Quest #601
Survival! The Human Body in Extreme Environments

(MUSIC)

(NARRATOR)
Some people manage to survive in the most extreme environments…

(ED WEBSTER)
They thought we were absolutely nuts for attempting a new route up Mt. Everest that had never been done. And we had decided to attempt the climb with no oxygen bottles, with no radios…

(BO CURTIS)
By the end my feet were numb, my hands were numb, and the pain was going up past my elbows and the pain was going into my hips.

(MIKE LYNN)
It just became apparent to me I wasn't going to finish.

(NARRATOR)
What does science know about <u>your</u> chances for *"Survival?*"

(QUEST OPEN, UNDERWRITERS & MUSIC AS IN ALL SHOWS)

(LINDA GREENLAW)
Hi, I'm Linda Greenlaw. A lot of people recognize me as that woman who survived the Perfect Storm. Some people think I've been awfully lucky. If I thought my survival was only a matter of luck, I would have to believe that my luck would eventually run out—I wouldn't be able to go to sea. There are some things fishermen can do to increase their chances of survival. One of them is donning a survival suit like this—not the easiest thing to do.

This Quest is about the human body and its ability to adapt to extreme environments.

What good is your equipment if you don't know how to use it? The Coast Guard recommends that we do drills: here we go…

(SPLASH)

(TITLE MUSIC)

(NARRATOR)

The weather was cold, but sunny at 7 in the morning on February 12th, 2003 -- as Mike Lynn and his dog Kayla set out for a ski and snow shoe trip. A fit 54 year-old man who recently became a grandfather, Mike had skied many of the trails in his home state of New Hampshire. He liked getting out into the quiet world of snow and figured he'd finish the 13 mile loop by four or five that afternoon.

(MIKE LYNN)
I had done a lot that winter of a combination cross-country ski and snow shoe, oh, just day long trips. This was no different than a few others that I had done, with one exception; I had never walked this particular trail.

(NARRATOR)
Mike probably wasn't thinking of the limited range of temperatures that his body can survive at, but he knew to check the weather report before his trip.

(MIKE LYNN)
The weather had done pretty much what it had been told it was going to do…The sun had started to come out and it was really kind of that time period between weather changes, and it was really very nice for a couple hours.

(NARRATOR)
Humans are really tropical animals with fairly fragile bodies. Our temperature must be kept within six degrees or so of 99 degrees Fahrenheit and our bodies require food and water at regular intervals.

So how have we adapted so well, living and traveling all over the planet? Intelligence. Our primary advantage has been our brains. We invent polar fleece, weather satellites, or even do something as simple as change our shoes to compensate for our bodies' limitations.

(MIKE LYNN)
In the beginning I was able to start on my cross country skis and was able to use those actually until the section of the trail that they call the cascades…At that point I switched to snowshoes… and attached the skis just to my pack with a length of rope and pulled them behind me.

(AMY GAUTHIER)
So now, Jason, you've done the 30 minutes of rest, so we're going to have you bike.

*(*NARRATOR)
At the sports physiology lab at the University of New Hampshire, Robert Kenefick's students are trying to isolate some of the body's adaptations to heat and cold.

(AMY GAUTHIER)

This strip right here is the EKG lead so we can monitor his heart rate…and from that we can determine how much blood is pumping through his heart.

(NARRATOR)
The body is always adjusting to maintain a constant, stable equilibrium with the outer environment --- a process called homeostasis. This on-going adaptation involves all of the body's systems, an unconscious process of balancing and re-balancing with the conditions wherever we find ourselves.

(ROBERT KENEFICK)
You will go into homeostasis with whatever environment you enter. It's a dynamic state, it's constantly moving, you are constantly making adjustments to keep this steady state, temperature, fluid state, pH, things like that.

(NARRATOR)
So far, Mike's body could easily handle the stresses of the White Mountain environment (cold, intense exertion, altitude). What if these stresses go on for too long or there is a sudden change in the environment?

(ROBERT KENEFICK)
Our physiology is still from ancient man, and ancient man used a fight or flight mechanism, that we still have. So an example of this would be going out, you know, hunter gatherer, collecting berries, and comes upon a saber toothed tiger and so he has two choices: one is to fight the tiger, or run away. If he's going to do either one, he's going to have to have some physiological changes. There needs to be an increase in heart rate, there needs to be an increase in fuel availability, there needs to be an increase in oxygen, your respiration goes up, the liver starts to increase its activity in getting more glucose into the blood. All those activities are there so you can either fight or run away.

(NARRATOR)
This group of responses to stress or danger is called the sympathetic nervous system. It is an automatic response, beyond anybody's conscious control. A rush of changes is set off in every system of the body and has been known to give people sudden strength to perform superhuman feats.

In everyday life, common stresses disrupt the homeostasis state of our bodies, triggering physical adjustments to compensate to that stress. Even though Mike enjoyed the outdoors and didn't perceive conditions like the cold as a danger, his brain set in motion various changes in his body.

(ROBERT KENEFICK)
If you take off your shirt, expose the skin, you'll see the vessels collapse. So they will shut down, and what they are doing is they are pushing blood flow away from the peripheral vessels out here at the extremities and pushing it centrally. The

idea a lot of people have is, that that is to protect the central organs from the cold. That's not really a true idea, the real idea is to lower your skin temperature.

(NARRATOR)
The body tries to maintain a skin temperature that's within one degree of the surrounding environment. So if it's 55 degrees out, your skin temperature will be 56 degrees. The closer your skin temperature can be to the environment, the less heat you will lose to the environment.

(ROBERT KENEFICK)
…the blood's got to go somewhere. You've clamped up all those vessels out here, so now the blood flow is going to go here, centrally.

(AMY GAUTHIER)
168 over 82.

(NARRATOR)
Preliminary results from Robert Preliminary results from Robert Kenefick's study show that when cold causes increased blood flow to the central body, blood pressure and arterial stiffness increase. This could be one explanation why people who are healthy exercising at normal temperatures, suddenly have a heart attack while shoveling snow.

Mike's heart was already working hard, but then he used up valuable energy and time when he was forced to go off the trail and find his way back.

(MIKE LYNN)
Kayla wouldn't cross a couple of streams in a few places. If it had been solid ice, she would have gone across but there were broken ice and water that would spook her.

And once I left that area and got down into the wilderness, I began to know I was, time wise, I was running behind where I would have liked to been, so I left my skies. Instead of having the exertion of both pulling them behind me and continued just on snowshoes.

(MUSIC)

(NARRATOR)
Extreme heat is not a common problem in Northern New England's climate. However, the body does have survival mechanisms for dealing with heat that can still effect people in cold weather.

(ROBERT KENEFICK)
The heat is pretty much the opposite of what happens in the cold. Instead of having peripheral vassal constriction, you have peripheral vassal dilation. All the blood vessels at the periphery open up. What they are trying to do is they are

trying to get blood flow from the core out to the periphery. And what they're trying to do is bring that blood flow out here and then with the sweating response, that gets signaled from you brain, sweat will come out onto the skin and the heat from that blood that's at the periphery, will increase the skin temperature, your sweat will evaporate off of the skin and as it evaporates, it will carry that heat away. Sweating is the primary, in mammals and humans, is the primary mechanism for thermal regulation.

(NARRATOR)
It's possible to get heat exhaustion in the cold from sweating too much.

(MIKE LYNN)
I was dressed very lightly, I was dressed for…primarily for cross country skiing, which you can't dress too heavily for because you sweat so quickly that it becomes a problem. Fortunately, in my pack I did have extra layers, dry layers, of polar fleece.

(ROBERT KENEFICK)
In the heat there are two major things that we think about: heat exhaustion and heat stroke. They are different, heat exhaustion is really an idea of an individual having too little fluid…I've worked, a number of years ago, at the medical tent at the Boston Marathon, and you would see the individuals finish the marathon and have heat exhaustion and be dehydrated. They come through the tent and have all of those symptoms. Some of them are just like, "Oh, tell my wife I love her." They give them an IV, get them fluid, give them stuff to drink, 30 minutes 45 minutes later, they're skipping out of the tent; they feel fine. So that's heat exhaustion. Heat stroke is more severe. Heat stroke is a situation of being too hot, your body core temperature is too hot, and you have to get that core temperature down or the person will die.

(NARRATOR)
Whether in hot or cold environments, getting wet interferes with the body's ability to maintain its temperature.

Today, a group of eleven students from the US. Coast Guard Academy are learning first hand about the effect of cold water on the human body. After a week of training with Outward Bound at Hurricane Island in the Gulf of Maine, they're expected to capsize their boat into 45 degree water, then right the boat, bail it,…and then get back in the water and swim to shore!

(GROUP TALKING))

(NARRATOR)
After formulating a plan, the group walks through the maneuver…

They head out in a light rain with the air temperature at 48 degrees, not much warmer than the water. The biggest threat to these students is hypothermia, a condition when the body can no longer maintain its temperature.

(DAVID JOHNSON)
People have the notion that as soon as you drop into cold water you are immediately hypothermic, and in fact that is not the case.

(NARRATOR)
David Johnson has taught survival skills and first aid to groups from the FBI to the Bolivian Army through his company in Bryant Pond, Maine. Also an emergency room doctor, he recognizes some misconceptions about hypothermia.

(DAVID JOHNSON)
You could take a person who has a body fat of about 10%, put him in water that is 50 degrees Fahrenheit, and their body temperature probably wouldn't start to drop until around 15-20 minutes.

The first thing that happens is they start to gasp. If their face is in really cold water, their heart rate goes up, their respiratory rate goes up and they involuntarily gasp, and they panic as a result of the gasping. Because I don't think there is anything more frightening then not being able to breathe.

(OUTWARD BOUND STUDENTS)
I think without a plan we would have panicked a lot more in the water, knowing exactly what you had to do, when you had to do it, made it, it's like okay, do this, do this, do this, not climbing over each other, like you have seen before.

And not only talking about it, we actually walked through what we were going to do before we got out there, and that helped a lot.

We're sitting here planning and going over everything and, what it does, and how we were going to do everything. The toughest part was getting it to flip. Once it flipped…

It was like clock work.

The planning made it go a lot quicker.

Definitely did.

(STUDENTS ON DOCK)
He's cold. Aww. Group hug.

(DAVID JOHNSON)
The other things that happens is that the skin, the circulation of the skin clamps down in what we call shell core, or vasoconstriction, and as a result of that circulation to the muscles diminishes. They get cold quickly and you lose strength and coordination.

(OUTWARD BOUND STUDENTS)
So for me, it was the coldest experience that I have ever had. Especially when we got in to swim back, that was the coldest.

Your muscles started freezing up when we tried to swim back. I almost couldn't move anymore.

It feels like needles are hitting you.

The back of your head hurts when it's cold.

You had to watch your body parts to know where you were putting them, because you couldn't trust, you were like, okay the arm is there, good.

(DAVID JOHNSON)
If you can keep your head above water, and keep your wits about you, within a couple minutes your respiratory rate will slow down and your body will adjust to a degree of that. Then over time you've got maybe, depending on the temperature, you've got some time to work on things that would help you survive. So to decrease your surface area that is available to lose heat. So if you get yourself into a ball for example, or if you are in a group of people, if you could huddle up together. What you don't want to do is flail around, or try to more around. You want to get your head above the water and you want to get your body out of the water if you can, because you lose heat about 20-25 times faster through water than you do air. So people get this notion that if they are in the water they actually feel a little bit warm, if they are in the water they are actually better off in the water than they are in the air, that's absolutely not true. They want to get out, if they can.

(NARRATOR)
Are women more susceptible to hypothermia than men? Experts disagree, although it has been documented that in the cold, women's blood vessels shut down blood flow to the skin sooner than men's.

In any case, one of the first signs of hypothermia to watch for is the loss of mental capabilities along with physical control. For easy recognition, these are dubbed the "umbles," and include the mumbles, stumbles, fumbles and grumbles.

(MIKE LYNN)

It just became apparent to me I wasn't going to finish. I knew I still had a fair amount of elevation and quite a distance to go…Primarily my respiratory system just had come to a point where I couldn't go many steps without having to stop and bend over to breathe. . I was able to at least stop on my own terms instead of falling down.

When I did make a decision to stop I was pretty certain I was on the trail I thought I was on. And really physically I wasn't able to go much further.

Once I stopped I used my snow shoe to dig down into the snow just to lower my body below where I wouldn't be in direct exposure to the winds and I took all my wet clothes off and put all dry clothes on.

(DAVID JOHNSON)
You could become hypothermic in a temperature that is above freezing if the conditions are right. So if you don't have fuel, if you are not well hydrated and it's windy, wet, and cool, and it doesn't have to be very cool…your body temperature will go down.

(NARRATOR)
When even one part of the body is kept wet for an extended period of time, a type of hypothermia called trench foot may develop. Like World War One soldiers in trenches, modern day kayakers sometimes suffer hypothermia because their feet are kept wet in their kayak for too long.

Yet, occasionally someone manages to survive in amazingly wet and cold conditions. The unique story of Robert "Bo" Curtis' survival at sea in winter is one such classic tale, now a Maine fishing legend.

(BO CURTIS)
The morning I took off we had sea smoke, where you can see the sky, but you can't see around you. It's similar to fog…So I couldn't see, the visibility weren't real good.

(NARRATOR)
It was January of 1984 when "Bo" Curtis left his home in Rockland, Maine in a 15 foot skiff, headed to North Haven, an island half an hour away. Good weather was forecast.

(WEATHERMAN NARRATOR)
Seas one to three feet. Visibility one to three miles, wind at five to fifteen knots.

(DAVID JOHNSON)
I think one misunderstanding about wilderness survival is that if you prepare, that if you take enough gadgets, than you will be safe. That is not so, the environment is pretty capricious and things happen when you don't expect them to.

(NARRATOR)
Because of the sea smoke, Bo Curtis didn't see the snow squall coming. His small boat was suddenly into 12 to 14 foot waves. While steering into the waves and bailing to keep from being completely swamped, he was only going about 5 knots forward, and close to 20 knots sideways.

(BO CURTIS)
So then for the next 45 minutes to an hour, I'm just trying to keep the boat afloat. And I just happened to come by this buoy. I didn't know which one it was. And I see that and I just knew that the safest bet would be to tie on to one of these handles, that was on the original buoy.

When I first grabbed that handle the sea dropped the boat right from under me. And I pulled myself up right there but there was a sheet of ice probably four or five inches thick. It was going underwater about up to here in the surge. And I got up here and I got my boots rolled down and the boat disappeared pretty much instantly. Three or four waves later it was gone out of sight.

(NARRATOR)
Although Bo was dressed for a cold boat ride and wore his hip wader boots, there's no doubt it was cold and wet enough to induce extreme hypothermia and likely death. The buoy he found himself on was covered with ice, ten foot waves continued to break around him and it was so cold that the sea spray was freezing on contact. What could someone possibly do to stay alive in these conditions? …bite off pieces of your rubber boots and use your Bic lighter to burn them, of course.

(BO CURTIS)
I lit the lighter with this hand and draped that rubber boot across it there. Of course I had to take my face away, so I could see what I was doing and not burn myself and I'd let it smolder a little bit and then go out, and then it would just smoke. Then I would hold my breath and I would stick my face down into the thing. And during the night I would get my clothes dried off. I got my clothes dried off down past my knee, cause during the night I had torn my boots down past my knee.

And I had water spraying up in here, I don't know if you can see it or not, but there is a little hole there. And I folded up one of the pieces of rubber boot and stuffed it into the hole. Because water kept coming down through and like I say at 10 o'clock there was ice on this platform where I was sitting so my butt was froze to it. So I pulled up and I felt the pants had stuck there. And the inside of my pants was going to pull the skin off me. So I had to do something about that. I had on a down vest, and I sat on that afterwards.

(NARRATOR)
Like Bo Cutis on his ice-covered buoy, Mike Lynn did what he could to stay warm in the woods at minus 30 degrees.

(MIKE LYNN)
As I dug my little hole for us to sit in, my hands very, very quickly started to freeze up and I think that was my first sense of how cold it was. So that became my primary concern, protecting my hands and face. So I kept my hands down inside my pants, and a lot of times would keep a, I had an extra vest with me and I made a hood to keep over my face. So, I was able to protect those parts very well. And my core stayed warm, I had enough layers of fleece…The one thing I couldn't protect adequately were my feet.

(NARRATOR)
Frostbite is when the water molecules in the body's cells actually freeze – usually starting in the fingers, toes, nose, ears and cheeks.

(ROBERT JOHNSON)
To get frostbitten, the ambient temperature needs to be below the freezing point of water, and actually it really needs to be down around 24 degrees Fahrenheit. So the most important thing is to be aware of when you can get it, and to protect yourself.

(MIKE LYNN)
I left an itinerary of my trip with friends at work, and I tried the best I could to follow the itinerary …And it's an awful responsibility to put on somebody to say, if I'm not back at five, come and save me. In this case it was the difference for me, no doubt.

(BRIAN ABRAMS)
It was a pretty quiet day when the dispatcher told me to make a phone call to some folks who had a friend who was over due. Sam, who's my neighboring officer volunteered to come down and give me a hand with the search.

(SAM SPRAGUE)
Coincidentally the night before, I had seen the weather forecast of all this brutally cold weather coming in and had repacked all of my winter gear, because I don't like to be terribly unprepared. We don't know if he is 250 yards in the woods, or 10 miles back in the woods and how long it's going to take us to get there, and how long we are going to have to spend. So it's really a balancing act of not over packing, but making sure you bring everything you need.

(BRIAN ABRAMS)
After hearing that Sam was on his way, I headed back into town and went to the local convenience store and got two sandwiches, a couple bottles of Gatorade, some crackers and looking back on it now I wish I had bought six sandwiches, and six bottles of Gatorade, but we had what we had and we headed in about 10:30 or so.

(SAM SPRAGUE)
I did the same thing, stuffed my bag with food and beverages. Listened to the radio/ weather forecast from Mount Washington—it didn't sound very good

(MIKE LYNN)
I just settled in…It was a strangely beautiful night. It was windy, but it was almost a full moon if not a full moon. And if you could let yourself just relax it was kind of pretty it was really pretty. But it was a long night, I'm sure I must have dozed off a little bit, I don't really remember, but it was a long night. I've learned a little bit about hypothermia, and I very quickly went into what I think they call first stage, or initial stage where it's not an occasional shiver, it's a full body shiver, pretty consistently.

It's violent enough, or a strong enough reaction that literally all of the limbs in your body are bouncing off the ground. And that's very much what it was like. And it was nearly consistent 100% of the time.

(SAM SPRAGUE)
The one thing with hypothermia you can't guarantee that somebody is going to stay on the trail and he did. Because of the way that the wind had blown across that pond, the most interesting thing I remember vividly was those dog tracks, Kayla's tracks being raised up from the level of the pond. They weren't recessed into the pond, she had actually packed the snow a little bit with her paws and Mike hadn't had the same effect with his snow shoes, but she had packed little perfect dog prints. They were raised up a quarter of an inch from the blown surface of the snow. And you could follow them and they would appear and disappear, but as long as I was on her tracks I figured we were on his tracks as well.

(BRIAN ABRAMS)
I remember hiking across the pond and the wind was so fierce and it was so cold that you could feel, you know, damage being done to your skin.

(MIKE LYNN)
A lot of people said, well, why didn't Kayla lay on your feet. I had made the little hole that I was in big enough for her to come in with me, and she tried to the first evening. But as my shivering intensified, she couldn't get anywhere close to me without disrupting her own survival…she just had a way of surviving that involved getting into the smallest little ball you can imagine. And she went out just to the right of me outside of the hole, over a little hump and dug a hole of her own. And she would sit there for hours at a time, just perfectly still.

I thought a lot about my father, my father had passed away in April, and certainly he was much more of an outdoors man than I am. But I felt very close to him, especially that first night, it was just a beautiful moonlit night.

(DAVID JOHNSON)
If you do get frost bitten you want to be aware of it while your skin is still soft because it's pretty simple to thaw it out. Either body to body, hands in your own body, blowing in you hands. Once it's full thickness, it's more difficult to thaw out and if it re-freezes the consequences of re-freezing full thickness frostbite are huge : swelling, blisters, significant tissue damage.

(BO CURTIS)
The next day I came up to this next section just for visibility 'cause I could see pretty good.

I saw a big boat…It was a coast guard boat, the Point Hannen from Jonesport…so I was waving away at it. I took one of my hoods and I was waving it and sure enough I see it turn. That was like 3 or 4 miles away.

Of course, the closer they got the more happier I got and there was a bunch of young fellows right on deck and they thought they were looking at a dead guy I guess, because from burning them boots all through the night my face was all black…

I lost 17 pounds...I was hungry, I was real hungry, and I hadn't thought of food, I hadn't thought of having a drink of water before that, it didn't cross my mind.

A helicopter come along…and they dropped a basket and hoisted me up and flew me off to Bangor and they checked me out up there. And other than my frostbite, I still had my sense of humor I think and they let me go home.

(NARRATOR)
Most people would not come through such an ordeal even if they could stay as calm or be as resourceful as Bo Curtis. From a scientific point of view, his survival could be due to a unique phenomenon. A study in Canada found that vascular systems of people like fishermen whose hands are constantly exposed to cold and wet conditions will adapt. The cold still causes the blood vessels in their hands to shut down, but an occasional surge of blood will flow back into their hands, keeping the tissue alive even in cold water.

This is likely the case with Bo Curtis – he had been digging clams and lobstering bare-handed since he was four years old.

(BO CURTIS)
I lost all of my finger nails, I lost six toenails, 7 toenails. That was the extremities that froze, pretty much froze. I could have banged them against this buoy and not felt them, until they started thawing out and they thaw out you go through the same pain. Only it goes the opposite way it crawls back out of you—and it's just severe pain…Actually one of my thumbs, pretty much my whole thumb came off. It'd be like cutting a squab off right there and taking it off, only there's still a

fingernail attached to it. There is veins inside of it that you can see had frozen over. It's like plumbing in your house. The skin underneath it was real tender. And it took awhile, it was just tender and dainty after that.

(MUSIC)

(NARRATOR)
After sitting in his snow hole for another day, Mike Lynn's feet were frozen. He kept his spirits up throughout the day, certain rescuers would follow his itinerary. But as darkness fell, he feared he wouldn't survive a second night in the wilderness.

(MIKE LYNN)
I think I was probably pretty close to slipping into a deeper hypothermic state…by the time night fall came on Thursday night, beginning of the second night, I began to think well, something may have happened to my itinerary. And so by my estimates 7 or 8 o'clock, it seemed pretty unlikely that anyone was going to come that night, so it would have been nice to be a little less conscious, because at that point it was pretty obvious to me what the outcome was going to be.

(SAM SPRAGUE)
We found his skies at that point, where he had left the trail. Then we knew Then we knew, when people start abandoning gear, there is a sense of urgency setting in, that they are leaving stuff behind. So that was a good sign that we were still on his trail, we're on the correct trail.

(SAM SPRAGUE)
When we got down into the thicker trees on the other side that's where we started encountering moose tracks in the deep snow. We had to run those out, one guy would stay with what we knew were Mr. Lynn's tracks and his dogs tracks while the other guy would follow the moose tracks out because just the furrow in the snow could be anything. So you got to follow it out a ways and see if it was moose tracks or Mr. Lynn getting off trail.

(NARRATOR)
As they continued to trudge through the mountains with their sixty-pound packs, their leg muscles began to cramp from walking so long on snowshoes. Sam and Brian were at risk for hypothermia themselves.

(SAM SPRAGUE)
Drinking ice cold water when it's that awful out – you've got to force yourself to do it. Because you don't feel thirsty at those temperatures, but you are.

(ROBERT KENEFICK)
Probably one of the more important studies that we have done as of late, and this is in collaboration with the US Army, was to look at thirst responses in the cold. I do a lot of winter mountaineering, ice climbing, that kind of thing, and I have

noticed in my activities that people don't seem to drink a lot, and I have thought a lot about that. So we planned a study, to try to look and see what happens to individuals when in the cold and their thirst, their thirst mechanism. And our findings do indicate that when you are in the cold you feel less thirsty.

(MIKE LYNN)
I did have enough food for a day, a day and I half. I had dog biscuits for Kayla. I had water, I probably hadn't been hydrating myself enough, especially near the end of the day because I was trying to rush, but by the middle of that first night my water had frozen.

(NARRATOR)
People like Mike and his rescuers don't feel dehydrated in the cold because the brain senses all that excess blood that's being sent to the body's core as excess fluid. So the brain doesn't trigger the hormones that tell us to drink. However, just like in hot weather, not drinking in the cold can cause severe dehydration, collapse and even death.

Geoffrey Tabin, an ophthalmologist and professor at the University of Vermont's Medical School was the fourth person in the world to climb the highest mountains on all seven continents, including Mt. Everest. As a doctor, Geoffrey Tabin's well aware of the limits of the human body, so why does he purposely put himself through extreme conditions? As a father with five children, why does he put aside his survival instinct to test the outer limits of experience?

(GEOFF TABIN)
Sometimes the whole world will boil down to simply how to reach the next hole. Everything drops away. It's also almost a meditative discipline…it's like a yoga type experience, a complete focusing of the mind and the body into a single, absolute, at the edge of your limits effort…And that's a really wonderful, joyous way to live, to be completely focused in the moment, and climbing is one of the few sports that absolutely brings you to that position.

(NARRATOR)
Reactions to altitude can range from a slight headache to fatal conditions such as pulmonary edema when blood fills the lungs. All these illnesses are known under the general term "altitude sickness." However, if the altitude is not too extreme, over time some of these reactions will disappear as the body acclimatizes.

(GEOFF TABIN)
I had my first experience of very hard technical rock climbing on Mount Kenya back when I was 21 years old. My partner and I climbed a relatively easy route, the standard route to the summit of Mount Kenya. By the standard of rock climbing it was well within our limits, but…we found that it had taken us twelve hours for something the guide book told us we would be able to do in 8 hours from our high camp. And we were exhausted we were altitude sick, we were dehydrated, we felt absolutely lousy.

When people would do a first descent of Mount Kenya they would sign the summit book and describe the route and we were looking at the description of the hardest routes on the mountain thinking, oh my god what kind of super human, freak of nature, of a species, obviously different than us, could possibly climb that hard at this altitude. We crawled off the summit. Two weeks later we were so well acclimatized…we were rock climbing as well at 14-15 thousand feet as we do at sea level. And we started off and on a blank section of rock on Mount Kenya and started climbing, and the next thing we knew, we were on the summit, exactly two weeks after our first miserable night on the summit, having climbed the hardest route on Mount Kenya, which had never been done up until that time, and feeling good. And it's a matter of your body adapting to the lack of pressure as you go up in the atmosphere. It's not a change in the amount of gases, it's a change in the pressure of oxygen.

(NARRATOR)
Our lungs evolved over millions of years to function within a range from sea level to a mile or so above sea level. Suddenly exposed to a higher altitude, the body doesn't have the ability to pass oxygen from the lungs into the blood stream.

(GEOFF TABIN)
You breathe in through the lungs, and it's the pressure, the partial pressure of oxygen in the lungs that goes through these little air sacs in the lungs called the alveoli…and across a thin membrane into the little blood cells …As you go higher, the pressure decreases, so the initial response is to want to bring more oxygen through the lungs. You do that by over breathing, you hyperventilate [gasps] and going at extreme altitudes you really feel that, it's like you have to hyperventilate with every step.

(ED WEBSTER)
On my first Everest expedition…I experienced what a lot of climbers experience at around the 24,000 foot level, I hit a physiological wall, where I just was not able to push myself, or will myself to go any higher than that and it really does almost feel like you're hitting a wall.

(NARRATOR)
Ed Webster from Topsham, Maine is one of the few people in the world to have experienced the ultimate extreme of high altitude mountaineering …climbing Mt. Everest without oxygen.

(ED WEBSTER)
I first got interested in mountain climbing after my mother got a book out of our local library called Everest Diary. And the book was about the first Americans to climb Everest back in 1963. And I totally devoured that book. It was the one book that changed the course of my life. I was 11.

(NARRATOR)
In 1987, Ed and a small expedition of 3 others attempted to climb a new route up Mount Everest.

(ED WEBSTER)
We had decided to attempt the climb with no oxygen bottles, with no supplementary oxygen, with no radios, and with no sherpa companions helping us to carry our equipment. Most of our contemporaries thought we were completely crazy.

I couldn't know how I would respond when I was up in the death zone on Everest; above 26,000 feet in altitude is known as the death zone. Your body is being depleted every single day, you can't restore your energy or your strength, you're basically going down hill everyday you're above 26,000 feet. Human beings are not designed to live at 26,000 feet.

(NARRATOR)
Ed Webster's team was still in pretty good shape when they left their last camp, at twenty six and a half thousand feet…ready to ascend to the twenty-nine thousand foot summit of Mount Everest.

(ED WEBSTER)
We decided to leave at 11:00 at night. And to climb all through the night, using headlamps to illuminate our path and to get a jump on the next day…And, we managed to get up to only about 27,000 feet, by 5:00 the next morning when the sun did rise. And it was an absolutely beautiful sight. It was the one thing I think for me, that made the entire experience worthwhile.

(NARRATOR)
Ed Webster's body responded to the altitude of Mount Everest much like Mike Lynn's body reacted to cold. Even if it were boiling hot on mountain tops, Ed's brain would still frantically re-direct what oxygen it could get to itself. By closing down the extremities, an oxygen-deprived brain only exacerbates the tendency to become hypothermic or frostbitten.

(ED WEBSTER)
I just remember thinking to myself, maybe I'm never going to be up here again, maybe this is the only time I'll be on Everest, I should get some pictures. And so, I impulsively took my outer gloves off, even though it was 30 below 0, I took my outer gloves off, I took my camera out and I took 8 pictures in about 2 minutes. But it was like I was holding onto a piece of dry ice…And so taking these photographs eventually cost me 8 fingertips, so they were obviously very expensive photographs.
Frostbite sunrise is the name of that picture.

(NARRATOR)

As Ed would later learn, his body's other adaptations to high altitude were also working to increase his chances for frostbite. For instance, his body had begun to produce more red blood cells so more oxygen could be carried in his blood.

(ED WEBSTER)
When I took my gloves off…I was frostbitten in part because it was 30 below but also because…your blood gets very viscous and thick like sludgy motor oil…and the fact that it wasn't circulating and bringing new oxygen to feed the tissues in my fingertips. After about 1:00 in the afternoon, we were over 28,000 feet in altitude and we started feeling like we were living in a dream, in a dream world. We lost all sense of time…So you only had enough brain power or brain energy to do just the basic, basic functions of breathing, not falling over and losing your balance and trying to keep moving 1 foot or boot uphill at a time…

(NARRATOR)
Only about 300 feet from the summit, Ed Webster passed out. He woke up, passed out, then woke again.

(ED WEBSTER)
I kept climbing for maybe another 15 or 20 minutes, but I suddenly realized that if I took another step, I was probably going to die, that I had completely lost whatever control I had had in this situation and that I was really risking immanent death by continuing, even if I'd went just another 5 feet…I suddenly had this feeling, this really strong feeling, that I did not want to die on Everest, but also that there were other things in my life that I wanted to accomplish and to do, besides climbing Mt. Everest. And that I had given it my best try…and so I turned around.

(GEOFF TABIN)
People sometimes divide the altitude illnesses into separate entities. But in fact, they are all part of the same spectrum of diseases. All part of the manifestations of the lack of pressure of oxygen and the body's attempt to survive in that environment.

And the treatment for all of these is the same, to get more oxygen – which at altitude usually means descent, descent, descent, descent.

(ED WEBSTER)
It took us 3 and a half days to descend the mountain without food because we didn't have enough man power to carry up food and supplies…And we were basically more dead than alive when we got to the bottom. We could barely stand up. And our frostbite kept getting worse and worse because we didn't have any food, we couldn't generate any heat. …

For frostbite, you wait as long as possible before you amputate to give the injured tissue as much time as possible to regenerate, to grow back. And I waited for two months. All my fingertips were black and mummified from frostbite.

(MUSIC)

(BRIAN ABRAMS)
I guess it was about 9:30 or 10pm and we were following tracks and we were calling Mike's name

(SAM SPRAGUE)
I looked up ahead with my headlamp and moved my head from side to side and saw two eyes looking back at me, reflecting and glowing in the light and they were two different colors, which was very bizarre, just to be out there that long hiking and all of a sudden to have these two different colored eyes staring back at you out of the darkness. It was rather eerie and rather strange but heard the dog bark and figured we must be really close and then heard Mr. Lynn call us.

(BRIAN ABRAMS)
That was a tremendous feeling when we knew that we had reached Mike in time to help him out.

(SAM SPRAGUE)
We were both surprised to find him as coherent and cognizant as he was. I know I was fearing the worst that nobody was gong to survive two nights out like that.

(MIKE LYNN)
My dog barked almost at the exact same time that I became aware of the flickering of the lights. I was facing towards the direction that I thought the rescuers would most likely be coming, from the shorter end and god bless them, they had walked over nine miles on the coldest afternoon and evening of the winter and they just never stopped. They are the ones who go hot liquids into me right away and warm fire right next to me going right away, and warm clothes that they had extra of from their prepared packs…And there was no question that they were going to sit down and take a nap, because it took two men and almost constant effort to keep the fire going.

A lot of people said well, why didn't you light a fire, because I had matches with me, and when I first sat down I crumpled up one of my maps and put pine bows down and I kind of laughed at myself. I said, well that's great, how long is that going to last, cause there was no way, and I had no idea how much effort it was going to take until I watched Brian and Sam.

(SAM SPRAGUE)
We had to be really careful, we wanted to keep Mike warm and alive, but at the same time if we had thawed his feet out, he probably would not have survived it back out of the wilderness for a number of reasons. He would have been in excruciating pain for one thing if we had thawed his feet, he would have experienced tremendous fluid loss if his feet had swelled and thawed…We knew

it was going to have to be a helicopter evacuation and he was going to have to move at some point. So better that his feet were frozen and moving, rather than thawed and re-frozen because the injury is much worse at that point.

(BRIAN ABRAMS)
I think his dog Kayla was certainly a big part of keep his spirits up and helping him through that long night.

(SAM SPRAGUE)
I think she had enough by the end of the ordeal too.

(NARRATOR)
Keeping Mike warm, awake and optimistic, Brian and Sam were dealing with the psychological aspects of rescue as much as with the physical.

What is the role of psychology in survival? Science is just beginning to unravel the connections between mental states and physical responses to perceived dangers.

(DAVID JOHNSON)
When you are feeling physically overwhelmed or you're in danger and you get into this struggle. You know, you've got this one little guy on one shoulder who is telling you, you can't do it, you are going to die, or you're going to make a mistake and you've got this other guy on the other shoulder who is telling you that everything is going to be okay, you need to pay attention to the task at hand, don't worry about anything else and just move ahead. Do what you know to do, and I think in general the folks who survive, who are more likely to survive, are the folks that listen to this guy.

There are so many factors that can weigh in here: the temperature, whether you've had anything to eat or drink, how tired you are. you just need to be able to find some inner strength in yourself.

(NARRATOR)
The fight or flight response that gave Ed Webster extra energy on Mt. Everest went haywire on his return, producing panic attacks. Possibly the lack of oxygen on Everest caused neurological damage – much like soldiers who experience post traumatic stress syndrome.

(ED WEBSTER)
There's no way you can ever know what a panic attack feels like, unless you've actually had one. And they're hard to describe. Basically, you feel like you're going to die in about five seconds. You start hyperventilating again, you get really light headed, your throat gets really dry and constricted, your chest, your heart is pounding away and you get an incredible adrenaline rush and you're just -- all systems are overloading.

I took medication to try to curtail some of these symptoms and after about two years, they started to go away.

(DAVID JOHNSON)
The sympathetic nervous system is a two edged sword. It can be a great survival thing, but to the extreme it can be a bad thing. We've all seen people who panic, lose control and do something really stupid that they shouldn't have done, and that's where the cognitive part comes in.

And I'll tell my students, push control alt delete, and re boot yourself and get back to what you know, and then slowly try to get yourself out of that situation from a familiar place.

(NARRATOR)
Luck definitely has a role in every good survival story. However, studies show that there are three things you can do to control your chances of survival.

First is preparation and training. Both mental and physical conditioning prepares the body to deal with a stressful environment.

In the case of going into the wilderness, proper gear and an understanding of the terrain go hand in hand with physical fitness.

(SAM SPRAGUE)
A lot of people have a weekend picked out when they are going to go hiking, and they come up when the weather is horrible and the weather forecast is bad, but it's their weekend to go hiking so they go anyway and they ignore the warnings because they are on a time table, and boy that gets a lot of people in trouble.

(MIKE LYNN)
I certainly did some things wrong and number one was, in my mind being on a trail that I didn't know, other than from a book, in the wintertime…you have to be better prepared than I was. So the fact of not knowing the trail and having proper clothing and shelter for a night's stay, are probably on my top two of what I did wrong.

(NARRATOR)
A second aspect of every survival story is will. The mental stamina to believe and to need to survive.

(BO CURTIS)
There was an engagement. I was engaged to be married…And there was supposed to be an engagement in the picture, in the paper, and I didn't want the deceased thing to come in the same paper as the engagement.

(GEOFF TABIN)
…The two essential attributes are to believe you can survive, and to believe, up until the absolute last minute, that it's within your control. Once you give up, things go downhill very rapidly.

(OUTWARD BOUND KIDS)
You have to do it, you have to get in there and do it. So what ever drives you that's what's really going to pull you through in that situation. You just reach in and go for it.

(SAM SPRAGUE)
I think his thoughts of his grandkids and of his family kept him going and he didn't want these to be his last days. He wanted to spend time with his family and he was willing to fight for it and he did.

(NARRATOR)
Finally, what makes a difference is the survivor's ability to overcome their fight or flight response. Can they stay calm? Assess the situation? Divide what needs to be done into small tasks instead of looking at the possibilities for tragedy or death.

(BO CURTIS)
Panic kills, it just does and a lot of people don't have control over that, and I was fortunate that I didn't panic. If I had panicked I wouldn't be telling this story.

(NARRATOR)
After a long night, the National Guard helicopter was able to pick up Mike Lynn. He was rushed to the hospital, while his rescuers waited for the helicopter to return.

(BRIAN ABRAMS)
It was a long cold wait, but they finally did come back for us. The plan was to drop a duffel bag and to put Kayla in the duffel bag and winch her up first to the helicopter and then they would take us. And I thought well if this dog is ever going to bite me it going to when I put him into the duffel bag, and he went right into the duffel bag and let me buckle him right in and we hoisted him up and he did just fine.

(NARRATOR)
For their exceptional professionalism and bravery to push on with a rescue in darkness and cold, Sam Sprague and Brian Abrams were honored with Life Saving Medals from the New Hampshire Fish and Game Department.

Mike Lynn lost both his feet to frostbite; one had to be amputated at the ankle, the other just below the knee.

However, less than a year after his ordeal, he attended a learn-to-ski camp for people with disabilities.

(MIKE LYNN)
They don't like to be called inspirational, but they were inspirational kids. I was the oldest by far. But it was just a lot of fun.

(NARRATOR)
Many survivors' bodies and minds must continue to adapt to the new environment they find themselves in after their ordeal. As difficult as a life- or-death experience is, its aftermath can also be a matter of survival.

(MUSIC)

(LINDA GREENLAW)
I hope I never have to use any of this equipment in a real emergency Maybe I have been lucky. But when it comes to survival, I'm not taking any chances. This is Linda Greenlaw. I hope you've enjoyed this QUEST.