

Xtreme Teams

In the new world of business, all work is teamwork — but very few teams work all that well. How do groups of ordinary people achieve extraordinary results? Learn from these extreme teams. Your team may never work the same again.

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First appeared: FC29, p.310

Have you ever been part of a team that required your all but never had to ask for it? A team in which the work itself was actually the most important reward, and in which teamwork happened with almost no effort at all? A team that, looking back, you just can't imagine not having been a part of?

Jacqui Lopez, a producer with Industrial Light & Magic, has led many such teams. "The trickiest part of the job," she says, "is when you're on your 18th straight day of work, when you've been at it for 14 hours a day, when the director is screaming at you and the studio is up in arms — and you have to keep all of the stress from filtering down to your crew. In film, we can't miss our deadline. But if I start pressuring artists about time and budget, then creativity suffers."

So has Robert Nagle, an adventure racer with Team EcoInternet. "We stay ridiculously focused for 170 hours," he says. "We don't let team dynamics, mistakes, the weather — or any of the other bad things that can happen during an adventure race — get in the way. We just concentrate on our objective."

So has Bob Mitcheltree, a NASA engineer who works on the Mars Sample Return Mission. "Only a few events that occur in my lifetime will be considered large, breakthrough discoveries," he explains. "I'm willing to bet that this mission will be one of those events."

"Extreme teams" are the stuff of business legend: the geeks who built the Apple Macintosh, the rebels who redesigned the VW bug. Lopez, Nagle, and Mitcheltree all belong to those kinds of teams. They work under conditions that are undeniably extreme — impossible deadlines, long hours — and they are producing extreme results. They and their colleagues are ordinary people who are doing extraordinary things.

"These teams are passionate about their work," says Harold J. Leavitt, professor at the Stanford Graduate School of Business and coauthor of "Hot Groups: Seeding Them, Feeding Them, and Using Them to Ignite Your Organization" (Oxford University Press, 1999). "In fact, the people on these kinds of teams don't view their work as 'work.' They view it as fun.

They're addicted to it. They don't think about anything else. They want to talk about it, think about it, and do it all day long — and they want to be around people who feel the same way."

Jean Lipman-Blumen, a professor at the Claremont Graduate School, who is also Leavitt's coauthor, adds, "These are people who want to take on a challenge that they are convinced is earthshaking. It may not look that way to people on the outside, but that's how people on these kinds of teams perceive their task. They are so committed to what they're doing, to their desire to achieve a breakthrough, that they know they will make it happen — because they supply the combustion. They create the explosion that gets through to the next level."

What follows are the stories of three extreme teams: a production group from Industrial Light & Magic, an international adventure-racing team, and a group of NASA engineers. The projects that they work on are extremely interesting, and the stakes that they play for are extremely high. Most important, their experiences should prove extremely enlightening to people on all kinds of teams.

Extreme Deadlines

Jacqui Lopez jogs into the theater slightly winded, her morning latte sloshing over the edge of its paper cup. Her blond hair is still wet from the shower. "Sorry I'm late," she says to the near-empty room, before realizing that she isn't actually late. The previous day's visual-effects files for scenes from the movie "Wild Wild West" are still being turned into film. "Good," says Lopez, her face relaxing slightly. "I'm going to go move my car so that it doesn't get towed."

Lopez, 36, the film's visual-effects producer, has good reason to feel pressed for time. Her team, consisting of 150 artists and animators from Industrial Light & Magic (ILM), has less than three weeks to finish the remaining 140 shots for the movie — roughly one-third of the movie's digitally created shots. That pace will match the unprecedented speed at which another ILM team worked on "Star Wars: The Phantom Menace." The "Phantom Menace" team, which included far more people and had far more time than Lopez's

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team, churned out 1,900 visual-effects scenes.

The digital work for “Wild Wild West,” a summer movie starring Will Smith, involved adding explosions, fires, fake backgrounds, and a 90-foot-tall mechanical tarantula to the film (which opened on July 4). “Being late is not an option,” Lopez says. “The publicity is already locked in, and the studios have schedules to keep. We can’t be late.”

And ILM teams never are late. Along with the 29 Academy Awards that ILM has won over the past 24 years for visual effects and for other technical achievements, the company (created by George Lucas) has earned a reputation for being fast. Indeed, ILM is so fast that other effects studios routinely farm out last-minute work to it in order to avoid missing deadlines on such films as “Titanic,” “Mighty Joe Young,” and “Deep Blue Sea.”

Fifteen minutes after Lopez arrives, a group of about 20 artists and animators gather in the darkened cinema at the ILM complex. They are reviewing scenes before shipping them to director Barry Sonnenfeld, who worked with both Lopez and visual-effects supervisor Eric Brevig on Sonnenfeld’s previous film, “Men in Black.” As the group members noisily take their seats, their wisecracks belie the serious purpose of the session: This is a test. If the scenes don’t pass Brevig’s critique, the artists will have to spend hours fine-tuning shots that they’ve already been working on for weeks. The lights go down, and the film starts rolling. The reel includes a half-dozen three- or four-second scenes that speed by without sound. After each snippet, Brevig backs up the reel and views each scene several more times.

One scene shows Will Smith dismounting his horse in front of the White House. The White House, its lawn, and a wrought-iron gate have all been digitally created. The only “real” parts of the scene are Smith and his horse, which were shot together against a blue screen and later superimposed on a digital background. The result is flawless — or, rather, it appears to be when it flies by the first time. But Brevig slows the reel and calls attention to Smith’s foot as it swings over the horse’s back. When viewed in slow motion, the edges of Smith’s shoe stand out starkly against the background. The foot looks as if it has been pasted in.

“Can you do anything about that?” he asks. Brevig, 42, who is a 10-year ILM veteran, knows how to fix the shot. But he keeps the answer to himself.

“I’ll go back in and try a radial blur,” one animator responds. “Great,” Brevig says.

This exchange demonstrates one of the team’s unwritten rules: Never tell people how to do their jobs. Instead, present them

with a challenge, and then let them choose the best way to attack it.

“Even when I have an idea or a plan, I try to invite people to be part of the problem solving,” Brevig says. “That way, they feel like part of the team — and they usually come up with a better idea than mine.”

Dan Taylor, the team’s animation supervisor, puts it this way: “You can’t turn people into just a pair of hands. It’s always a mistake to dictate how a shot should be done. Doing so completely devalues people and their creative abilities. How can people get excited about being part of that kind of a team?”

That kind of hands-off management is the perfect strategy to push a team to become extreme, says Jean Lipman-Blumen. “You want to create an environment that allows people to think for themselves and to take chances,” she says. “And that means loosening controls, rather than tightening them. It means organizing not more but less. Check people’s work, but leave how they do that work to their discretion. Don’t get involved in the details of execution.”

The ILM team’s just-delegate-it approach worked particularly well during its creation of the 90-foot-tall mechanical tarantula — an invention of the film’s villain, Dr. Loveless (played by Kenneth Branagh). Unlike most visual-effects mechanisms, the spider wasn’t built in full scale or in model form. Instead, one leg was constructed, and the rest was drawn digitally. To learn how to mimic the movements of a real spider, the animation team spent hours watching documentaries on arachnids. Studying those documentaries enabled the team to make sure that the digital spider’s movements would be realistic. The final digital creation has more than 150 moving parts, including pulleys and cables that appear to pull taut and then to go slack as the tarantula moves. Not only did the animation team deliver a realistic, evil-looking, soot-belching machine, but it did so on time — with only half as many animators as Brevig originally thought he would need. “There was no way that anyone could have told the team how to build that thing,” Taylor says simply. “That had never been done before.”

Digital painter Bridget Goodman, 34, created the look of the spider’s tarnished, soot-smear exterior. She did so by building a vast database of thousands of colors and textures, and by studying old “Star Wars” films to get a sense of how to shade the contraption realistically. Her task was nerve-racking. The movie’s success hinged on her ability to make the spider look real, and she had to bring rough drafts of her work to daily critiquing sessions. “It’s hard for people to understand what you’re visualizing in your head when all they’re seeing is the beginning of a painting that looks nothing like your end idea. But they hung in there with me,” Goodman says. “Jacqui

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[Lopez] trusted me as an artist, and that was a pretty amazing feeling.”

The team’s preferred method of maximizing speed is through parallel processing. Meetings are a series of entrances and exits choreographed by Brevig and Lopez. Whether it’s the morning critique, the midday production meeting, or the end-of-day critique, no one sits through an entire session. Animators leave as soon as their shots are critiqued; production assistants leave when they get new assignments; model makers exit after they give their opinions on the logistics for a new scene. “When there’s work to be done, keeping people in a meeting longer than they need to be there is pointless and aggravating,” Lopez says. “When we get down to the wire, our artists need every second they can get in front of their computers.”

The “Wild Wild West” team made its deadline — just 36 hours before Brevig left for a vacation in the Caribbean. The team cut it so close that the beginning of the final scene was being processed into film while the end of that scene was being digitally retouched. Lopez says that despite the crunch of 70-hour workweeks, the team’s morale remained pretty high — in part, no doubt, because of Lopez’s practice of bringing in massage therapists, springing for pizza or dim sum, and generally playing the role of cheerleader.

Taking care of your team, Brevig says, is another secret to maintaining speed over time. “The actual process of creating a lot of visual effects for a movie doesn’t worry me,” he says. “I worry about creating an environment in which people can perform at that level and not be totally burned out when they’re done. Three months from now, we’ll all be working as a team on another project. You can’t afford to treat people like they’re disposable.”

Extreme Pressure

Here’s Team EcoInternet’s idea of fun: Hop on a plane bound for another country. Hike 45 miles through the jungle, carrying 8 days’ worth of food, water, and other supplies on your back. Jump into a kayak, and paddle 35 miles through white-water rapids. Rappel down the side of a cliff. Ride a mountain bike through a valley. Cover 235 miles in 8 days, getting no more than a total of 10 hours of sleep. And throw in leeches, saltwater crocodiles, and poisonous snakes — just to keep things interesting.

Welcome to the sport of adventure racing, a world in which extremity borders on insanity. Adventure racing combines hiking, biking, paddling, climbing, and running through wilderness. There is no official course. Teams of four or five athletes race across, say, the Australian outback or the Sahara Desert, with no more than a compass, a map, and their experience and

wits to guide them.

To win such a race, you must be fast and strong. But you must also be part of a complete team. If your team loses even just one member during the race, you lose.

Some of the world’s most physically qualified teams have lost races because they lack the particular brand of teamwork that adventure racing demands. While most events draw teams of Navy seals or Army Rangers, no military team has ever placed in either of the top two slots at any major adventure race. Why not? “In the military, showing weakness is itself a weakness,” says Robert Nagle, 41, one of EcoInternet’s founders. “But in racing, we practice asking for help. We’re all really good athletes in our own right, and we’ve had long, successful careers. But we’re all able to make that switch and say, ‘Right now, I’m the weakest person on the team. And in order for the team to move faster, I should ask for help.’”

Nagle, who is director of software development for InterSystems, based in Boston, knows what he’s talking about. He and the other members of EcoInternet — including an Australian entrepreneur, an American firefighter, and a window washer from New Zealand — have won all three of the major adventure races at least once. So far this year, they have had two first-place finishes and one second-place finish. They are the New York Yankees of adventure racing. And they’re experts on teamwork in extreme settings.

The founders of the team, Nagle and Ian Adamson, first met via the Internet in 1994. The following year, they put together the nucleus of their team. The squad has since grown to include about eight people from all over the world (they rotate on and off the team throughout the year, depending on the race). All of the members are world-class athletes in at least one sport, but they say that it isn’t the physical challenge that draws them to adventure racing — it’s the mental challenge. “Your limits are constantly being pushed by the surprises that are built into the race, and then there are other surprises that are based on your execution,” Nagle explains. “You may make a poor navigation choice, or forget to bring a critical piece of gear, or lose your maps, or run out of food. You have to deal with all of those situations. And that type of test is completely different from the test that’s imposed by the physical prerequisites.”

So how does the team work? Every decision is made by consensus. If that means that the whole team stops to spend an hour debating which way to head through a canyon, so be it. “Over the course of six or seven days of nonstop competition, you can’t look to the same person for everything,” Nagle explains. “Part of our success lies in having tremendous redundancy within our team. So we just allow leadership to flow,

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hour by hour, to whoever is strongest at the time.”

The same holds true for many of the “hot groups” that Leavitt and Lipman-Blumen have studied. “You get pluralistic thinking,” says Leavitt. “You get a multiple brain that is likely to be more creative than a single one.”

A more important rule for EcoInternet’s members is that they let go of a decision once it has been made — no matter how it turns out. “You have to treat mistakes as the next challenge, rather than as a self-inflicted problem,” Nagle says. “So we tend to say, ‘Okay, we decided to come over this ridge instead of following the valley around. It’s a lot worse than we expected. But that doesn’t matter. We just have to deal with this circumstance and move on.’”

Which doesn’t mean that there isn’t plenty of postrace feedback. “We come back after each race and analyze every decision in a very honest and pretty raw fashion,” Nagle says. “We talk about why people acted the way they did, why we made particular decisions, and how we ended up in particular circumstances.”

In preparing for a 1998 race in Ecuador called the Raid Gauloises, the team miscalculated how much food it would need for the nine-day trip. Upon entering the final two days of paddling, EcoInternet was in first place. One team was within 15 minutes of EcoInternet, while the rest of the teams were all at least a day behind. EcoInternet had figured that each team member would need about 10,000 calories a day for the paddling stretch — and the team had just 500 calories’ worth of food left.

“We looked in our bag and said, ‘My God, there’s no food,’” Nagle says. “But as a group, we knew that it wasn’t a problem. It may seem amazing, but we knew that we would find a way out of that mess. And just knowing that is tremendously reassuring. You just have this sense of calm that you will find a way — that you will find a solution. That’s how much faith we have in the team.”

That evening, most of the team camped by the river’s edge while Nagle and a teammate hiked into the jungle, where they found an Ecuadorian farmer. In broken Spanish, they explained to him what they needed, and then they traded some of their gear for food.

Ian Adamson, 35, describes the team mind-set as being almost entrepreneurial. “New Zealanders like to call it ‘the eight-gauge wire solution’: You believe that you can fix any situation with the resources you have on hand,” Adamson says. “We’ve got a stick of chewing gum and some string. We’re all set! We don’t waste time whining because we don’t have a hammer.”

One tricky aspect of adventure racing is that a team can move only as fast as its weakest member. And since each race stretches over a series of exhausting days, every person on a team will be the weakest member at one point or another. The EcoInternet strategy: Shore up the weakest member at every point in a race — so that everyone makes it through the race without burning out.

“Instead of worrying about my problems and managing them internally, I let them show, and I concentrate my effort on the other three or four members of the team,” Nagle says. “That way, I have three people looking after me, rather than one. If one of us stumbles for the second time in 10 minutes, there’s no question about what needs to be done: Somebody reaches into that person’s pack and takes out some weight, and then we all just move on.”

Team member Robyn Benincasa, 33, says that, unlike other teams that she’s raced with, EcoInternet is free of internal competition. “All of us are of one mind — one mind with 10 arms and 10 legs. And that really makes a difference,” she says. “There’s no pride in carrying other people’s things. It’s just what you need to do to get the job done. You’re not the hero for taking on extra weight, or the schmo for needing help. You know that, three hours from now, the guy carrying all of your stuff may need you to carry his stuff.”

Benincasa and Adamson have started a training program in Colorado that puts corporate teams through milder versions of adventure racing. “In adventure racing,” Adamson says, “you go through every emotion that you’ll experience in life — only faster and more intensely: The highs are higher, and the lows are lower. If you can handle that, you can handle anything.”

Extreme Goals

After working at NASA as an aerospace engineer for 10 years, Bobby Braun still hasn’t lost the boyish awe that he feels for the space explorers who came before him. On a tour of the Langley Research Center in Hampton, Virginia, Braun points to a 240-foot-tall, eight-legged steel structure that dominates the skyline. Called a “gantry,” the structure looks like a towering, headless insect. In fact, it was built to teach the Apollo astronauts how to land on the moon.

“The instructors hung a lunar-landing module from the top, attached support cables to simulate the effect of lower gravity, and told the astronauts to pilot it down and then land,” Braun explains. “Neil Armstrong used to practice here. Today, we’re using it to test the prototypes of the capsule that will bring soil samples back from Mars.” He pauses and grins, thinking of the link between the historic Apollo project and his own work. “I think that’s pretty cool.”

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Braun is himself likely to become part of NASA's legacy. He was part of the Pathfinder team that sent a land rover to Mars, from which it beamed back the celebrated first pictures of the planet's surface. Today, he is the project leader for one of the units of the Mars Sample Return Mission. NASA, with help from Italian and French space agencies, will do a return trip to Mars in 2003, sending two rovers to gather soil and rock samples. The mission, which will be led by NASA's Jet Propulsion Laboratory in Pasadena, California, will take five years to complete.

Braun's team is building the space capsule that will return the samples safely to Earth. It is no small task. The capsule has to be strong enough to land on Earth at 80 mph — without a parachute. It has to endure temperatures up to 3,000 degrees Fahrenheit. The project is mammoth in scope and ambition. Even now, four years away from the first launch, the team has hard deadlines to meet. "There is no downtime," Braun says. "There are just times that are very stressful and times that are only moderately stressful."

The first deadline that the team faces involves locking in the design requirements for the capsule. The team must decide which materials to use to build the capsule and how the capsule should be shaped. Those decisions must be made with other project units — because the size and mass of the capsule is predetermined by how much weight the rocket can carry — and they eventually must go through an extensive independent review.

To make those decisions, the team has relied on prototyping. But this isn't the take-three-months-and-spend-millions-of-dollars kind of testing that NASA was known for in the '70s. Today's team relies on pared-down tests that are conducted with off-the-shelf components. As fast as test engineers can build models of the capsule, the team drops them from the gantry to measure the effect of the impact on both the soil and the prototype. "There is more than one purpose for every test," says Sotiras Kellas, a test engineer for the team. "And most of these initial tests cost less than \$40."

Lean testing? At NASA? As it turns out, many of the milestones that the team must hit have more to do with "inner space" than with outer space. The Mars Sample Return Mission is part of NASA's push to execute projects "faster, better, cheaper" — an agency mantra that was developed seven years ago by NASA administrator Daniel Goldin. With the same amount of money and time that NASA used to sink into just one space mission, it now launches 13 missions. That constant pressure to speed up results using leaner teams — without taking undue risks — has challenged a new generation of leaders to test the limits of what's possible. "There are a lot of 'never-been-dones' on this project," Braun says. "But if you're an engineer, this is the kind

of project that you wait your whole career for. I'm totally stoked to be a part of it. The 'faster, better, cheaper' mentality is what's keeping me at NASA."

While the team must move quickly and inexpensively (its budget accounts for only \$15 million of the entire project's budget of roughly \$750 million), it also must make tough decisions about the unknown. For example, even the most advanced mathematical models for predicting how much heat stress the capsule's shield will encounter are only theory. There is no such thing as a "definite" answer.

It's 10 am, and the Langley team is having a teleconference with a team at Ames Research Center in Mountain View, California. The Ames team is designing the heat shield for the capsule, and today engineers from Ames and Langley are comparing heat-testing data for composite materials that are under consideration for use in the shield. To stay on schedule, the team will have to make a choice about materials very soon. "I'm just not sure that I'm comfortable with where the numbers are," says an Ames engineer.

"Well, they're never going to be at the level we want," Braun responds. "In the end, it's a decision that we'll have to make on gut feel. If we wait for all of the information, it will be too late."

Braun isn't calling for a hasty decision. He knows that NASA's planetary-protection officer wants the chance of contamination to be less than one in a million. But there's a difference between having enough information to make a decision and having perfect knowledge — which is what engineers on the team often want, says Bob Mitcheltree, lead engineer for the team.

"Braun has an uncanny ability to make decisions without perfect knowledge," Mitcheltree says. "Sometimes, I get so bogged down in details that I can't convince myself one way or another. But he has this higher view. He looks out across the whole mission."

The team also performs risk analyses in order to find potential problem spots. "There are times when you have to go with a gut feel," says Lisa Simonson, assistant project manager. "But those decisions are based on the technical respect that we have for each other and on the work that we've put into researching the questions. We have confidence in each other and in the process."

Because of that confidence, the team is able to make decisions efficiently, without squabbling or political maneuvering, and to focus on the work itself. "How we all get things done — that's not the rocket-science part," Braun explains with a grin. "The rocket science is the rocket science."

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Sidebar: Xtreme Experts

What makes a team extreme? Harold J. Leavitt and Jean Lipman-Blumen, coauthors of the recent book “Hot Groups,” have spent more than 20 years exploring why some teams fly while others crash and burn. “You don’t go out and create hot groups,” Lipman-Blumen explains. “They grow themselves. Look at organizations, and you’ll see the beginnings of hot groups almost everywhere. They’re like weeds. But organizations that are bureaucratic and orderly don’t like the idea of hot groups, so they go around and spray weed killer on those groups. The issue is not how you create hot groups but how you keep them from being stamped out.”

In an interview with Fast Company, these two extremely well-informed professors offered their perspectives on extreme teams.

Work matters.

“People who are part of these teams are searching for meaning in their work. They don’t want to go to work and spend eight or nine hours working on trivia,” Leavitt says. “They want to feel that what they do will make a difference — not just in their paycheck, but in the world. For a long time, hr people have been pushing the notion that they’re trying to develop a satisfied workforce, a happy workforce. But happiness alone isn’t the Holy Grail here. People are also looking for an opportunity to do something worthwhile. Those two kinds of motivation are very different.”

Titles don’t matter.

“Hot groups don’t care about people’s status within an organization,” Leavitt says. “It doesn’t matter if somebody is a senior VP and somebody else is a new recruit. Hot groups are very democratic and very informal. They are quite antibureaucratic, and that’s both a strength and a weakness. It helps them to jump over the walls that sometimes imprison teams. But, on the other hand, it creates a lot of resentment and animosity in the rest of the organization, and you have to deal with that.”

People bond in the heat of battle.

“These groups tend to grow around their task, rather than around relationships,” Lipman-Blumen says. “That’s the opposite of the way most groups get

started. When people launch project teams, they usually call in consultants and take everyone on a retreat to do the wilderness team-bonding thing. But it’s the contributions that people make to a task that lead other people to respect them, to like them, to want to be around them. When people see someone bring something important to a task, they get excited about that. Long-lasting relationships grow out of that kind of respect for other people’s ability to make a task happen.”

Teams take care of their own.

“Within hot groups, people can be very individualistic,” Lipman-Blumen says. “They can express their creativity, and they feel protected while doing so. They are shielded by the group. In the past, individuals were isolated, and they had to do things on their own: If they succeeded, great; if they didn’t, they were cut off at the knees. The hot-group mentality makes it safer for people to experiment.”

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