

Dave Asprey: You're going to want to listen to today's episode of Bulletproof radio all the way through to the end because it's full of all kinds of information about ways you can control your cellular biology and it's sort of nonstop. At the end of the show, if you like what you hear about, I'm going to tell you about a way that you can get red light therapy and a copy of Head Strong as a gift. Even if you have the book, it's always good to have an extra copy to give to your mom.

Announcer: Bulletproof radio, a state of high performance.

Dave Asprey: You're listening to Bulletproof radio with Dave Asprey. Today's cool fact of the day is that a tiny version of a physics toy is actually revealing a bunch of things about quantum biology and quantum mechanics that we didn't understand. You've those suspended metal spheres dangling in a row where you pull in one and it hits the other one. And those are hallmarks of Newton's cradle. It's kind of cool and sort of mesmerizing and if you were alive in the 80s, you probably saw those on the desks of executives. But scientists have recreated that idea on an atomic scale and they're using it to probe how quantum systems reach a balanced state which is known as thermal equilibrium.

For instance if you leave a mug of hot coffee on the counter it will gradually cool until it reaches thermal equilibrium which means it matches the temperature of the room. And that thermalization process is well understood on the scale of coffee cups but at the quantum level, no one really understands it. So the researchers studied how chaos introduction into a quantum Newton's cradle paved the way for thermalization and they replaced those big metal spheres with a row of chilled laser trapped atoms that were kicked into motion with a laser.

What they found was that for thermalization to happen, all the atoms have to be moving randomly just like the jiggly molecules in your cup of coffee instead of moving in a regular back and forth pattern. To achieve randomness, they took advantage of the fact that certain atoms they used are magnetic. So in addition to colliding with each other, the atoms tugged on one another. Why I'm I telling you all this stuff? Because well, we have no idea what's going on in the atomic level, we're just figuring this out. They found that by using a magnet they could introduce that chaos. The result is probably going to be important for designing ultra small devices in quantum computers. And quantum computers are terribly important for us to be able to decode what's going on inside our own quantum biological systems, like what's happening in your cells. And this is a very cool fact of the day because we're going to be talking about cellular biology and light specifically and how light affects things with a couple of experts in the field.

Before we get going on the show though, I'd like to remind you that in addition to getting everything to make on bulletproof.com, you can also get it on Amazon and if you've purchased Bulletproof on Amazon, I'd be so grateful if you would take a second to leave a review. One of the ways you can tell people that Bulletproof coffee totally turns your brain or any of the other good stuff we

make, is just to leave a quick review. So I'm grateful if you take a second to do that.

Today's guests are Justin Strahan and Scott Nelson. And they're the co-founders of Joovv, a company that is using clinical research healing benefits of red light therapy and turn that into practical devices that you can use at home. But I'm interviewing them because we have a combination of expertise that I want you guys to learn from. Scott focuses on the biology of how this stuff works. And he's spent years working for large medical device companies Medtronic, Covidien, Boston Scientific, C.R. Bard working on the technology of medicine.

Then Justin has spent a lot of time on design and engineering. So we can talk about clinical studies, we can talk about what light actually does. And if you've read Head Strong or you've looked at some of the other posts that I've done about light, you'll know that it's one of the big signals that your body is listening to all the time. It's like another nutrient that comes in. I've talked junk light, you've heard me talk about the TrueDark, you've heard me talk about light therapy. The truth is that, I started using light on my brain to turn my brain back on about 20 years ago with a super sketchy, home brewed device that once scrambled my language processing for a few hours.

The field has come incredibly far and I was a little concerned to bring this up at the very beginning of Bulletproof 'cause people would think light therapy was just too crazy, it was the land of unicorns. But these two guys; Justin and Scott have been actually looking at the data all that time as well and then came out with a company that does that stuff. So there are people who believe enough and did enough of the research to actually say that they wanted to make this a part of their life's work. So guys welcome to the show.

Justin Strahan: Thanks Dave. It's a pleasure to be on. As you mentioned we've been digging in at the science for sometime now and though initially skeptical, as you mentioned the land of unicorns, it's really blown us away with the potential in the field and also just the reality that we've now experienced, having been in this for a few years, the experiences of the people that are doing it on a daily basis.

Dave Asprey: Now if you're looking for voice recognition, that is Justin who's a design and engineering, focus guy who can talk about how you actually make these lights work. And the other voice you're going to hear soon is Scott. First question for you guys is ... I'm going to go back in time. There was this crazy guy who had a broken brain and he started a Yahoo group that's now been disbanded for more than a decade. And he said, "I read this one study ..." There are only couple of studies about specific wavelength light and LEDs that could make specific wavelengths had just come on the market. "And so I bought this thing and I cobbled it together and I shined it for two minutes a day, down the middle of my brain and it grew my brain back."

And he sold about 150 of these devices. I still have one in the closet and for years it was my most precious thing because I would use this for two minutes in my forehead and the back of my head and I could think and my brain would turn on in a new way. It was infrared light, which is really fascinating. What do you think was going on? I was shining a bright infrared light, very similar to the emitters that you're using in the Joovv on my brain really close for two minutes at a time.

Justin Strahan: That's a great question. And it's one that we've actually discussed with Dr. Michael Hamblin of Harvard University and in fact that's his favorite thing to do with photobiomodulation or light therapy is actually treat his brain. The theory there is because of the specific wavelengths of light are able to help restore healthy cellular and more importantly near infrared is capable of penetrating through muscle and even bone tissue to reach the brain and so it's actually quite effective for a number of brain function benefits.

Dave Asprey: So the doctor researcher says it definitely works he likes to use it. What's going on biologically with an infrared light on my brain? I'm going to ask Scott this one.

Scott Nelson: I'll take this one and for those listening in, this is Scott. Dave had a nice intro but this all kind of goes back to the core fundamental mechanism of the action around light therapy is at a cellular level more specifically at a mitochondria level and I know Dave you've produced a fair amount of content and spoke a lot about the importance of mitochondrial function. At a high level, specific wavelengths of light are helping our mitochondria produce more ATP. And if you want to peel back the layers of the onion a little bit, most photo medicine researchers, although the field is still relatively new, most scientists that study this on a daily basis really hone in on the fourth phase of cellular respirations it's kind of where the magic happens. And we kind of harken back to our high school biology classes.

During that fourth phase of cellular respiration, the goal of our mitochondria is to create this gradient, this energy gradient, through the electron transport chain. We get basically two sides of the ETC as it's often referred to as where one side has a very negative charge, the other side has a positive charge. What happens when our cells aren't functioning properly, you don't get this gradient. This gradient becomes just not as much of a significant difference in the charges. So one enzyme in particular nitric oxide when our cells produce too much of it, it has a tendency to bind a certain protein enzymes that transfer across this gradient and so electrons aren't spinning off.

So specific wavelengths of light is just to mention typically in the low to mid 800 nanometer range, the near infrared IRA range and then in the low it's 600 nanometer range. There's enzymes that have sort of an affinity to use this photons of light. Cytochrome c oxidase is one of those enzymes. So these specific wavelengths of light help actually to break those bonds that nitric oxide creates with certain enzymes like cytochrome c oxidase helping your cells spit

off more electrons that then create this gradient where then you can produce more ADP which is then converted into ATP or cellular energy. So that's actually sort of what's happening at a biochemical level when it comes to light therapy and the end goal of producing more ATP.

Dave Asprey: It's funny you mentioned those 800s. The light that I used year ago, it was the only one available it was 880 if I remember right. What frequencies in that 800 range are you guys using in Joovv?

Scott Nelson: 850.

Dave Asprey: 850, okay. Actually there's more research on that now than back in the day there was no LEDs available. It's hard to express what a difference this thing made and I'd use it and I'd get really tired and then I wake up the next day and I was smarter for lack of a better word. And that was just one, and now you have this huge panels of emitters, you can lay on the thing ... Well, you can't quite lay on it, you stand next to it but it's big enough to cover your whole body. That is going to have effects at a cellular level. But let's talk about nitric oxide for a minute.

A lot of people listening have heard me talk about nitric oxide and those people with beetroot products to increase nitric oxide. But there's a little bit of biochemistry that I think is worth talking about. It turns out there's three kinds of nitric oxide that your body has. There's neural nitric oxide uses in the brain, there's endothelial in the circulation system which is the one that we're always looking for and basically better erections, better blood flow. Everywhere in the body that blood needs to flow. Then there's also one called inducible and this is the one that's relatively toxic and there is actually three different genes you can have called NOS1, NOS2 and NOS3 that help your body know how much of which one you're likely to produce.

And when you get inflammation you get too much inducible nitric oxide or nitric oxide synthase actually. And what happens with that then is you get inflammation because it turns to peroxynitrite in the cells which creates free radicals and you have to have really strong mitochondria to turn off the free radicals and you basically get jacked up. So for some of us taking lots of nitric oxide, things like arginine, is actually going to trigger inflammation and for the rest of us it's going to trigger a better day or better brain.

What is light doing when we're shining it on our brain or on our junk?

Scott Nelson: Little bit of a loaded question but I'm glad you brought that up 'cause I remember even in your interview with Dr. Mercola I think maybe it was close to a year ago now, I think I remember you speaking directly about the different forms of nitric oxide. But beyond just brain, that's one of the reasons light therapy specifically enhances so many different physiological functions. Brain function, muscle recovery, reducing joint pain and inflammation, aesthetic

benefits like skin health etc. increase collagen levels, is because of that core mechanism of action. I mentioned nitric oxide, it is one of the enzymes that does tend to bind to other important enzymes that we need to sort of cross that ETC barrier. Excess nitric oxide does have a tendency to easily bind to those important enzyme and so light therapy actually helps break those bonds, sort of spinning off the needed electrons in order to create that gradient across the electron transport chain.

That gradient is so important because it's like the fundamental end product of the four phase of cellular respiration, is to create ADP, adenosine diphosphate. With the addition of a hydrogen atom we can create ATP.

Dave Asprey:

And for the biohackers out there, we've all by now heard of ATP which is that primary energy enzyme in the body and the T stands for tri, which has three Ps on it, which are phosphates. A normal cellular respiration when you burn an ATP, you throw off one of the phosphates, get the electron and then you have two left which di or ADP. Then quite often you make some AMP, where you lose the extra one. The problem is that, it's really hard for your body to make new ATP. It's biologically very expensive to make these little things. And normally when you have AMP, you just pee it out. One of the things that I've formulated as I was riding Head Strong is called a [inaudible 00:13:41] and it's a set of things that actually will scavenge AMP back to ADP so you can put it back into the energy production chain. If you do that and you add light therapy to it, what we're talking about here is the ability for the body to heal faster, to turn on a young person's metabolism and all this. And light seems to be one of the most effective triggers.

Ketones really help proper cellular hydration, having the right B vitamins, the right minerals, all that stuff matters. But even if you want all that stuff [00:14:09] up you still might not get things turned on without light therapy which is why I'm happy that you guys are on the show and that you're out doing the work you're doing in the world because I don't know that I would be sitting here doing what I'm doing if I hadn't had the ability to use LEDs and lasers and things like that to make my body do what I wanted it to do. Can I just go on the sun? What's the difference?

Scott Nelson:

I'll adjust and answer that in a second but I think you bring up an important point even a few minutes ago when you brought up the idea that 10 years ago the science sounded way too woo-woo. Quite honestly if you asked me the question two or three years ago before sort of the origin of Joovv, I would have thought the same thing until looking at the clinical data. But the reality it may sound like we're talking a lot of biology but all of this is really physics at a cellular level. It's biophysics. So it's just kind of interesting that you brought up that story about, it's sounding woo-woo but this is really all just physics and energy at a cellular level which I think is really important. But to answer your question about the sun, that's a great one I'll pass the baton here to Justin.

Justin Strahan: That's a great question and as we pulled up your driveway here this morning, we saw you outside engaging in some nice taking in some rays-

Dave Asprey: I was totally naked lying on the front yard there. They snuck up on me with a camera. Guys don't post that. I just had my shirt off.

Justin Strahan: No we're definitely fans of getting as much natural light as much as possible. The problem is for most people that can be a challenge. Whether for your requirements at work or your latitude where you live.

Dave Asprey: We are in Canada.

Justin Strahan: Obviously a lot of things working against you so there's definitely challenges there to get the natural amount of sunlight that we should be getting and certainly that's something that has changed over time say over the past even 100 to 200 hundred years, just as a society and our lifestyle has changed. But beyond that I would say with light therapy what we're able to do is get a high dosage of the specific wavelengths that are really able to help restore healthy cellular function with a relatively short time period. And those are one of the things that we wanted to design for early on was to provide a product for where people could get a significant dosage so that they would really receive those benefits in a time period that would be something they could fit in their daily lifestyle.

Dave Asprey: And that's really important when I created this biohacking field, I didn't trademark the term 'cause I wanted a name for what we did and the definition when I first published it was, it's the ardent science of changing the environment around you and inside of you so that you have control of your own biology. What you're saying is critically important. Like we're commuting, we're driving cars with windows that block normal light. We're in offices a lot of the time and we're not naked in the sun. And if we were, we'd probably have some problems because you can get too much sunlight. You're getting lots of the UV and you absolutely need UV. But if you get way too much of it in an effort to get more of this red light or more of the infrared light, then you're probably not going to like what happens over time either.

Now what you're saying is people can actually get a higher dose per minute which is going to have a different effect than a lower dose from sunlight, even though sunlight is very full spectrum. The problem is you can get too much of it and it may not be where you live and you're probably in doors doing something that was a better use of your time than laying in the sun for 40 minutes a day which is awesome if you can do it. So it's that giving people time back is something that you can do with light therapy because it's just not feasible for most of us to get that much time in the sun. But you guys both have a tan and these red and infrared Joovv lights don't provide tans. I'm guessing you guys aren't afraid of the sun?

Scott Nelson: Exactly, no we definitely enjoy getting out and getting the UV rays that as you mentioned are very important. In fact there's a lot of interesting research surrounding the benefits of getting red and near infrared both before your body is exposed to UV and actually afterwards during that before ... If you're getting basically near red and near infrared light before getting UV that actually helps prepare the cells so that they can have basically a natural protection so that they can harness the beneficial aspect of UV rays to produce that vitamin D. Then actually in the evening where sunlight will provide naturally higher levels of red and near infrared, it actually helps restore and repair.

It's very interesting in what most of us do when we get sunlight is we stay indoors all week long and then when it's 85 degrees on the Saturday we go and lay out during the hottest, most UV intense part of the day and then we wonder why we have these problems with sunlight. It's very interesting because skin cancer and all these things, they are blamed on sunlight. We didn't have these 150 years, 200 years ago when we were actually out in the sun getting red and near infrared spectrums of the morning and then evening sunlight as well.

Dave Asprey: It's really funny that exposure to fluorescent light is more highly correlated with melanoma than exposure to sunlight. But sunburns are highly correlated. And it's funny if your cellular respiration is working better, say because you're pretreated with red and infrared light then your cells are going to be able to better handle the load that UV puts on the cells. And if you have the right nutrients ... I use Eye Armor that we manufacture specifically for your eyes but it's full of the astaxanthin which really can help with sun exposure. It's one of these rare types of antioxidants that have an effect on that.

If you're doing those kinds of things and you're eating a diet with the right kinds of fats in it, the stuff that I recommend in Bulletproof diet and Head Strong, your resilience to sun goes up. So it's very rare for me to get sunburn even if I'm out for an hour without sunscreen on, it just generally doesn't happen. But if I'm out for two or three hours, then I'm going use an amazing technology that really just came out, I think it's called a shirt. You guys agree with that perspective?

Speaker 5: Yeah. That sounds about right.

Dave Asprey: Do you recommend people putting anything on their skin before using a Joovv light with a red and infrared therapies? Should I be using ... Obviously not tanning lotion but should I be smearing butter on my skin or anything like that?

Justin Strahan: Well we'd love to hear the results of that study if you ... Did you see the April first, a butter lipbalm video? That was the best ever. For the people listening too, if you haven't seen that, just google Bulletproof butter ChapStick or butter lip balm it was the best video ever.

Dave Asprey: I smeared butter all over my face from a ChapStick tube in for April fools. It was awesome. But I actually do think there's probably some additional benefits to be

had from putting on things on your skin whether it's hormone cream or just the specific things that can absorb through the skin and then exposing yourself to something that causes cells to work together, 'cause it will take it in faster. But you guys don't have studies or anything like that?

Justin Strahan: Some of the most interesting studies done on that, to answer your question normally, you basically recommend that people don't have ... That they do treatment on bare skin because a lot of types of lotions and creams that people would use would tend to inhibit or block part of the light and if anything we're likely to do more damage than good. That being said, there are some very interesting studies that have been done with green tea extract where they are basically applying that on like a damp cloth that's been soaked in it on the skin. And actually have improved their results for skin health benefits, reducing wrinkles, those sorts of benefits, by significant time period where they see improved benefits. That's something that's definitely been interesting.

Scott Nelson: Yeah and speaking of green tea most people think it's because of the high ORAC score of green tea that you see some additional benefits-

Dave Asprey: ORAC means the strength of the antioxidant, just for people listening right?

Scott Nelson: Mm-hmm (affirmative) but actually when you do a quick PubMed on green tea and actually there's loads of published studies around the enhanced cells signaling benefits of green tea.

Dave Asprey: That's why it's in polyphenomenal, a supplement for that stuff. Here's what I do before I use the Joovv. I use some topical stuff, I use the [inaudible 00:22:34]. Andy [inaudible 00:22:36] has been on the show three or four times. He's the model who ripped half his face off a long time ago in a car accident and then recovered using Bulletproof diet and made a lay mask. But he has some stuff that contains copper peptides and some marine collagen and a bunch of antioxidants. What I do is I take that and I actually add a little bit of methylene blue which is something I read about in Head Strong and I put that on my face. Then I stand in front of the light.

The reasons I do that is that are I've noticed the difference the spectrum of light that you guys are using definitely wrinkles and it causes thicker collagen in your skin. So I'm eating lots of Bulletproof collagen, I'm putting this other stuff on that is definitely light activated and as far as my research shows doesn't block any of this stuff. And I stand in front of the light I'm like, "Men." People are saying regularly that I look younger now than I did three years ago. And I've done all sorts of stuff that you're going into the blog and some of the other content I'm producing where I'm looking to tell people, "Here's all this weird things but if you stock them they work well and I think is fundamental. Any thoughts on having copper peptides, having these other things in conjunction with your light therapy?"

Scott Nelson: There's not as much probably research around copper but there is some that does suggest enhanced benefits when using some sort of copper extract along with light for skin benefits. It's fairly limited right now but there is definitely some pretty clear evidence that suggest that works, in fact we're big fans of Andy and his work with [crosstalk 00:24:08]. We're pretty early but we're in the process of trying to work on a compound specifically ... A formulation specifically to be used with the Joovv.

Dave Asprey: I totally did not know that. It makes sense but it's a small world. It's one of the joys of being a biohacker, is you see a study, "Can I get that?" I've injected far more research chemicals than probably it makes sense because, "This clinical research is really good." And you look at the mechanism of action and we don't know the longterm effects. But truth be told, we don't know the longterm effects of combining whatever your favorite lotion is with toast. No one has ever looked at that combinatorially. There's all sorts of crap out there that we do every day, so there's not risk. But we actually don't know. So when I'm choosing to do something that has strong benefits, at least if you know what you're doing it seems like that's pretty helpful. I'll do stuff 10, 20 years before it might be affected and it's been disproven, it's unlikely to be terribly harmful. And if it is harmful hopefully we can mitigate the effects. But red light has passed that 20 years ago, red and infrared light was a little sketchy and I was highly skeptical.

But let me tell you another story about my second experience with light. This was my first experience with red light. This was in the late 90s and I was driving home from work and some guy in a BMW 750 was looking in his phone, hits the car behind me at a stop light, it hits me and gives me a pretty nasty whiplash. This is second time I'd had whiplash and the first time it took me almost a year to recover. Whiplash actually causes traumatic brain injury, it's like it sloshes your brain around. And for me I just had terrible upper back pain, my hands and eyes closed, headaches. I just felt worked over, I couldn't think.

I talked to a natural path friend of mine he said, "Dave try this medical laser thing." We were actually at Santana Row in San Jose and he pulls it out the restaurant ... "Okay this is weird." So I stick it down my shirt and within three minutes of this pulsing ... I think it has infrared in but it's definitely red, infrared maybe some violet ... It was just red and infrared. And within three minutes, I felt three almost lightening bolts of something go up my spine. The muscles that were knotted just let go and my hands got warm. And I looked at him just said, "How much is that, I'm buying one. Because this is going to save me a year of driving to a chiropractors and massage and physical therapy and just trying to get better." And I was fine in a few weeks after using the laser but is specifically pulsed.

So a couple of questions come out of that. First one is, what's the difference between a laser and LED when it comes to this photobiomodulation kind therapy?

Justin Strahan:

That's one of the first things that we looked at because low level laser therapy or LLLT also called cold laser therapy has been around for decades and has been proven to be quite effective for different types of recovery. Physical therapists, you bang up your knee or you're recovering after a surgery, it's been proven for some time. But really what's relatively new is the aspect of being able to do the same thing with LEDs. And that was really proven by a handful of studies in the 90s, it basically demonstrated that basically the important factor was the wavelength and the intensity of the light. So essentially your cells don't care what technology created the photons that they're being bombarded with, they basically just care about the intensity and the wavelength.

And what they found is you can accomplish that with LED. So with the advancement in technology, you can basically replicate what you're doing with a laser, with LEDs, only now you can do it with a much more cost effective product and you can do it over a much larger treatment area.

Dave Asprey:

This thing I used had a treatment area about the the size of maybe two one-dollar coins. It was relatively small and I run about five grand. I ended up meeting the guy who created this and he was this older dentist who invented the first dental laser sometime in the 70s or something. And he had the most perfect set of teeth I had ever seen and he was talking all about jaw alignment and he'd invented this light specifically with laser, specifically to affect the trigeminal nerve. If people listening are interested in jaw alignment, TMJ or sleep apnea, I interviewed Dwight Jennings who is a jaw alignment specialist. So I realigned my jaw that totally changed my nervous system which was really kind of cool. And the whole time I'm using this red and infrared laser on my jaw to chill out all the inflammation that's driven in the trigeminal nerve, which if it's inflamed it will inflame the vagus nerve which controls a lot of stuff throughout the body, including fight or flight response.

So if your jaws is misaligned, you're grinding your teeth all the time, you have the bad bite, you're probably going to be in fight or flight way more than you want to without any knowledge that's going on. So I hacked that in myself. But light therapy was a major part of it. So your first question was laser verses LED and you're saying no, they're pretty similar. The second part of that though is, why did it work differently when the laser paused? This is different than the wavelength, this is how often it turns on and off per second. It was measured in hertz. What's the deal with blinking lights? Do they matter?

Justin Strahan:

That's a great question and it's one that I think will be very interesting to see what science really comes out with this especially over the next five to 10 years. There's a significant number of studies that have been done on testing various frequencies but I would say the jury is still out in terms of what frequency is best. But what we do know for sure is that a relatively stable pulse specifically around the 60 hertz or 120 hertz is there are significant benefits to be made.

Scott Nelson:

And just to add that. The gold standard within the photobiomodulation community is continuous wave therapy. Across the board you talk to any photo

medicine researcher they'll say by far and away continuous wave, there's so much evidence that supports that. In fact there's over 200 double blind placebo control studies on continuous wave light therapy but-

Dave Asprey: What that means is the light that turns on and stays on. But that's actually a lie for LEDs 'cause LED work by turning on and off faster than you can see them. They're never a continuous wave even though the LED junk lights we put in our houses now, they blink, you just can't see it.

Scott Nelson: On that note, there is a small subset of research on pulse technology but it's just mentioned, the frequency at which those lights are ... It's all over the place in terms of what research is showing what frequencies work the best. Everything from 10 hertz to 20 hertz to 200 hertz to a thousand hertz. Across the board some studies show that they work better in sort of continuous wave and some studies say it doesn't. Just as mentioned, the jury is out in terms of what that looks like on a cellular level and it kind of makes sense because we kind of understand that were kind of going back to what we talked about earlier with the mechanism of action, we understand the gradients that occur during the fourth phase of cellular respiration. But there is limited information on how those ions channels, how they respond to different frequencies and I think with more understanding on that, that mechanism of action I think there maybe a little bit more definitive guidance as to what that looks like.

Justin Strahan: One more thing to add on that as well. When you see a study on pulse light, typically even with LEDs what they're doing is doing a true start-stop where the light is totally turned off and then it's totally back on. Where the natural pulsing is happening because of the alternating current is a much more of a wave and not a true start-stop which is what you'd typically see at a true pulse light study.

Dave Asprey: One of the reasons that I know that this is different from pulsing light is that I can feel a difference that beginning of the scientific method which is observation. If I hit myself with a hammer twice, it hurts more than once therefore I know hitting twice without further study. So the fact that you can feel a difference even if your eyes are closed and you're shining it on the back of your leg or something, it's a subtle difference but you can feel it. But something different is going on. One day two years ago I went to a conference it was called the Near Future Conference, but they cut off the name a little bit wrong. This was really neat because they had a bunch of investors, futurists, researchers, it was a lot of fun and it was held down there by the Sal Institute in San Diego.

Instead of having the normal networking, mixer party which if anyone has ever been to a networking event is kind of boring, they said we're going to mix things up and we're going to have a pajama party. Apparently at the time and maybe unicorn onesies were on sale. Because almost everyone shows up to this party or these VCs and CEO types wearing unicorn onesies which was hilarious. And not getting the memo about unicorns and being too busy to actually order my own pajamas, I had emailed my assistant and said, hey could you order some

pajamas for me. So she orders bright red, Hugh Hefner pajamas for me. So we're all standing around at this really nice place looking like total idiots.

One of the people who spoke was researcher, a neuroscientist from Harvard who had studied pulsing light. Being from Harvard and all she didn't wear her pajamas to the party and thought we were all nuts. I ended up sitting on a couch next to her friend an hour and talking about a research and tricked her into thinking I was a neuroscientist not on purpose 'cause I was asking rude questions about BDNF. She explained her research and I'm ... I wish I could remember her name off the top of my head. I need more light on my brain for this. She actually started a company and what she found was 40 hertz did specific things for breaking up Alzheimer's tangles in the brain. Not 39 hertz and not 41 hertz.

If we can have research results like that out there, I am going to go out on a limb, which isn't really a limb at all. It's just looking at their data and say, pulsing matters. I'd also say I don't think we know what rates do what yet, but allowing people to control the pulse rate on their lights seem like really good idea. So you guys can talk more potentially about it but saying the research isn't in on pulse is there but i think it's very accurate to just say look it matters, we're not sure how much and we know exactly we know what to do. That's where my personal, which is relatively biased perspective is. Anything to add to that flashing matters or it doesn't matter?

Scott Nelson:

I think you're spot on. Most people would say there's kind of two aspects to pulsing. One would be the ability to generate more power in a relatively short amount of time without risk of overheating. So you can actually deliver that energy deeper into tissue because most people that say every centimeter you're losing about 90% of the energy. That's one aspect. But the other aspect that's a little bit more unknown is what you just hit on Dave is that at a mitochondrial level, what is that frequency? How are ourselves, our mitochondria specifically responding in terms of the residence of that frequency. Our brain cells they may respond to a different residence. I think it's pretty clear that 40 hertz-ish range they respond better. Other cells of our body it maybe a little bit different. So when you look at a lot of the studies that have been done on pulse, photobiomodulation, that's why the evidence is still unclear. Because there's not definitive studies done at the specific wavelengths on brain tissue versus muscle tissue verses other types of cellular tissue. I think it's a little bit unclear but for your comment about observation, it's clear that there's something there that is pretty interesting and probably worth exploring.

The other thing that I will point out is kind of to circle back around to the earlier part of our conversation is that at the end of the day whether we're pulsing using pulse light or continuous wave light, we need more light in general. We don't get enough of it and so the major draw back to pulsed light is that it's typically more expensive to manufacture and just think I'd probably speak to this more than I could-

Dave Asprey: It's less studied to be perfectly clear. You guys, the Joovv doesn't pulse right now but I imagine you're thinking about it. The problem is, how do you know what pulse rate to put in there? And I think the research is coming up but to support your point there, standing in front of the Joovv which is something I do on a very regular basis. You guys have seen it, you're here at Bulletproof labs where I test all of my stuff. I stand in front of the light and I actually last night came back from a trip to New York. I went there and back in 36 hours to some video for Amazon. Airplanes wreck your biology on a cellular level.

So I was sitting there when I came back with the smaller Joovv panel on my upper back and definitely feel a difference when I do that sort of thing. So I am very happy to use continuous stuff and I'm very curious about what's coming down the road. How soon do you think we're going to have enough research for you guys to say, "Let's put something pulsed in here."

Justin Strahan: I think your initial, the idea that you have which we've discussed actually is giving that control to the user where they could actually choose the frequency of that pulsing based on maybe the research that they've been looking at for specific that they're trying to treat. Because there is a lot of research out there that it absolutely exist. But to your point we're not yet to the point where you know exactly which frequencies to use. That could very well be the way it gets morally introduced to the industry is that ability to adjust it, certainly is a viable solution.

Scott Nelson: One other thing to add to that is that we have a keen interest in doing more studies, that's one of the reasons why our devices are now class two cleared by FDAs, it's going to be tough to get an IRB approval with a class one indication. And so our class one clearance-

Dave Asprey: Please explain what those are for people who don't know what IRB is or don't know what their different classes are.

Scott Nelson: In the world of medical device operating in a pre-regulated with FDA and CDRH in particular, there's three different classes. Class one, class two and class three. Class one is sort of a layer for the most part you're still under the purview of the FDA so it's still important to have a class one clearance. But class two and class three in particular, all of your processes across the board have to be sort of leveled up from a not just a manufacturing standpoint but also how you in essence commercialize and put your devices in the hands of everyone. You have to check an onerous amount of boxes when it comes to that. Class three is even higher than that. Class three would be a heart valve, something like that.

Any more with CDRH you get some high breed programs like the De novo pathway as an example. But in order to fund a study, typically you have to have IRB approval investigative board of typically physicians, have to approve your study and they're never going to do that if your devices aren't at least class two cleared by FDA. That was one of the reasons our devices have class two

clearances. We want to do a lot more of that type of work, pulsing being one of the avenues we probably want to explore in more detail.

Dave Asprey:

A lot of people listening probably aren't familiar with that stuff and it's funny because I come out of the world to technology where if you want to build something, you kind of read the code and release it on the world and you see what happens and if you don't like it you change the code. But when it comes to running a food company especially a disruptive one like Bulletproof, there's a lot of rules you have to follow. Just crazy levels of rules that are invisible to people. Often times you wonder why does food cost so much. Well there's a 50% regulatory burden we spend probably more than a million dollars on tests right now that aren't the tests that I would like to run, the ones that would provide the most value but the ones that allows to checkboxes in order to be very high quality food manufacturer and to pass those.

But when you cross over to medical devices, a lot of people listening don't know I was CTO of one of the wristbands tracking companies that Intel bought for \$100 million and went through this before that, a stick-on heart rate monitor for hospital use. The level of regulatory stuff on medical things is crazy. You guys are going down that path and this is why med tech companies often times raise hundreds of millions of dollars even though their actual product cost isn't that high because they're spending a lot of money on proving stuff so they can say what it does. So you're, I would say a third of the way down the path of doing that. Is that pretty accurate?

Scott Nelson:

I'd say we're probably a little bit further than-

Dave Asprey:

Half way down.

Scott Nelson:

Yeah. From the standpoint of CDRH which was a subsidiary, that's prob a poor description but it's almost a separate group within FDA. There are certain indications or claims that we can make it out, light therapy, devices based on other predicate devices. But we have a much, I think we have as a team, the broader Joovv team, we have just like with a lot of the stuff you're doing with Bulletproof, we have an interest in kind of doing the basics but also we have a much broader interest in doing more research around some of the interesting topics as well. Whether we end up going down sort of the De novo pathway, we're actually funding trials and getting indications that aren't available right now from the FDA standpoint. That's sort of where our heads are at. We want to do more interesting research around UV light in particular, pulse light, different wavelengths of light especially. That all requires a significant amount of, as you mentioned a significant regulatory burden. I think we're a little bit further down that path but there's still a lot of stuff that we want to do for sure.

Dave Asprey:

Do you ever just shine light on mice?

Scott Nelson:

There's a fair amount of clinical data that is just animal alone. Yeah. For sure.

Dave Asprey: In terms of animal research, light therapy testing on animals is unlikely to cause substantial harm to the animals. They probably feel really good.

Scott Nelson: Exactly. It's one of the few animal studies where across the board they almost benefit. That's the interesting thing about photobiomodulation. We get this question a lot, is can you use it during pregnancy? Or for other types of conditions? And there's really not a whole lot of side effects. There's certainly studies that have been published that showcase ... The researchers didn't see any clinical efficacy but you'd be hard pressed to find a study where it actually led to downstream negative effects. I think that's pretty important aspect.

Dave Asprey: You remember the old Flowers for Algernon book, read that in some of the creators? It's a really famous work of literature and the idea is there's a guy who's profoundly, mentally impaired. And he goes through some experimental procedures that makes him the smartest person on earth for a while and then he returns back to his state. There's this whole moral ethical dilemma in that that says, would you do it? And there's a group of people who say, "Oh no, I would rather never have that." I don't understand those people. Those are not my tribe. I'm like, "Hell, yeah, give me five minutes of being the smartest person on earth even if when I'm done back to myself. But then there's the question, if you did something really, powerful but then when you're done, you might die.

And there's a class of people they are called Olympic gold medalists and they've done surveys on these guys and women. They say, "To be the best in the world, even if I knew I was going to die in five years, I would probably do that." Because they're so motivated but right now when it comes to experimenting on yourself as a biohacker, there's that whole range from would it be amazing but high risk? Or would this be amazing and maybe or maybe do nothing or low risk? And I think light therapy falls into that. It's relatively safe, but it still could have negative things. Let me go back to the negative thing.

When I shined that infrared light over my language processing center, it's a little bit above the left ear and back. I did this because my wife is Swedish and when she speaks Swedish or French or the other three languages she speaks, but specifically Swedish and French, my auditory processing is not like normal humans. So to me it sounds like mush, I don't make out the individual sounds at all. And it's frustrating because she can say one word to me and I'll say back a different word and she laughs at me. This has been irritating for years. So I'm just going to hack that so I shine the light on there for about two minutes and then I stopped and for the next four hours, I would speak gabbled words in English and I didn't help me hear ... Poor thing, which is any better. But it scared the crap out of me.

So it's possible that could have been the heating effect, I have no idea so what I did it for that was only 30 seconds not two minutes and I seems to be fine. But it's probably possible to over expose specifically parts of the brain but if you're doing a panel format like you're doing with Joovv, whatever as soon as I was pressing the LED, a single one, high powered right up against one of the spots in

the brain, what you're doing is a whole skin exposure. So I think even that would be a very low risk kind of scenario.

Justin Strahan:

Yes the total energy dosage that you're looking at is actually very similar to sunlight so right around the neighborhood of a hundred milli watts per square centimeter or about six Joules per minute if you're looking at studies with dosages. But kind of touching back on the earlier topic of FDA approval and regulatory burdens and so forth, what we really tried to do from the very beginning is provide a device that we know works well that is cost effective enough so that people can use it everyday in their own homes and it's not something that has to be regulated to a doctor's office or a spa that they can only use it once or twice a week.

Dave Asprey:

I'm just going to go out on a limb here and say, it is absolutely unacceptable on a human rights perspective that you're required to get a permission slip to use any piece of technology on earth that exists. So if you want to buy something to do something really stupid, you should be allowed to do that even if you totally burn your own arm off or whatever. I'm just saying that because if we're going to allow people to drive fast cars on race tracks where they might die, we're going to let them ski downhill at high speeds where they might die, we're going to let them ski down hill at high speeds where they might die, what the hell! Why can't I buy some crazy medical thing and do it? I don't know it just seems to make sense that it's a basic freedom issue.

Even that said, this isn't a dangerous kind of technology but it's one that I think is really useful because the data that I've come up with and just the writing and the research that I've done, there's definite improvements in collagen in your skin especially if you're eating collagen at the same time. Your muscles recover faster so you're not as sore after workouts, you can actually perform better after light therapy and athletic stuff. Joint pain, I use that laser and I've used LEDs on my knee back when it used to hurt all the time 'cause I've had three surgeries on. I had arthritis on my knees since I was 14. I don't typically have knee problems anymore. But it totally works on joint pain, I injured my shoulder. I used the Jovv light on my shoulder along with all sorts of weird injectables. But I avoided surgery after bone on bone separated shoulder and I have four range of motion back at my shoulder.

That's kind of badass right? I avoided cutting things open. Also for mental clarity, we talked about that already and improvements in sleep. But one thing we haven't talked about yet is growing hair. I've always wanted to grow my initials on my chest and chest hair. Can you? No. Hair growth with red lights is something that I've read about for a long time and all the guys in my family are pretty much bald in their mid 20s so I've kept my hair pretty well and I'm actually working on growing more of it, actually I have more hair growing. And I'm doing all sorts of crazy stuff I'll share later. But part of that is definitely red light therapy. So talk to me about the red light spectrum and hair growth or any of these other things I just listed, not just infrared but the red part.

Justin Strahan: That's definitely an issue for men especially. There's quite a bit of studies on light therapy and it's benefits for hair growth and specifically for me, I'll lean over here. You can't see this but believe it or not this was actually nearly gone or ... It looked a little rough let's just say in that typical male pattern baldness. A few years back before I started light therapy, that was one for me. It was really a cool-

Dave Asprey: So it totally worked.

Justin Strahan: Yeah. It's real.

Dave Asprey: The idea of male pattern baldness is not being just a hormone issue, but being a biochemical issue and energy production in hair follicles, has a lot of evidence behind it. So you're turning on your mitochondria in your cells like, "Oh I guess I should act like a younger cell. I think I'll make a hair." Assuming that you're getting enough of the building blocks that you need like silica, like collagen and protein and vitamin C and all the things that are required to make that stuff. So you've seen results from that and lots of people have as well. So hair growth works, is it going to make women grow hair too?

Justin Strahan: Great question we've actually had to field that a few times. The answer is no, it's not going to cause your body to grow hair in places you've never grown hair. It's not going to cause women to get massive muscles or anything like that. It's basically just helping yourselves work the way they're designed to work and restore healthy cellular function.

Dave Asprey: I've always wanted a mono brow, jeez! It doesn't do that. But I can tell you my wife Lana uses it and has definitely seen improvements in hair thickness. And it's in conjunction with just having the building blocks for the hair. I think it's harder to use red light therapy to cause hair growth if you don't have minerals that your body needs for instance or biotin and other things like that, hyaluronic acid and what not. And that's all stuff that you mostly eat and sometimes it's topical but she's definitely seen improvements in hair thickness as well. But has not grown a goatee. I'm like, "Come on Lana, grow a goatee. Just want to see it once." And then she hits me.

Doesn't look like there's any issues with that. What about mental clarity? How would you use this red and infrared light to improve your mental clarity?

Justin Strahan: I would say that's one of the big things that we get feedback on. So with our devices the entire goal was to treat a large area of your body. So naturally most people would tend to treat their face from the beauty benefits, the increased collagen production, reducing wrinkles, those sorts of benefits. And the nice side effect of that that most people don't think about is they're also getting their forehead. So what most people find is a very calming relaxing effect. So for people that are in an office building all day, they're stressed out, they come home at the end of the day and they do that 10-minute treatment in front of

the light and they find that they're able to relax, to de-stress. It's a really cool thing to hear that feedback from people, they reach out and they say, "I totally didn't think this is going to do anything. But I literally could feel the difference the first time I used it."

Dave Asprey: What about eye safety? So you've got this bright lights shining right in your eyes if it's on your face, do I need to wear cool sunglasses? Tell me I get to wear my matrix one.

Justin Strahan: Great question. So part of the whole FDA process is we actually have to go through the testing, that basically says, "Yes this is okay for eye safety." So not having to use goggles or anything to protect the eyes, the wavelengths that are used in our devices are actually beneficial for your eyes.

Dave Asprey: You don't want macular degeneration. You might want to get that right for a good [inaudible 00:52:36] in there.

Justin Strahan: Have I violated any regulatory things you want to say that? There you go see how I did that? The intensity you mentioned is very bright, so what a lot of people do is just start a session with your eyes closed.

Dave Asprey: That's what I usually do.

Justin Strahan: And if you want you can actually keep them closed. But some people open their eyes, it's really more of a comfort thing, it's not a danger.

Dave Asprey: Let's talk a little bit about countering junk light. In Head Strong I wrote a lot about what fluorescent lights are doing, not just fluorescent lights, LED lights. We're not talking about frequency specific LEDs but actually these white or even warm white LEDs that are really, really high in the blue spectrum and are just lacking red infrared entirely. What is that doing to our bodies and does getting higher doses of red and infrared even separately from indoor junk light, do you think there's a benefit to that? There may not be studies but just kind of walk me through with the bad effects of junk light on the skin, on the eyes, on the body, on the cells and then what happens if you add red and infrared.

Justin Strahan: There's a ton of information out there that you've obviously brought a lot of that tot the marketplace in terms of the dangers of blue light whether it's through the eyes, obviously with the light that we take in through our eyes, it basically goes straight through to the brain and basically affects all of our entire hormone processes. Everything that goes on with the body is basically disrupted by anything things that throws off our circadian rhythm with blue light being a big factor there. And even blue light on the skin in abnormal amounts which we certainly get through a typical office environment where you have under lights that are at maybe 5500 hundred Kelvin or 6000 degrees Kelvin, the dangers there. I think the world is starting to wake up to the issues with that. I think it will be very interesting to see in the next few years, is there a real restorative

benefit to doing red light afterwards. I always suspect that that's quite likely that that will be found out, that that's the case.

Scott Nelson:

Our biological systems evolved at analog light. Native light, so to speak. So when you think about ... There's some decent data that suggests that the average American spends 93% of their time in doors now, under artificial light. And when you think about over the course of that scale, over the course of someone's lifetime that such a significant amount of time spent under artificial light which causes in most respects causes cellular stress. Our cells kick off a bunch of reactive oxygen species etc. And you see much of the downstream magnifications of that. And so those restorative benefits of healthy wavelengths of light, red and near infrared light specifically, they can help restore some of that cellular function so our cells can actually heal from being exposed to so much artificial blue light on such a regular basis.

But that stat whether it's 93% or 80%, it's such an enormous amount of time and even me specifically before June I've spent most of my time in like a corporate environment. From the time most of us wake in the morning, get ready for work, commute in some sort of transportation with windows that block light, then we go into the office exposed to all kinds of artificial light. In the Winter months, you don't get any natural light by the time you go home. And it's like you literally spend the entire day without getting any sort of natural light. So at scale that's such a significant amount of ramifications. We touched on this earlier but even just getting a little bit of biohacking, just a little bit, getting five to 10 minutes of healthy life from something like the Joovv on a routine basis, that can be extremely beneficial.

Dave Asprey:

It makes a lot of sense. One of the other things that I look at for all the technologies that we use at the Bulletproof Labs, we're actually are spitting that out, it's now called Upgrade Labs it's becoming its own entity. And it's all about ROI. The return on investment for red and infrared light, well you can take your shirt off on a conference call. Maybe not in your cubicle, I thought at Bulletproof, depending on what you're wearing underneath your shirt. But I certainly do it at home and a lot of people have ample opportunity to put a light on their face or to even do this, way you're brushing your teeth. So it's additive to your day, but it doesn't take an additional chunk of time away from your job or your kids or your friends or whatever you wanted to do. So that is just change that environment around you to give your body things that make it work better so that you can make better use of all the other time you have. And if it's time that doesn't take away, that it gets in extra bonus point, for me and my stack of biohacking stuff.

You guys came in and you've toured the alpha place where I test all the technologies for Bulletproof labs, all these biohacking things. And there's somewhere in a million dollars invested in this place. And the idea there is, I only have so much time that I can use that stuff each day 'cause most of it requires my attention or afford but light therapy doesn't. You turn it on and you get it. It's kind of idiot proof which is something that makes it valuable. So my

strategy for this, I block half the blue light but not all blue light during the day 'cause you need that signal. I use the TrueDark glasses for that. Then I'll use red and infrared, I'll use the Joovv panel whenever I get a chance. I don't need to [inaudible 00:58:05] video for this call I'll just turn it on. And so you can actually get an extra dose of this stuff which seems pretty good.

In fact there are studies for all those things I just listed. And if it has some of those benefits for me, I don't need five more minutes to fire those ones, it doesn't really matter, perfection isn't there. But that's why light passes the bar as a cool biohacking technology. It's not just me though. Tell me about what NASA did to look at this? The space program is one of the most interesting places for biohacking data. You've got Special Forces people, they're always know weird stuff. Elite athletes, the antiaging crowd where I'm probably closest to and then astronaut programs. So what did NASA figure out about red light and when?

Justin Strahan:

Back in the early 90s they were first exploring using LEDs actually to grow plant in space. I'm not sure when it crossed their mind or what point that came. But they actually ended up funding a study with Ward Photonics in the early 90s using 670 nanometer red light for the purposes of helping the astronaut's not lose bone density and muscle mass while in space. The results of the study was so compelling that you mentioned Special Forces and that's exactly where they went with it next, is they took this 10 device, at the time it was about the size of your fist and you could treat small injuries or wounds and again they had really impressive results. Basically cut the recovery time from superficial wounds in half.

So that was kind of the beginning of the light bulb going on if you will, that LEDs could really have some really cool biological effects.

Dave Asprey:

So NASA figured this out, let's see 1993, they started looking at this. And here we are only ... Jeez! 25 years later basically and only in the last 10 years have people really started even paying a little attention to it. I started doing this about five years after the NASA research came out because in the dark corners of biohacking, this stuff has always been out there but few people are going to try that sketchy thing you found on Yahoo and all that.

But if you look at what's happening now in biohacking, we're just having all these cool new things coming out of the woodwork and some of it is total BS and some of it isn't. And after a while you sort of develop radar and this is compounded by the fact that most medical innovators are even worse than Silicon Valley engineers at making companies. What I learned in Silicon Valley where I was part of the co-founder of a part of the company that held Google's first servers in all this, and it actually used to really mad, is that the best technologies almost never win because they aren't marketed well and subpar technologies that are marketed well often times win.

So it's funny in biohacking, I think it's worse. Because you get these people who really think really oddly and come up with, "I noticed this crazy thing." But then they face not knowing how to take that to the world and then they don't understand the regulatory hurdles and frameworks, they don't understand how to build a team and how to not micromanage and all that. So if you have something that's really special and you want to bring into the world, you have to believe it's special enough that you're willing to stop whatever you're doing and start building a company and put your personal assets on the line and raise funding and risk failure. So it just seems like the mindset that creates awesome stuff often times isn't the mindset that allows you to hire the right people or to actually do that stuff yourself.

You guys have started out skeptical, you looked at the data. You started playing around with it and you said, "All right we're going to actually start a company around this." And the combination of Justin, you have the engineering background to do this and Scott you've got the medical device background, said, "All right we're going to put our careers on hold and go do this." Which makes me excited for the future of biohacking because now you're saying, we found in a fact it's really important, it's still being studied but it's been studied enough that it's worth your time and then worth people's time to do it.

Before we finish up the interview, give me the kind of one-minute story of when you decided you were going to stop doing what you were doing and start a company in a space that no one's heard of.

Justin Strahan:

My wife Melissa was actually the first one to stumble across red light therapy and was just basically blown away with the benefits but was frustrated by the fact that there were literally no products in the market that were effective that you could use at home. Basically the only things out there were small handheld devices basically you'd use for a long period of time and then if you are faithful at it, you can maybe do your whole face I think. That was really where we got started and she came to me and is like, "I need something I can use in my whole body."

Eventually we dove into the science and we found out, wait a second here, this is actually a real thing, it's not woo-woo, it's real, the benefits are real they've been proven. And we were basically kind of stunned that no one was actually doing previously. The only products in the market were basically for skin health. And that's where Scott with his marketing background was like, "Wait a second here, this could be a real opportunity." So it started out small, but we kind of rolled up our sleeves and dug into things and now with my wife Melissa and Scott's wife we've all been doing this now for ... What is it? Three years, a little over three years now? And it's been really cool. I can honestly say it works way better than I ever dreamed it would.

Scott Nelson:

Just to add to that, Justin is probably even less skeptical than me when our wives first introduced us to light therapy and my background is traditional med tech. We're talking about cardiovascular stents and balloons and heart valves

and that kind of stuff. When I thought light therapy, red light as like an actual therapeutic type of therapy, it sounded way off my radar. Fortunately they sort of persisted and my wife in particular was like, "Just look at some of the science." I mentioned this earlier, the science around photobiomodulation light therapy is completely legit.

I mentioned this stat earlier but there's over 200 double blind placebo controlled trials and continuous wave light therapy. You compare that to any other therapeutic intervention, you'd be hard pressed to find something similar. There's loads and loads of science but as Justin mentioned there, we didn't intend to start a company but when we were sort of doing some diligence there weren't any devices that delivered the right wavelengths with a significant amount or a clinically relevant dose of energy across your entire body that you could use in a convenient way. And so that's sort of what started us down this path and here we are, some three years later with a completely refreshed design and pretty excited to introduce that.

Dave Asprey: Very cool. One more question for you guys. I know you listen to the show so you probably know it's coming. Did you prepare? Is someone came to you tomorrow and said, I want to perform better at everything I do as a human being, your three most important piece of advice. Scott why don't you go first.

Scott Nelson: That's a great question. I would say from a mental standpoint, always be curious. The other thing would be always be learning, which I guess is sort of similar to always be curious. Open minded, always be learning and then how can I not end it with be more focused on how our bodies have evolved. Be more attune to that and use things that are in alignment with that sort of approach.

Dave Asprey: Sweet. Alright Justin what do you think?

Justin Strahan: I would say the number one thing is just think about how things used to be 200 years ago and do what you can to minimize the impact that society has had on the way that we have to live today. So what are some things that you can do with that in reality? First I would say is don't undervalue the importance of light. Whether that's sunlight, photobiomodulation, it plays an incredible role in health.

Dave Asprey: I thought you were going to tell me how to wear a powdered wig and a corset. I'm happy you didn't go there.

Justin Strahan: That was number two.

Dave Asprey: Sorry go ahead.

Justin Strahan: Number two I would say spend time in nature. Up here in British Columbia the scenery and just the silence of nature and just hearing the leaves rustling, it is amazing calming effect and that I think far too many of us miss out on for a

large chunks of our life. And then thirdly I would say, value yourself and think about what you're worth because there's people that care about you and having an outlook on life and enjoying life everyday is something that most of us don't put near enough energy into doing.

Dave Asprey: Beautiful thank you. You've been listening Justin Strahan and Scott Nelson from Joovv. Your website is J-O-O-V-V.com

Scott Nelson: That's correct joovv.com but if you go to joovv.com/dave for every Joovv device purchased we'll actually gift you a copy of Head Strong and one of the reasons we're doing that is because your book Dave is rooted in so much science and as a company, we're big believers in education around light therapy especially if it's based on scientific evidence. So that's one of the reasons we want to gift a copy of Head Strong for every Joovv device purchased. If you go to joovv.com/dave.

Dave Asprey: Well, thanks for that gift for listeners. This is worth doing in my new book Game Changers that's coming out later this year there's a section on red light where I mention you guys because I think this is one of those fundamental technologies that isn't that hard to use, that's really helpful. So if you like this show, you want to try these stuff out. There's a whole variety from handheld stuff all the way up to full body panels on the Joovv side and thanks guys for including a copy of Head Strong, I think that will help people.

Scott Nelson: Absolutely.

Justin Strahan: Thanks Dave.

Scott Nelson: Awesome. Thanks again for the opportunity Dave.

Dave Asprey: If you liked today's episode, you know what to do. Head to bulletproof.com/itunes which is going to take you right to the Apple page where you can leave a review that says, hey this show is worth your time. I'm hoping you learned a lot today about how important light is for biology, how we understand what it does on the cellular level and how you can build it into your day without spending a lot of extra time doing it which is totally worthwhile.