

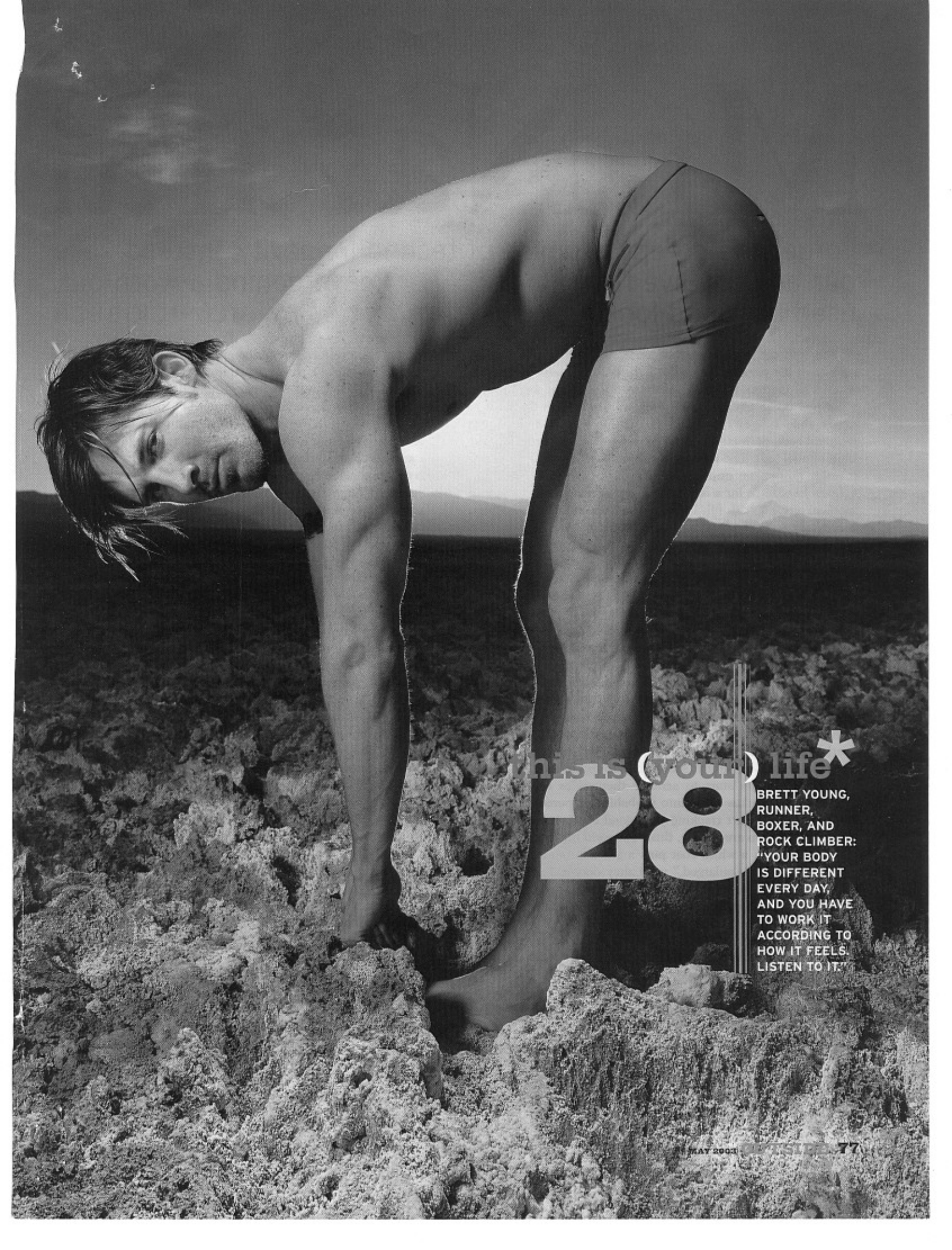
BODYWORK SPECIAL

BY ANDREW TILIN

THE FOUNTAIN OF YOUTH IS A MYTH. But take heart: Intelligent training and an adventurous spirit will keep you running, kicking, screaming at the peak of your potential for years to come.

A DECADE-BY-DECADE GUIDE TO PERPETUAL FITNESS

PHOTOGRAPHS BY JEFF RIEDEL



this is (your) life*

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BRETT YOUNG,
RUNNER,
BOXER, AND
ROCK CLIMBER:
"YOUR BODY
IS DIFFERENT
EVERY DAY,
AND YOU HAVE
TO WORK IT
ACCORDING TO
HOW IT FEELS.
LISTEN TO IT."

Mr. Natural

Forget the creepy promise of techno-longevity. Instead, take our advice: Live fast, die hard, and leave behind a worn-out, used-up, good-looking corpse.

ESSAY BY BILL MCKIBBEN

IT WAS 7:15 ON A GRAY WINTER MORNING, and I was walking across an icy parking lot at the Lahey Clinic, outside Boston, when I slipped and went down hard. Banged but not broken, I jumped up in the cartoon-quick way that guys do, as if to imply that I hadn't actually fallen but was just making a planned reconnaissance of the pavement. It was precisely the kind of accident that I'd had my share of in my first 40 years. A fluke, an outlier, unpredictable.

I was headed in for a full-day battery of tests. Lahey is a vast medical city, its walls filled with posters reminding patients that *U.S. News & World Report* ranked it one of America's top hospitals, a Harvard of healing. Partly I was there as a reporter, finishing work on a book about the efforts of technoscientists to use genes, nanotechnology, and other new disciplines to keep us alive and young forever. But mostly I was there as a recent arrival at that milestone that is 40, ready for my first real overhaul—an "executive physical," they call it. Looked at another way, I was there for my entrance exam into a statistical universe I'll inhabit for the rest of my life.

Your first four decades are the random decades. Maybe you slip on that patch of ice, maybe your SUV rolls into a ditch. But nothing medically serious happens to a large enough group of people to amount to a statistic worth knowing; the leading causes of death are still things like accidents, homicide, suicide, infectious disease. But slowly, subtly, sometime around midlife, your particular data points start to arrange themselves on the larger human curve. Flukes settle into probabilities, percentages. The doctor wants to start tracking your good cholesterol, your bad cholesterol. If you are a male, this new world hits home the first time someone in a white coat puts a glove on and tells you to bend over. ("Mildly enlarged," my Lahey doctor, internist John Przybylski, told me. "You have to get up at night to pee? That's your prostate knocking at the door.") By the end of my day at Lahey, after I'd been through half a dozen tests—from X-ray (obvious signs of arthritis around my lowest vertebra) to colonoscopy to allergy (lung capacity starting to decrease)—the avuncular Dr. P. promised we'd be able to calculate how likely I was to die of a heart attack by the age of 50.

My results were not all that startling, or all that bad, just the first inexorable signs of what could only be termed decline. All on schedule—but that was the point. My body was now on a schedule. "We're here to talk to you about the next 40 or 50 years of your life," the doctor said as he picked up my chart. Looking a little more closely at the dates, he corrected himself subtly: "The next 30 or 40 or 50 years of your life."

THIS, OF COURSE, is the great boomer bummer. Most of us alive today can reasonably expect to live to 75, while at the turn of the last century the average American dropped dead at 47. But that great leap in life expectancy won't repeat itself in this millennium—it came with revolutions in sanitation and antibiotics. Even if we wiped out cancer, we'd add only a couple of years to the average lifespan. But that doesn't mean we're going quietly into the good night. Not us—we're entitled; we've got technology. Never mind Viagra. It gets way, way weirder than that.

A confluence of new technological developments has suddenly led some from this generation to imagine that there might be an escape clause, a way out of mortality altogether. It doesn't take much poking around the techie Web sites to find people dreaming hard about physical immortality. And their dreams sound increasingly more like science fiction than science.

Consider, for example, Dr. Michael West, the head of a Massachusetts company called Advanced Cell Technology, which in 2001 (a year before the Raelian UFO cult's Clonaid claimed to have done so) cloned a human embryo. West didn't grow it into a baby, partly because he has other things in mind. Some of those things involve curing diseases—he'd like to harvest stem cells from cloned embryos to see if they're of use in the fight against, say, Parkinson's disease. But right about there, West parts company with what we normally consider medicine. He has told one interviewer after another that what he's really interested in is keeping humans alive—and young—forever. A team of biologists who worked for him at another corporation managed to synthesize telomerase, the enzyme that keeps cells from dying off after so many divisions. Now he's imagining "making body components one by one," each of them "made young by cloning. Then our body would be made young again segmentally, like an antique car is restored by exchanging failed components."

Such sentiments are not uncommon. At a conference on advanced technology in 1999, University of California at San Francisco molecular geneticist Cynthia Kenyon explained how she had dramatically extended the lives of a class of worms. It was, she told her fellow researchers, as if a nonagenarian suddenly looked forty-something. "Just imagine it: I'm 90," said the 45-year-old scientist. And if genes won't do the whole trick, researchers are ready with a wide array of other plans. Nanotechnologists—who manipulate matter at the atomic and molecular levels—believe that their tiny machines will soon be able to patrol the bloodstream, constantly repairing damage and eventually replacing all the functions of the circulatory system. When a nanotechnologist was asked in a recent *New York Times* article if

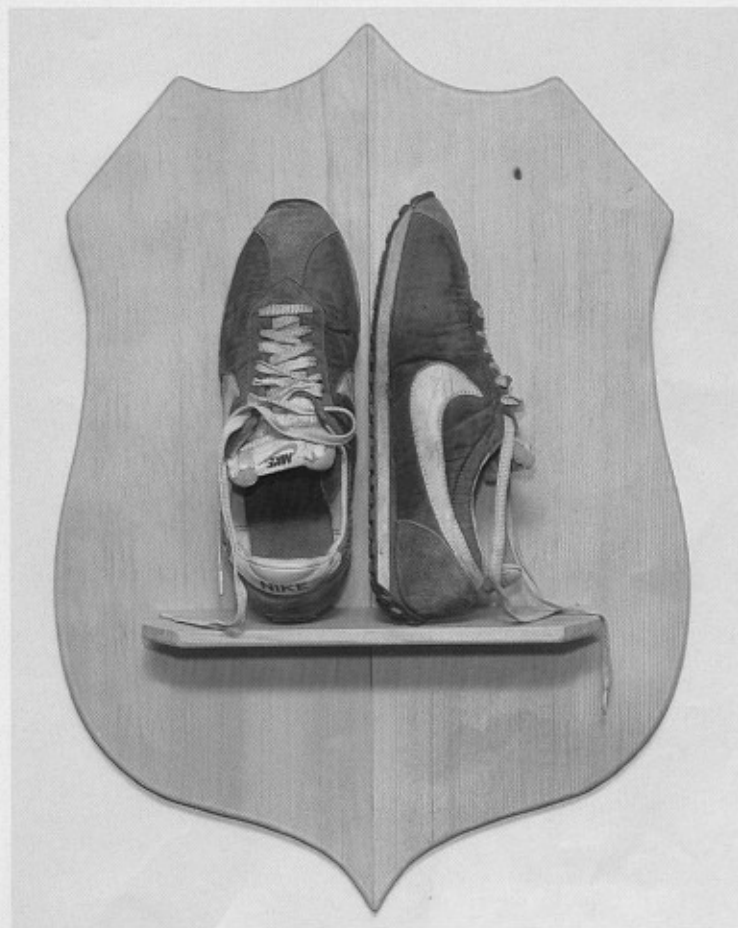
he would miss the beat of the unneeded heart, he said no: "The noise in my ears keeps me up when I try to go to sleep."

A few years ago, Alcor Life Extension Foundation, the Scottsdale, Arizona-based cryonics company that is reportedly storing Red Sox legend Ted Williams's frozen carcass, was investigated for freezing the head of an 83-year-old woman before she was declared legally dead. Alcor's attorney called in depositions from top scientists; Eric Drexler, the father of nanotechnology, asserted that "future medicine will one day be able to build cells, tissues, and organs to repair damaged tissues." Hans Moravec, head of the Mobile Robot Laboratory at Carnegie Mellon University's Robotics Institute, in Pittsburgh, took the idea further. "It requires only a moderately liberal extrapolation of present technical trends," he said, "to admit the future possibility of reversing the effects of particular diseases, of aging, and of death, as currently defined."

It is at least possible, in other words, that we stand somewhere near the dawn of that great human dream, life eternal. So why does it sound a little... nasty?

ALWAYS BEFORE, life has meant passing through. Making way for those who will come after. Coming to terms with decline. Living intensely in the moments we get. Accepting that the day will come when, instead of telemarking off the icy cornice, we'll rock by the fire and *remember* telemarking off the icy cornice. Understanding that, like everything before us, we will rot our way back into the woof and warp of the planet. That's what humans are: animals that can anticipate their demise.

And being human has always meant being, in some irreducible way, yourself. Not a genetically programmed machine designed for maximum performance, not an interface with sili-



We're not going quietly into the good night. Not us—we're entitled. **NEVER MIND VIAGRA.** It gets way, way weirder than that. There might be a way out of mortality.

con or with nanomachines giving you more power by orders of magnitude. That basic identification—I am me—is the reason that, in the end, activities like sports have real meaning. Otherwise it doesn't mean much to accomplish anything, because who is it doing the accomplishing?

Think I'm exaggerating? The same theorists working to get rid of the human heart are also busy imagining sports the new breed of humans—or semi-robots—might want to play. "This could be an especially interesting prospect for highly dangerous activities you might not otherwise have the nerve to try," writes nanotech pioneer Robert Freitas in his essay "The Birth of the Cyborg." Boxing, parachuting, mountaineering. In such a world, people could "feel reckless," Freitas says, "without risking personal harm." Without, in other words, it meaning a thing. You could be Super Mario.

OR YOU COULD CHOOSE otherwise and be yourself. As the afternoon at Lahey wore on, there was one exam left: the stress test. I stripped down to my shorts while a pretty nurse shaved my chest and hooked me up to a set of monitors. I climbed aboard the treadmill and began to walk, in accordance with the standard

Bruce protocol for the Treadmill Exercise Stress Test, beginning at 1.7 miles per hour on a 10 percent grade and getting steeper and harder every three minutes. But—and this will amaze health club athletes—you get to hold on to the front bar. It's true that by the time the 21 minutes were up, my forearms were cramping. But it's also true that I was going six miles per hour up a 22 percent grade. And I was still able to wheeze "No problem" every time the nurse asked me how I was doing. I aced the test—me, my own out-the-door-every-afternoon-for-a-run-bike-ski self.

"Now I'll be able to say yes when people ask if anyone's ever gotten all the way through," the nurse said. Could one impress pretty nurses with a nonbeating nanoheart? Could one impress oneself? When I sat down with the doctor, we looked over all my numbers and calculated that there was a 3 percent chance I'd die of a coronary before the decade was out. Three percent's not nothing, and in the next decade it will get higher, and the decade after that, and then, by God, it will someday happen. But I'll take it. I can deal with being a real human. ○

BILL MCKIBBEN's most recent book, *Enough: Staying Human in an Engineered Age* (Times Books), was published in April.



this is
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KELLY SLATER, PROFESSIONAL SURFER: "HIS BODY WORKS SO PERFECTLY WITH HIS BRAIN," SAYS SURFING BUDDY CHRIS MALLOY, "THAT THERE'S NOTHING LOST IN THE TRANSLATION."

THE REST OF YOUR LIFE STARTS NOW.

IT'S TRUE YOU CAN SHAPE YOUR DESTINY. But it will require choosing one of two paths: *1) Muscles turn to flab in your thirties, you get clumsy in your forties, weak in your fifties, and by your sixties you're primed for heart attacks and cancer. At 74, it's *sayonara*, sucka; you've just hit the average life expectancy for an American male. *2) You're Vincent Carnevale, 86, of Glen Ridge, New Jersey, and you just ran your 500th race—your 500th race since turning 70, that is. ¶ The choice is a no-brainer, right? So read on for our strategy to stay young while you're young *and* for the long run.

20s (your)

BACK IN 1999, 20-year-old John Grossman, a part-time ski instructor, kayaker, and all-around fun hog from Ketchum, Idaho, decided to take up boardercross, that nutty mix of motocross and snowboarding. But during the Swatch Boardercross at Colorado's Copper Mountain, Grossman fell and badly dislocated his left shoulder. While he endured a couple more seasons of downhill combat, he ultimately came to a rather mature realization. "In some sports, you just hurt yourself," he says. "It was too dangerous."

The Bad News "You have little concern about what life might look like after retirement," says Christina Geithner, Exercise Science department chair at Gonzaga University, in Spokane, Washington. Grossman's epiphany underscores your biggest liability during this golden decade of athletic prowess: your Superman-like self-image.

But pay attention: Your body's decline has already begun. Cartilage, that Teflon-like material that ensures smooth joint movement, is deteriorating. Flexibility-wise, you're over the hill:

Your biggest liability during this GOLDEN DECADE of athletic prowess is your SUPERMAN-LIKE SELF-IMAGE.

Males' biggest natural gains in elasticity come at about 13, whereas in your twenties, collagen, the protein-based connective tissue around your joints, begins to harden and make you stiffer if you don't stay active. Suffer a common injury like a blown knee, torn shoulder, or tweaked back and you hasten physiological decrepitude—often through the likes of arthritis. Alas, recovery from those injuries is rarely 100 percent.

The Good News "It's the charmed decade. You haven't faced your own mortality," says Geithner. And why should you? VO₂ max, the maximum amount of oxygen that your body can process, peaks in your twenties. On average, muscle makes up a whopping 45 percent of a body's lean tissue. (The rest consists of bone, organs, and water.) Double bonus: Sixty percent of the horse-

power in that muscle is generated by "fast-twitch" fibers, the ones designed for explosive activities like sprinting and leaping. With your body humming on all cylinders, you're more likely to take on activities—steepcreeking, BASE jumping, all-night Red Bull-and-vodka benders—that throw common sense out the helicopter window. Enjoy yourself.

The Prescription Keep your hamstrings and torso flexible by stretching them after every workout to ensure the muscles don't shorten and tighten up. >> "Make every third aerobic workout a cross-training day," says Lynn Millar, a fellow at the American College of Sports Medicine. "If you're a runner, cycling, swimming, or rowing offers an excellent aerobic workout while giving your hips, knees, and ankles a rest." >> Swimmers, cyclists, and other low-impact athletes, take note: Since bones develop throughout your twenties, you'll need a steady diet of explosive movements—lifting heavy weights that fatigue muscles in no more than ten reps, trail running, shooting hoops—to buttress bone density and carry you up to and through middle age. Do nothing for your bones and you risk the early onset of osteoporosis.

30s (your)

IF YOU EXERCISE AS FREQUENTLY—and intensely—as you did in your twenties, you'll retain almost all of your physical abilities from a decade ago. But that's a big *if*.

The Bad News "Physical decline happens in your thirties because you simply give it away," says Jon Schriener, the medical director of the McLaren Sports Medicine Center, in Flint, Michigan. With each year of sluggish inactivity, you're able to lift 1.5 percent less weight. And goodbye, VO₂ max: Your aerobic capacity drops up to 1 percent per year.

The Good News You can minimize these losses with hard exercise, even if you can do nothing about a diminishing ability to bounce back from grueling workouts. It's a lesson that mountain-bike racer David Roth, 37, from Los Angeles, learned to heed only after falling out of the top ten in race after race. Finally, after watching his bike-racing wife's smashing podium finish (the result of a carefully measured training plan of exercise and recovery), Roth saw the error of his go-till-you-blow

training habit, held over from his teens. To stay competitive, Roth needed to learn periodization, a training plan that ebbs and flows throughout the year, with months of increasing intensity followed by a couple weeks of recovery. According to periodization guru Joe Friel, author of *Going Long*, most thirty-somethings are capable of three physical peaks—be they marathons, bike races, or triathlons—per year. Nowadays, Roth enters only two big races during the season, but the payoff is worth it. Says Roth, “I know I’m a better athlete now than I was when I was 20.”

The Prescription Follow our basic 12-week periodization program to reach peak shape. **FIRST MONTH:** Complete a full-body weight-lifting circuit twice weekly. Do your cardiovascular workouts on three other days at low intensity, going long on one day. Each week, increase the duration of the long day’s workout by 10 percent. On the fourth week, cut the workout load by 50 percent. **SECOND MONTH:** Cut back to lifting once a week and add another day of cardio. The eighth week is for recovery, so cut the volume in half. **THIRD MONTH:** Stop lifting and use that day for cross-training. Ramp up your speed by completing one of the week’s cardio days at race pace. Your long day gets no longer, and for weeks 11 and 12 you halve its duration. Week 12 has you tapering by doing only 50 percent of week 11’s work. After you cross the finish line, take a couple of weeks off and then start the 12-week cycle anew. >> Your metabolism has started to ease off by as much as 10 percent, so steer away from the burger and fries and head toward the whole-grains shelf and the organic-produce aisle for your caloric sustenance.

40s (your)
JUST WHEN YOU THINK you’ve acquired and nailed all the skills necessary for your sport of choice, these ten years introduce serious bugs into the operating system.

The Bad News The cerebrum—the complex part of your brain that is the center for decision-making, learning, and reasoning—may shrink as much as 20 percent over the rest of your

You require 120 fewer calories per day at age 40 than at 30, but those remaining calories have to PACK MORE NUTRIENTS.

adult life. One study has shown that between 45 and 50, response functions—a combination of reaction speed and movement time—slow about 5 percent, or long enough that you’ll swipe at air instead of digging out a rival volleyball player’s spike. And simultaneously handling a lot of peripheral information also becomes harder; witness the fact that chess grand masters fade by age 40.

As for the flesh, it’s not unusual to carry about 17 more pounds of unneeded mass than you did in your twenties. As fast-twitch muscle fibers wither, explosive power recedes from your forearms and calves, diminishing climbing and sprinting performance, respectively. What’s more, key mechanisms for proper kidney function diminish by 10 percent, making dehydration a bigger threat. Drink up.

The Good News “Changing up activities expands your capacities for all physical functions,” says Waneen Spirduso, a professor of kinesiology and the director of the Institute of Gerontology at the University of Texas at Austin.

Colorado-based rock climber Jeff Achey, 44, battled encroaching mental and physical deficits by taking on sport routes way beyond his comfort level. Now falling no longer means failure—it means he’s challenging himself in the right way. “Being OK with a 20-foot fall from an overhang is a skill that every good climber needs,” he says. “I know it’s made a huge difference in my abilities.”

The Prescription You need to keep your internal balance receptors and the nervous system sharp, and you have to strengthen the small muscles that keep the back, hips, knees, and ankle joints in shape, since weakening muscles that cross over your joints result in decreased mobility. Accomplish all the above by balancing on a wobble board for ten minutes, three times a week. >> Your body requires 120 fewer calories per day at age 40 than at age 30, but those remaining calories have to pack more nutrients. Get them from vitamin-heavy fruits and vegetables, not processed foods, and start eating nuts, seeds, olives, fish, and avocados—the healthy fat in them actually puts the brakes on hunger.

50s (your)
DUNCAN HOWAT DIDN’T START ROWING until he was 54. But not long after settling into a scull, the 58-year-old general manager of Mt. Baker Ski Area, in Washington, realized a couple of things: He’ll never again have a 25-year-old’s engine, but someday he could have an Olympian’s stroke. “I asked myself, How do I best offset the effects of aging?” recalls Howat. “Emphasize technique to the maximum.”

The Bad News By your sixth decade of activity, it’s time to take an age-related reality check. You’ll still be able to play outside plenty hard, but after 50 you need biomechanical efficiency to offset natural physical deterioration. To wit, muscle-mass losses can accelerate to 1 percent annually, and bone density can start slipping at a rate of approximately 0.4 percent per year. You’ll increasingly struggle to focus clearly on the newspaper as tissue changes in your eyes, and your cardiovascular system will maintain its slow but steady decline.

The Good News A weight-training regimen will prevent peak power from falling dramatically until you’re past 60. And as Howat proves, you’ve still got excellent coordination.

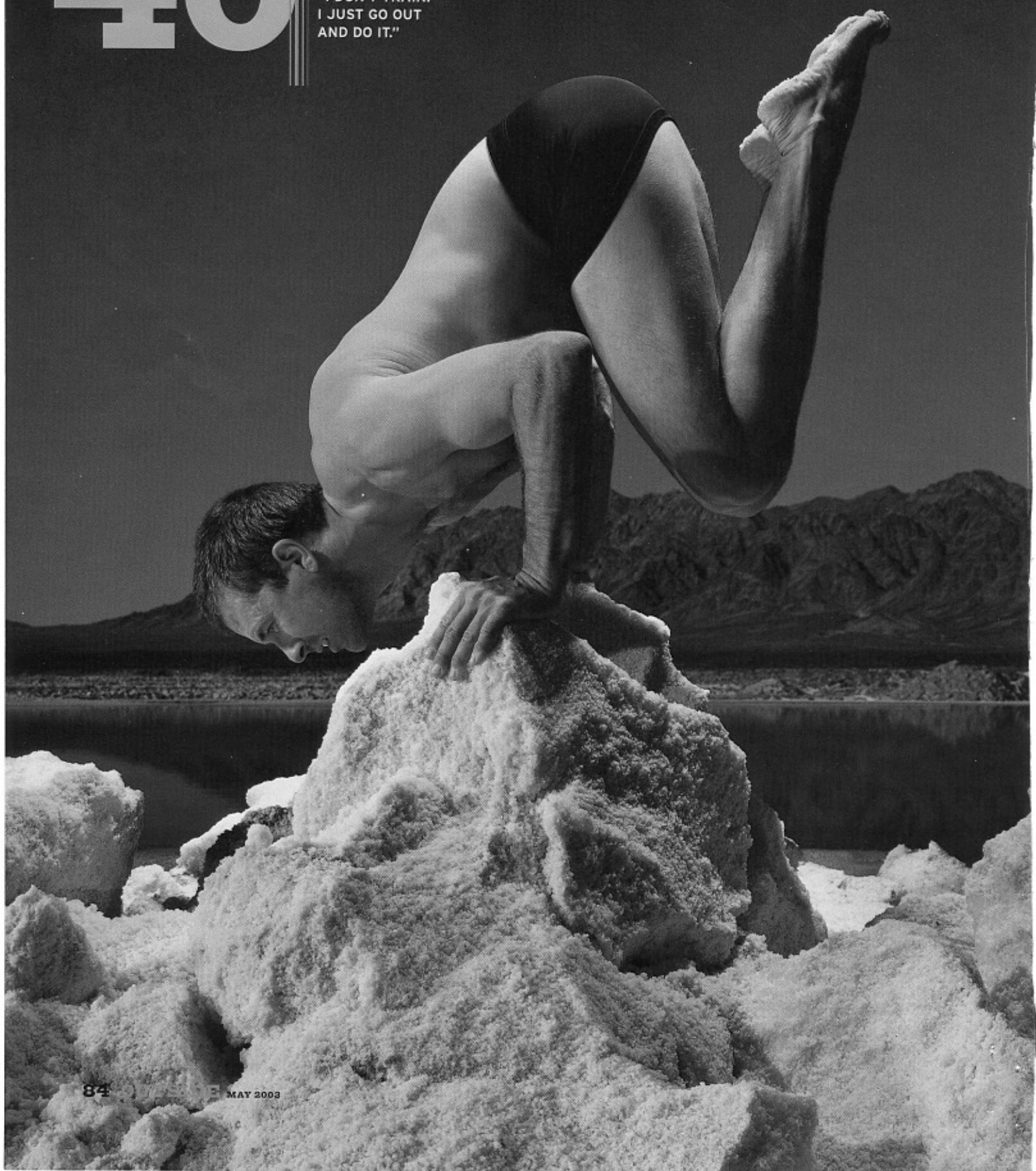
“Compared with the rate of muscle-mass loss, an athlete’s loss of kinesthetic awareness (a sense of where and how your body parts move) is quite slow,” says Spirduso, who conducted a study of masters rowers in 1998 and found that even into their sixties, the oarsmen posted times that were only 17 percent off world-record marks. Spirduso partially attributes the graybeards’ amazing performance to their excellent form.

The Prescription Lifting three times a week can help you avoid losing as much as 15 pounds of muscle mass. Work the whole body: chest, back, shoulders, stomach, and legs. Studies show that in only two

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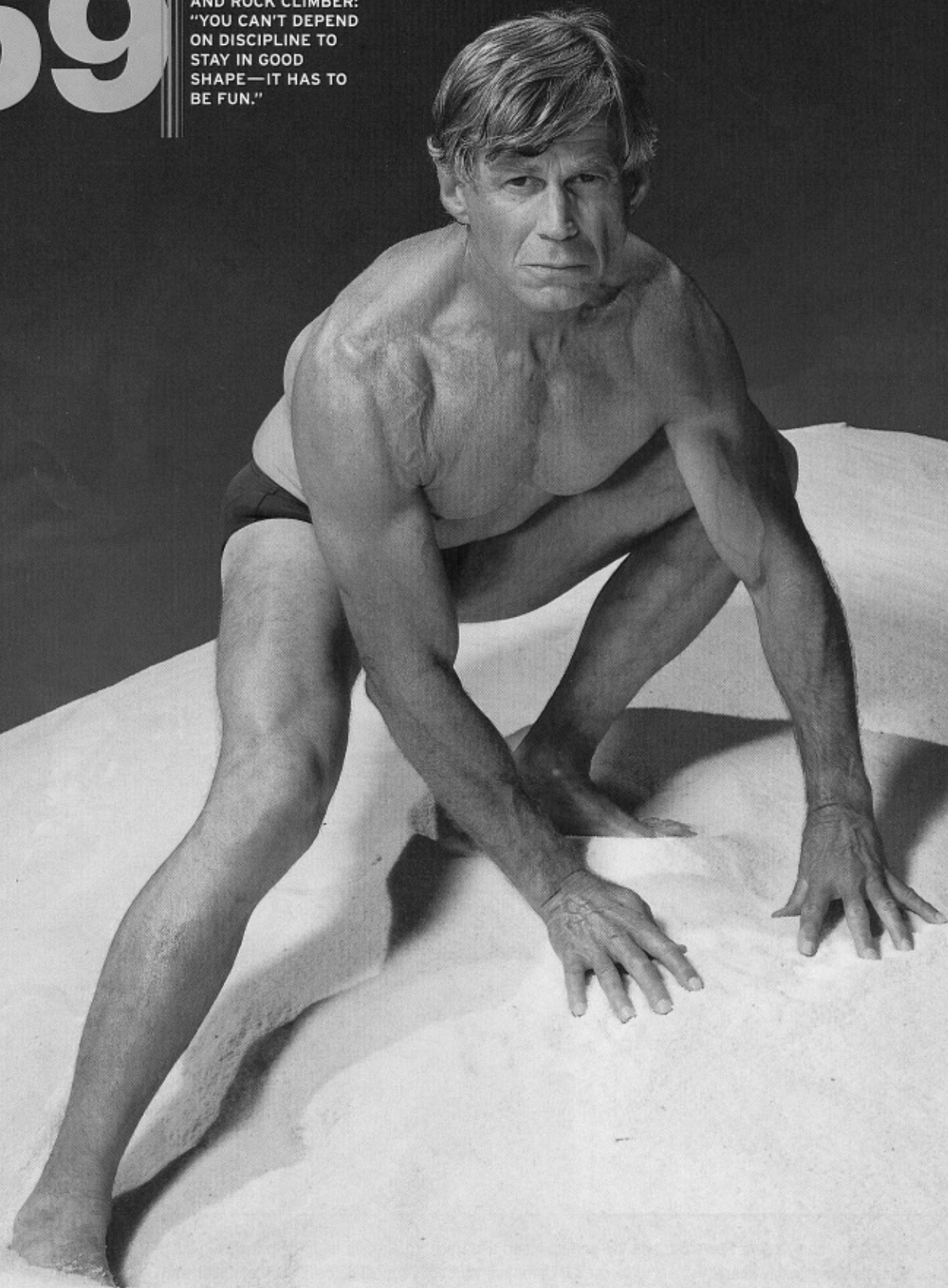
BRIAN LUTHER,
MOUNTAINEER
AND KAYAKER:
"I DON'T TRAIN.
I JUST GO OUT
AND DO IT."



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JAMES DUKES,
CYCLIST, JUDOIST,
AND ROCK CLIMBER:
"YOU CAN'T DEPEND
ON DISCIPLINE TO
STAY IN GOOD
SHAPE—IT HAS TO
BE FUN."



months, you'll gain two and a half pounds of muscle and could lose more than four and a half pounds of fat. "Make sure to vary the weights and reps with each workout to prevent your muscles from adapting to the loads," advises William Kramer, professor of exercise physiology at the University of Connecticut. One day, lift heavier weights for six reps. The next, lift lighter loads for 15 reps. The next should be a normal day of pushing out ten reps. » Assuming your body's in good shape, there's no medical evidence that says you need to reduce the frequency and duration of longer aerobic workouts. "But slow down, pay close attention to hydration, and be modest about your training intensity," says Walter Bortz, marathoner and co-chair of the American Medical Association Task Force on Aging. "Older runners can run marathons, but they still need to do all the training everyone else does." » The Institute of Medicine recommends a daily calcium intake of 1,200 milligrams. Pills aside, swallow three daily servings of leafy green vegetables and dairy products to keep those bones strong.

60s (your)

YOU TOOK A LITTLE TIME OFF from working out? Maybe a couple of decades? Don't panic, it's not too late. "I lived in Southeast Asia for 18 years, smoking and drinking and carousing and falling out of shape," says ex-Olympic swimmer Jeff Farrell, 66. Returning to the hyperfit environs of Southern California, however, kicked him back into gear. Within a few years, he was setting new masters swimming records.

"Exercise isn't a bulletproof vest, but it maximizes your potential for a healthy future," says Wojtek Chodzko-Zajko, professor of kinesiology at the University of Illinois at Urbana-Champaign and president of the International Society on Aging and Physical Activity.

The Bad News Exercise and a healthy lifestyle now represent the difference between life and looming mortality. Between 60 and 79, your chances of getting cancer are one in three. But scientists believe that a full third of cancer-related deaths could be prevented through improved diet and a regular fitness regimen.

For those of you who never retired the gym bag, you've lost 25 percent of your peak power but can still make gains in hamstring flexibility. Your reaction time is 20 percent off its peak of decades ago, but you've got more fast-twitch muscle fiber remaining than was once thought possible. Arthritis affects more than 4.3 million men over 65, but studies indicate that a weight-lifting regimen eases impressive amounts of discomfort—more than 40 percent.

The Good News Science indicates that a return to training at any age reverses the effects of poor health and brings you back to solid form. In a study begun in 1966, researchers gave a fitness test to five healthy men, all in their twenties. Thirty years later, the men were tested again after participating in a moderate six-month endurance training program. The results showed that the subjects' VO₂ maxes reached their levels of 30 years ago.

The Prescription Build up the muscles around your joints to ward off pain caused by osteoarthritis with squats, step-ups, and leg extensions three times a week. » Eat foods rich in omega-3 essential fatty acids—such as salmon and albacore tuna, as well as olive oil

SCIENCE indicates that a return to training at any age REVERSES THE EFFECTS of POOR HEALTH.

and flaxseed oil—to reduce tissue inflammation caused by arthritis. » Cross-train with tai chi to utilize your body's full range of motion and keep your neuromuscular network in tune.

70s (your)

YOU ALREADY MET VINCENT CARNEVALE, the perpetual-motion runner and our poster boy for supercharged seniors. Ask him if the scientists who claim that athletes as old as 70 can increase calf-muscle size by 12 percent are right. He'll probably say, "Of course."

The Bad News Experts say that mechanical signs of aging accelerate inexorably after 70. Arthritis becomes more prevalent. VO₂ max decreases until your body utilizes more than 50 percent of its aerobic capacity to accomplish daily tasks, threatening your independent lifestyle. Studies indicate severe strength drop-offs: Backs, hands, and biceps all get notably weaker.

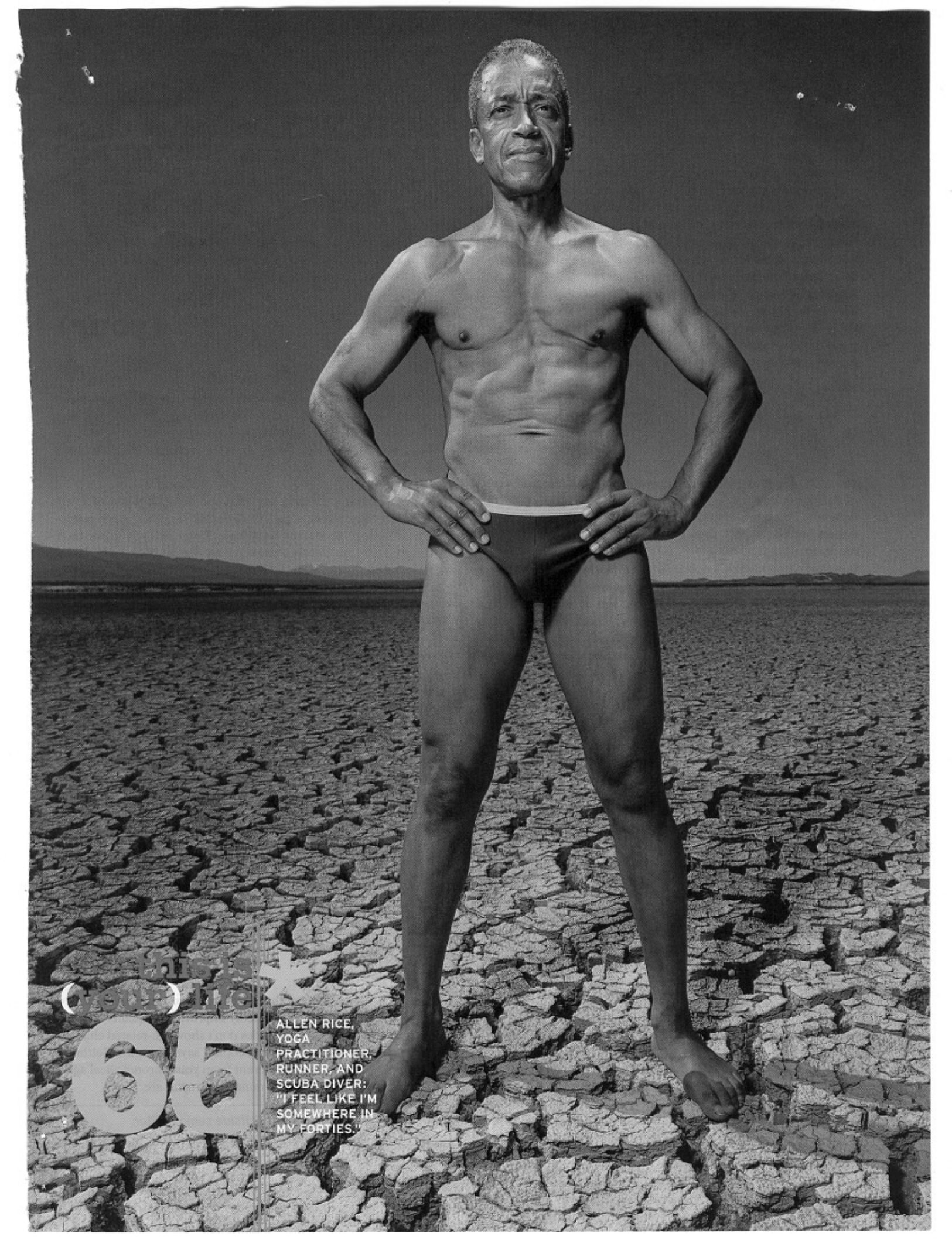
The Good News Or do they? In a study that tracked a six-month weight-lifting program for men over 70, the subjects reaped 60 percent increases in peak quadriceps strength. And a separate 12-week training study for participants between 85 and 97 showed 134 percent increases in power.

"It's unclear how far these changes in performance are due to a lessening of training with age versus aging itself," writes exercise physiologist Roy Shephard in his book *Aging, Physical Activity, and Health*. If you stay active, the medical community might learn a few things from you.

The Prescription With clearance from your doctor, train with similar frequency and intensity as the youngsters. In the gym, using relatively heavy loads and performing as little as one set of only eight reps will generate impressive gains. » The body's thermostat has gone on strike. Sweat glands operate less efficiently, making you more susceptible to heatstroke. Avoid extreme heat. A thinning of the skin layer called the subcutis results in less insulation, which, combined with poorer circulation, makes seniors likelier candidates for hypothermia. Bundle up.

RESEARCH HAS PROVEN that consistent exercise can add two years to your life, and it undoubtedly improves the quality of those years. "People with active lifestyles don't show age-related changes to the same degree as sedentary people," says Christina Geithner. "Your biological age can be different from your chronological age." If you're fit, you'll always act younger than you are. □

ANDREW TILIN is a former *Outside* senior editor.



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ALLEN RICE,
YOGA
PRACTITIONER,
RUNNER, AND
SCUBA DIVER:
"I FEEL LIKE I'M
SOMEWHERE IN
MY FORTIES."



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JOHN MCCUTCHAN,
WEIGHT LIFTER,
RUNNER, AND
SWIMMER: "RUNNING
FLUSHES THE SYSTEM
AND GETS YOU INTO
THE ZONE."