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## HOW BIG DATA IS REDEFINING THE MODERN TRIATHLETE

# IRONMAN 2.0

# THE IRONMAN ALGOR

When the IRONMAN WORLD CHAMPIONSHIP made its debut almost 40 years ago, triathletes won races with old-fashioned tools like grit and determination. Boy, have things changed. Today, as the popularity of endurance racing surges, ambitious amateurs and pros like Timothy O'Donnell (pictured) are devouring data to optimize their potential to the nth degree. Here's how.

# I T H M

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# THE YEAR THAT

triathlon legend Mark Allen competed in his very first Ironman, IBM had just introduced the world's first personal computer. It was 1982. Timex hadn't even released its classic Ironman-branded watch yet. Allen says he was lucky if he could find a wristwatch that could do simple split times.

GPS, too, had not yet trickled down to consumers, so Allen had only paper maps and a stopwatch to measure his pace. There was so little data to keep track of, he didn't even bother with a training log. "I had a general idea of what I was doing," he says. "But I don't have any log books from back then—it was all in my brain."

Allen went on to compete in a dozen Ironman Championships. He made the podium in nine of those and was the overall winner in six, most recently in 1995 at the age of 37. Allen is considered by many to be the godfather of the long-distance triathlon.

However, despite his analog approach to training early on, Allen was also one of the very first triathletes to embrace heart-rate monitors, sometime in the mid-'80s. And to this day he understands better than most the role science and technology plays for the modern triathlete—in fact, it's his job to understand. Now 59, Allen spends most of his time coaching. His clients include everyone from ambitious average Joes to world-class pros, but one thing they all have in common these days is their voracious appetite for data.

October 14 will mark the 41st Ironman World Championship in Kona, Hawaii, in which competitors from around the world who have racked up enough points in qualifying Ironman races throughout the year go head to head for ultimate glory. While little has changed in the race format over the years—it's still a grueling 140.6 miles that includes a 2.4-mile swim, 112-mile bike ride and 26.2-mile run—the science and technology surrounding endurance sports has transformed triathlon training. You can be sure that every athlete descending on the Big Island for the event this year will be wearing a wristwatch with the same capabilities as a refrigerator-sized supercomputer; they'll be buried in their laptops dissecting what went right and what went wrong in their training sessions. The triathlon has become almost as much of a math problem as it is a physical and mental challenge. "GPS tracking, rest-recovery scores, sleep scores—people are relying on those numbers more and more," says Allen. "And it can definitely help you fine-tune your training."

We're living in a golden age for tracking fitness metrics. Blood tests, satellites and sensors have become so accurate and user-friendly that they can produce a unique athlete profile no trainer or doctor ever could. While heart-rate tracking has become the ubiquitous gold standard, many athletes are now looking at even finer metrics, like heart-rate variation (the time between beats), to measure their readiness to train. Measuring pedal-stroke power on the bike has become standard, and tracker technicians are beginning to understand how to do the same thing with your running stride (with a pod that fits in your pocket). Athlete-specific blood tests can now uncover hidden micronutrient deficiencies that, once addressed, have the potential to shave minutes off your race time.

It's no surprise that a handful of Allen's clients are headed to Kona this fall. In fact, one of his clients is even considered a serious contender to win it all. American Timothy O'Donnell holds an ITU Long Distance Triathlon title, and Kona 2017 will be his sixth trip to the Ironman Championship (he placed third in 2015). At 36, O'Donnell represents a new generation of triathlete, with far

WE'RE LIVING IN THE GOLDEN AGE FOR TRACKING FITNESS METRICS. NOW YOU CAN PRODUCE A UNIQUE ATHLETE PROFILE THAT NO TRAINER OR DOCTOR EVER COULD.


Ironman athlete Timothy O'Donnell, 36, admits he's a total data geek when it comes to his training. "Triathletes are very analytic," he says. "I want to process as much information as possible."

more data at his disposal than Allen ever had. O'Donnell may be chasing the same sort of success as his training mentor, but his day-to-day training analytics couldn't be more different. "It all just happens automatically—everything goes through Bluetooth," he says of the data that is being collected during his workout. "I finish a session, hit stop and bam. I'll just pull it up on my phone while I'm waiting to go into a massage appointment or something. I start absorbing it all and then connecting the dots. Triathletes are very analytic. I want to process as much information as possible."

Basically, in a sport where efficiency is everything, data can be a secret weapon. For pros like O'Donnell, efficiency is the single most important differentiator—the single most important factor in shaving precious seconds off of one's time. In triathlon, the tiniest adjustments can have a game-changing impact.

As O'Donnell once put it: "The fittest racer doesn't always win Kona. The athlete who races at 100 percent *of their fitness* wins."

Ironman-distance triathlons are nearly as old as the sport itself. The debut event was held in Oahu in 1978, just a few years after the first known triathlon of any kind in San Diego, California. As with most great challenges, the Ironman race was primarily set up to settle a debate: which type of endurance athlete was the fittest. Fifteen men set off one early morning in February to prove a point—the winner finished in just under 12 hours. Today there are dozens of Ironman qualifying events throughout the year. The Kona World Championship race hosts 2,000 men and women every year and the event is broadcast on NBC.

Because of its multisport format, the triathlon has always driven innovation in endurance-sports science, everything from the metrics we can capture to the science behind nutrition. By the early '80s, triathletes were beginning to use heart-rate monitors and just starting to understand the importance of heart-rate "zones." Up until then, triathletes like Allen relied on what's referred to as "rate of perceived exertion," or simply how they felt. While RPE hasn't gone away completely, heart rate is still and probably always will be the primary metric that all other metrics are measured against.

However, a decade later came another breakthrough—one that seems to be driving most of the innovation today. In the early '90s, a company called Garmin was getting into the GPS business. At the

TRIATHLON HAS SORT OF BECOME ONE GIANT MATH PROBLEM—IF YOU JUST DO WHAT THE DATA TELLS YOU, YOU WILL ONE DAY BE ABLE TO COMPLETE AN IRONMAN.

**Although he's competed in triathlons around the world, O'Donnell says the Ironman World Championship is by far the most difficult race, where the stakes are high and the conditions aren't always favorable.**

time, GPS was mainly being used in the private sector—military, maritime, etc.—and the technology was in its infancy. But by the late '90s, the consumer application was obvious. First they began popping up in cars, and then in 2003, Garmin introduced its very first fitness watch, a matchbox-sized GPS unit you could wear on your wrist.

The significance of GPS in sports can't be overstated. Most people see it as a simple tracker of movement from point A to point B, accounting for things like speed and distance. But the latest GPS technology can actually track movement in all directions and even your rate of acceleration. In other words, it knows if your hips move too much when you run or if your swimming stroke is off. Today, Garmin's flagship triathlon watch, the Forerunner 935, can switch between swim, bike and run analysis with the push of a button on the go and uses data from past workouts to determine if you need to push harder or pull back to avoid overtraining.

The tech engineers at fitness-wearable companies are now engaged in a virtual arms race to make these devices even smaller, more accurate and easy to use. At Kansas-based Garmin, almost all employees on the technical side are endurance athletes themselves and are known for their relentless pursuit of perfection. One electrical engineer spent several days just trying to figure out how to make sure a watch's barometer (the sensor that can read elevation gained and lost) drained water properly after a swim.

"This guy is a sub-elite triathlete himself," explains product manager Joe Heikes, who has been with Garmin for nine years. "There he was with a bucket of water out on the sidewalk. He'd dip his hand in the bucket for a couple minutes, then take off running. He'd come back, dip his hand in the bucket of water, then take off running again."

A modern Garmin triathlon watch has over 200 separate fields of data, but it's what you do with the data that really makes a difference. Information is what basically helps an athlete make micro-adjustments that could have a major impact, whether it's sliding back a half inch on your bike saddle to increase power with less effort or leaving your outstretched arm in front of you for one tenth of a second longer in the pool. "Just this year, I've really started focusing on my running-stride length," says O'Donnell. "For me, a 1.6-meter stride length is where I want to be. And I'd notice, when I wasn't running well, my stride length got shorter."

O'Donnell isn't afraid of embracing more experimental technology either. He loves his HALO headset, which is said to stimulate the brain and promote connectivity between mind and body. A 20-minute session before his workouts, he says, puts his muscles into a state of "hyperlearning." O'Donnell is also beginning to measure his running power, and he's looking forward to the day when sensors can measure aerodynamics on the bike, something that as of now is only possible in a wind tunnel. "Garmin just bought one of the main players in fluid dynamics," he says. "That's a sign to me that the next thing will be sensors that can calculate co-efficient of drag."

One Ironman competitor who is sure to have O'Donnell looking over his shoulder at this year's race is Jesse Thomas, a 37-year-old former Stanford track star with several impressive finishes in shorter-format triathlons. A relative newcomer, his star is rising. Thomas considers himself "less obsessed with his numbers" than many of his peers, yet he's no stranger to cutting-edge science and tech when it comes to his training.

Midwinter rides in his hometown of Bend, Oregon, are a big challenge when the roads are buried in snow. But that didn't stop Thomas from logging lots of miles in the saddle—without leaving the house. "I just connect my indoor trainer to this virtual platform called Zwift," he says. "You can ride alongside other real people riding the same courses. By entering your weight and using your power meter, you can get this simulated group race. It really kept me motivated."

And while numbers may not be his thing, Thomas is a bit of a nutrition geek. He has his own energy-bar line and recently teamed up with exercise scientist Dr. Garret Rock in analyzing his micronutrient profile through blood testing. Athletes have been able to measure things like lactic acid or gross nutritional deficiencies for many years. But only now do we have the longitudinal baseline of athlete blood profiles to identify optimum levels of each micronutrient for various specific types of athletes. Rock and his team know exactly what your levels should look like across a couple dozen blood and genetic markers.

O'Donnell, a former U.S. Naval officer, lives and trains in Boulder, Colorado, with his wife and fellow triathlete, Mirinda Carfrae. In June of this year, he had a home-turf win at the Ironman Boulder race, which helped him qualify for Kona.

# ZERO TO HERO

Take it from Ironman royalty MARK ALLEN: 12 months is all it takes to be ready to compete in the triathlon's pinnacle event. "As long as you have some sort of fitness background, a year is plenty of time," Allen says. But it's not going to be easy. Here, he outlines exactly what it takes to prepare your body to swim, cycle and run 140.6 miles—and live to brag about it.

## 1 PICK A RACE

**Nothing makes this challenge more real than signing up for an actual Ironman.** "There's a mind-body connection," Allen says. "Signing up for a race helps your body be ready." Allen suggests a late-fall Ironman—the Arizona event in mid-November is popular for first-timers—so that the bulk of your hard training takes place during mild months.

## 2 BECOME A DATA GEEK

**A good triathlon watch can measure everything from sleep quality to swim-stroke efficiency.** But the one metric that matters above all else is heart rate, Allen says. Chest straps are more accurate than wrist sensors, so choose a watch that is strap compatible. Later in your training, a GPS feature will track distances and a cycling power meter will measure how much effort you are expending, which ultimately will tell you if you're getting fitter.

## 3 OPEN AN ONLINE TRAINING LOG ACCOUNT

**Having past, present and future training sessions accessible in one place allows you to pick up patterns of successes and failures and then adjust accordingly.** TrainingPeaks (trainingpeaks.com) is a popular one-size-fits-all option; coach-specific sites like Allen's (markallencoaching.com) are more personalized.

## 4 BUY A TRI BIKE

**Triathlon bikes are designed to be ridden in the aero position, and it's essential that you become used to the equipment on day one.** The right fit is important, too, Allen says, "because your body begins developing a neurological pathway between your brain and your muscles." Allen also suggests picking up an indoor trainer that's compatible with your new ride since you'll be logging your first several hundred miles during the winter.

## 5 DO A TRIATHLON!

**It's never too early to sign up for a local sprint-distance race.** With a breezy half-mile swim, 12-mile bike ride and three-mile run, this is a great chance to simply get a feel for combining the three sports under pressure and transitioning between them.

## 6 HIRE A COACH

**While Allen insists that this is not an essential step for Ironman hopefuls, services like his are surprisingly cheap.** For as little as $25 per week you can get help designing your training program, connect with coaches via phone and email and even receive personalized feedback on swimming, cycling or running form if you send video.

## 7 JOIN A MASTERS SWIM CLUB

**Swimming is one area where having another person evaluate your technique is invaluable.** Masters clubs are sort of like group-swim workouts, with some seasoned pros on hand for feedback. Allen suggests working on your stroke mechanics as much as possible early on. "Do it in the very beginning so that you have all the tools you need throughout the rest of your training," he says.

**Log workouts with the free TrainingPeaks fitness app.**


**Speed Concept triathlon bike by Trek, starting at $4,000.**

RICH CRUSE, TREK BIKE

## 8 SIGN UP FOR MORE TRIATHLONS

**Longer races such as Olympic-distance (one-mile swim; 24-mile bike; six-mile run) and half Ironman will serve as important milestones in your progression.** Allen recommends doing an Olympic-distance tri just as your training volume begins to really increase and then a half Ironman at the six-month mark. A couple of months later, he recommends another Olympic-distance race. "It sort of resets your body's concept of what fast is," he says. "Then, when you continue with your training, your Ironman speed doesn't feel as hard as it did."

## 9 DIAL IN YOUR NUTRITION

**"For all the information out there, Ironman nutrition is actually really simple," insists Allen.** "You just need to understand what to eat during your workouts and what you are eating in between workouts." During workouts, Allen suggests using energy bars and gels to consume around 300 calories (your exact caloric need will depend on trial and error) and about 30 to 40 ounces of fluid per hour. Before and after workouts, every meal should include unrefined carbs such as oatmeal or brown rice, lean proteins like chicken for muscle recovery and healthy fat, such as nuts or avocado.

## 10 LEARN TO JUGGLE

**By the second half of the year, you'll be doing five-hour bike rides and two- to three-hour runs, so you will need to be able to negotiate your schedule with your employer.** "Use weekends smartly," suggests Allen. "Put the long workouts on days off, where you have the best chance of getting it done." Finally, Allen has encouraging words for anyone who simply can't fathom the distances. "Take heart: When you finally get to your Ironman, it does not feel anything like two half Ironman races back to back. It's just a different feeling—you will be able to do it."

"One year before Wildflower—a hot and hilly half Ironman—I took the blood test," remembers Thomas. "Dr. Rock told me my magnesium looked a little low. It was so subtle he said I might not even notice in training, but that I might notice in the race. I won that race."

"The needs for an elite athlete are totally different than the rest of us," explains Dr. Rock, co-founder of athletebloodtest.com and himself a former Ironman triathlete. "Blood testing has become a critical tool in predicting your performance."

Another interesting thing Dr. Rock learned about Thomas through blood testing is his superhero-like ability to recover. Whereas most endurance athletes balance on the edge of overtraining, this gave Thomas some peace of mind. "He can beat his body up," says Dr. Rock. "We tested him before and after a training camp and saw that his baseline hardly changed."

For Thomas, it makes sense that triathletes would be early adopters and prime guinea pigs when it comes to new technology in endurance sports. "Triathlon has a history of leading the technology in sports like cycling and running," he explains. "It's less regulated than those individual disciplines, and that drives the technology even more."

The truth is, few athletes are as gifted as Thomas, O'Donnell and certainly Mark Allen. And overtraining is in fact the number one mistake made by all endurance athletes, professional and amateur alike. This is why every number, every chart, every metric out there is ultimately designed to do one thing: help you train at an extremely precise effort. "My watch tells me if I've overtrained," says O'Donnell. "There's so much information out there that allows us to train smarter and recover better that you're seeing guys like [three-time Ironman champ and Kona course record holder] Craig Alexander still winning races in his mid-40s. It's allowing us to actually extend our racing careers."

But believe it or not, it's having an even more profound impact on us mere mortals. For most of us, completing an Ironman is akin to climbing Mount Everest or dunking on a regulation-height basketball rim—achievements that seem almost otherworldly, or at least only possible for people blessed with inhuman genetic codes. But thanks to technology, an Ironman triathlon is now more achievable than ever. Triathlon has sort of become one giant math problem—if you just do what the data tells you, you will one day be able to complete an Ironman.

"It's the amateurs who benefit the most from all the numbers," says Mark Allen. "In fact, the higher your body awareness—like with the pros—the less the data matters. All the new high-tech tools really flattens the learning curve."

Rock's elite-level blood testing is now available to consumers, too, which is another prime example of how amateurs can avoid making the sort of nutritional mistakes that keep them from making significant breakthroughs. Owning a good fitness tracker and ordering up a blood analysis by mail is like having a team of trainers, nutritionists and even motivational gurus on hand 24/7. "One study showed that something like 50 percent of endurance athletes are deficient in iron," Dr. Rock points out. "Amateur athletes are significantly more prone to common athletic-induced disorders like this. Amateurs are often squeezing in workouts after stressful workdays, managing reduced sleep hours and training. So knowing this becomes critical, not just for better performance but just enjoyment—it's not fun when you don't feel well."

But at the end of the day, finishing an Ironman race is one thing; ending up on the podium is another. Most pros agree that medaling requires more than a knack for crunching numbers. While O'Donnell does pay attention to the data right up until the final miles of a race, it all disappears as soon as he can smell the finish line.

"I always say that triathlon's a professional sport where talent is a lesser factor than hard work," he says. "That said, the last 10k of an Ironman run, everybody's in the same situation. No one feels good, and it's just about being able to push yourself. You're not thinking about your heart rate or anything like that—it's just that ability to drive forward."

EVERY NUMBER, EVERY CHART, EVERY METRIC OUT THERE IS ULTIMATELY DESIGNED TO DO ONE THING: HELP YOU TRAIN AT AN EXTREMELY PRECISE EFFORT.