "Avoid the cereal grain foods," but it's not because of gluten. It's probably a number of factors including the way that the fibers move through the body and doesn't get broken down, isn't very nutrient-dense. It's lots of things which can cause the problems which were originally associated with gluten intolerance. It was just sort of one of those classics of science of someone saying, "Well, okay. I understand it's gluten-intolerance issue because I've done research on it. Now I need to improve on that research." Then the results of that improved research was it's not the gluten. And the supermarkets have got all those aisles, everything which potentially very useful for people with celiac disease. But a majority of people who believe they have gluten intolerance, it's not gluten.

Paul: It's more of grain intolerance.

Mark: Yeah, they'd be better off just trying to have more fruit and vegetable in their diet.

Paul: All right. Carbohydrates, again, talking about endurance, some people are going towards their fat adaptation routes, ketogenic diets, those sorts of things. What's your view? I think we probably almost need a round two, at some point.

Mark: Yeah, we may need.

Paul: But just a few words on that, if you have any views there.

Mark: The adaptation to increased fat burning, in itself, is a natural adaptation. Some people will do better than others relying on a ketogenic diet. However, the body requires glucose, the brain requires it. Its almost...it should be its sole use of energy. You can adapt if you're starving, which is where the ketogenic diet can be. But it's a survival response to keep you alive. It isn't a natural diet that keeps you healthy. You have a ketogenic diet as an infant and then you very rapidly move

away from that and you start digesting carbohydrates and the brain starts using this. And that's when the brain is growing and it's maintaining the health of the brain.

So the ketogenic diet, it actually creates its own antioxidants to protect elements of the brain that would be damaged by a ketogenic diet. And the body's natural response to ketone release is to shut down the release of ketones, which is why you have to keep fatty, and it has to be a starvation-like diet where you are depriving yourself of carbohydrates in order to continue releasing ketones because it isn't healthy to have that sort of acidic load on the blood. The body naturally has to respond to buffer that which means releasing sort of the minerals that would normally be supporting bones and cells. So calcium is one that gets a lot of press but actually isn't a big buffer compared to bicarbonate and phosphate. These are very common in the bones and they can be released from bones in order to buffer the blood against the acidic load.

So there's that side of it. And if you're on a ketogenic diet, you're probably not getting a lot of fiber, which calls into question the health of the gut and how quickly foods are moving along there. If they're not moving very quickly, then they can get to the stage where you get infections in the gut and then you start increasing the risk of certain cancers of the gut.

So there are more reasons not to have a ketogenic diet than to have one. And you can survive on it. It's a survival diet for when you haven't got a proper balanced diet. But all of us can have a proper balanced diet, so it's just...it's just something I don't see the appeal of. But some people get on well with it. And if they're happy with it, that's fine, but I certainly couldn't recommend it.

Paul: No, no, no, that's fair enough. No, it's just there isn't any, there just has been an increasing amount of press, I guess, around it but also, you know, there are some, I guess, amateur endurance athletes that are trying to run on fat-adapted diets and then it's just, given your interest in the ultra stuff and the diet, I wondered if there was a...

Mark: You can. And there people who do very well in races on that diet. And you could say it's amazing how well people do in spite of that diet, just as it's amazing how well they do in spite of whatever silly clothing that they are given to wear or the terrain they've been given. Let's say people at the start of the race who, all strengths trained for endurance. People do very well despite the fact they're not doing what might be

best. If we got a copy, if we got them cloned and we had one them living that lifestyle and we had another one having a completely different approach, maybe they'd still be winning but one of them would be healthier. And I like to think there's more to life than just the sport side of it and I'm interested in sort of the well-rounded health because I enjoy being here and I want to enjoy my life and feel healthy for as long as I can.

Paul: Good. Well, I think that's a good place to finish. I think that's quite a positive, inspiring note to finish on. So thank you very, very much, Mark. Where can people find you online or on social so they can say hi or check out more of your stuff?

Mark: On markhines.org. That's my website. There's a connect page on there, which is my social media.

Paul: Brilliant, and there's links to your books on that site, as well.

Mark: Yeah, links to the books, as well.

Paul: Fantastic. So yeah, everyone go over to markhines.org and check out Mark's books and say hi on Twitter or wherever that Mark hangs out and tell him if you enjoyed this. So thank you very much, Mark. Much appreciated.

Mark: Thanks a lot. Cheers.

Paul: Well, thanks again to Mark for that conversation and giving us that time. It was very, very interesting from my perspective. I hope it was from yours too. Please go over to my blog at paulkirtley.co.uk, find episode 18, if you're not listening to it there already and leave a comment about what you liked about this podcast in particular. If there are any areas that particularly interested you, if specific areas of what Mark has been up to really interested you, whether it was the cold weather trekking, whether it was the diets and health aspects or anything else, please do let us know what you particularly found interesting. And of course, let us know if you'd like Mark back for a round two on some of the areas that we touched on. I think we could have easily talked for twice as long as we did. And please say hello to Mark on his social media as well. You can find those links at markhines.org. And all the show notes for this podcast including links and links to related material can be found under episode 18 of the Paul Kirtley podcast at paulkirtley.co.uk. That's paulkirtley.co.uk.

So until the next podcast, please have a safe and enjoyable time in the outdoors and I will speak to you soon. Take care.