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Better, faster, smarter

Today's shoes do everything except talk—and that's on the horizon.

By Marnell Jameson, Special to The Times

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ATHLETIC footwear's come a long way from the days when runners strapped pieces of leather to the bottoms of their feet.

The biggest improvements now and on the way involve new mechanisms in midsoles — the slice of protective cushion between the shoe's upper and its outer sole — to better absorb impact; shoes that sense the pressure you need and let you "adjust your ride"; and smart shoes that incorporate computer technology and provide feedback about your performance.

Soon, even smarter shoes than today's may strike up conversations with you — telling you how to avoid an injury, when you're off balance or to pick up your pace.

"Everyone making athletic shoes is out to accomplish the same goals: absorb impact, give runners a plush ride, and take the strain and stress off their bodies," says Patrick O'Malley, vice president of product for Saucony, an athletic shoe company in Lexington, Mass.

Breakthroughs usually hit running shoes first, and then basketball shoes. "Runners and hoopsters tend to be the early adopters of new technology," says David Cornwell, lead patent attorney for Adidas, which owns Reebok.

But if you're a baseball or soccer player don't despair: Eventually, the technology will percolate down to your footwear too. "Every serious athletic company is making great shoes. Athletes can and should expect a great fit and better protection," says David Jewell, director of running for Road Runner Sports, a San Diego-based chain of running stores.

The hard part for buyers, he adds, is choosing. There is so much product on the shelves that knowing what to select can be overwhelming.

As shoes keep getting smarter, consumers will have to as well. Read on for a look at what's here and on the way.

Midsole makeovers

The midsole is where most of the improvements — and current hype — abound. Almost all running shoe midsoles today are made of blown-in ethylene vinyl acetate (EVA), a foam that provides a great cushion. But EVA's drawback is that it breaks down quickly, so athletes soon lose the benefit of the cushion.

Foam breaks down after the first 1,000 steps, says Peter Foley, chief operating officer for Skydex Technologies, a Centennial, Colo.-based company that develops foam alternatives. The average runner takes 1,600 steps in a mile. "I always tell people to enjoy their first mile," he says. "The shoes are really shot after 200 miles. But people still run in them."

As a result, innovators have been moving toward air, gel and other mechanisms that are thought to absorb shock better — an especially important factor for people who are getting older or are heavy.

But the real trend in athletic footwear is to replace foam with mechanical systems that do the same job better. (Currently, more than 80% of running shoes on the market have EVA foam midsoles, but Nike Air shoes, for example, feature an air-filled midsole, and Asics is known for its popular gel-filled midsoles.)

"The key is to create the ideal mix of cushion, rebound and durability," says Mark Nenow, vice president of footwear for Brooks Sports in Bothell, Wash.

Saucony's answer to a better midsole is ProGrid, a net-like structure in the midsole that provides support and rebound, O'Malley says.

"We looked at the sweet spot on a tennis racquet, the place that gives a great return on impact, and tried to replicate that in a gridded midsole that lets the foot down gently and rebounds back well," he says.

ProGrid, a rubber-enhanced EVA grid embedded in the midsole over a pocket of air, absorbs 10% to 15% more impact than EVA, gel or air in tests. It theoretically won't break down as fast as EVA and thus should offer more joint protection.

The company developed its grid technology in the '90s, but ProGrid is the latest evolution: It debuted in Saucony's Triumph 4 shoe last month. In June, Saucony will release Grid Sinister, which will incorporate the new grid technology in a track shoe. A plate in the toe of the shoe will help sprinters push off and bound faster.

Skydex has also developed an alternative to EVA foam midsoles comprised of a novel shape of plastic urethane. To explain the technology, Foley says to imagine a tennis ball cut in half. Then take the two hemispheres and reverse them so the bottom and top are touching to create a spring.

An independent lab has tested Skydex's midsoles against foam ones and found that after a million impacts, foam lost 40% of its cushion and 20% of its thickness while Skydex lost just 9% of its cushion and 4% of its thickness.

When Skydex midsoles were compared with gel and air midsoles, they also fared better. On a scale in which a smaller number indicates more durability, gel midsoles registered 13.3, air midsoles 12.1, and Skydex 10. Those may not seem like big gains, but "we've all gotten so much better that incremental gains in this industry mean a lot," Foley says.

Skydex technology is in all Pearl Izumi shoes as well as some Nike shoes. (It is also in such diverse products as wheelchair seats, football helmets and boat decking on Navy SEAL speedboats.)

While other shoe manufacturers work to replace or augment EVA with grid systems, Brooks Sports is banking on a better EVA. Last summer the company introduced its MoGo cushioning, a modified EVA.

The first shoe to include this "better" EVA is the Trance, which offers 40% more cushioning and 22% more rebound than the next-best shoe in its line, Nenow says. MoGo will debut in two more Brooks shoes — the Adrenaline 7 and the Glycerin — this month.

Adjusting the ride

As trends wax and wane in the footwear industry, a lot of new technology comes and goes. One innovation that didn't fizzle was the Reebok Pump. Now the company's taking it to the next level.

Introduced in 1989, the shoe had an actual pump that consumers used to inflate the upper of the shoe for a custom fit. It was a big success.

Last year, Reebok came out with a new automatic pump shoe. The upper of the shoe inflates with each stride until it reaches a pressure level pre-set by the wearer. Past that point, the air bleeds off. This lets athletes tailor the fit to the pressure they like.

Adidas used the same idea in the bottom of its Adidas-1, which came out in 2005.

A microprocessor in the shoe allows runners to adjust the shock absorption from hard to soft, depending on their weight and the impact of their activity — leisurely jogging versus sprinting, for example. A sensor in the heel of the shoe registers compression and adjusts through a series of wire coils that stiffen or relax based on demand, resulting in the most expensive shoe on the market — retailing at \$250.

It's a good example of the kind of underfoot innovations that will continue to allow athletes to adjust their rides.

One of the reasons for the \$250 price tag is the lightness of the shoe. The challenge for shoemakers, Cornwell says, is to keep a shoe light while at the same time adding new bells and whistles.

"Weight in shoes is a big deal...When we get the weight down, the costs go up," he says. "We're working to do all this great stuff, which requires shoe bladders and pumps, and keep the weight down."

Cornwell expects that within the next few years, each of the big companies — Nike, New Balance, Adidas — will have an affordable shoe that will let consumers customize both the underfoot cushion and the upper fit.

Outside the shoe box

Deep inside the walls of Timberland, a Stratham, N.H.-based company known for outdoor sporting gear, is the Invention Factory. Here, a team of researchers are paid to come up with unconventional ways to improve footwear. Team members study biomechanics, exercise physiology, and variations in terrain, temperature, foot type, weight, age and gender, says Doug Clark, Invention Factory vice president.

This March, the team will introduce a shoe just for trail runners: GoLite footwear.

"We looked at EVA foam and saw that what was good for road runners wasn't so great for off-road runners," Clark says. Whereas road runners need a shoe that's soft against the foot and tough against the ground, trail runners need a shoe that's softer against the ground, and less so against the foot; shoes with stiff outer soles lose stability.

To make a good trail shoe, Clark's team found inspiration in a car commercial in which a gem cutter sat in the back of a car cutting a diamond while the car drove over rough terrain — the wheels were bouncing and absorbing the shock, allowing the rider to cut a flawless gem. GoLite will have "metamorphic suspension," a fancy way to say the softer part of the shoe hits the ground first.

Footwear innovators are constantly seeking ways to increase the "smartness" of their shoes. Another new development will come in August, with Saucony's Paramount shoe that will include a snazzy mesh in the upper designed to keep feet cool and help prevent blisters. This ComforTemp material monitors foot temperature; When it reaches 82 degrees the fabric adapts and cools the foot.

But the real excitement, Clark says, is coming in the next 10 years. "I expect to see a computer in almost every type of shoe. We'll see technology in shoes that will aid wellness, so a customer can count steps or calories burned. We'll see GPS systems in a hiker's boots, and LoJack systems in children's shoes. These technologies are here, and their applications will become affordable."

Nike+ is the most recent example of a smart shoe. Last year, Nike partnered with Apple to create a system that links Nike running shoes with the iPod Nano. The shoe has a quarter-sized chip that inserts into the midsole. The chip tracks the runner's pace and distance, and a voice, via the Nano, tells the runner how he or she is doing. It can also track calories burned and let you download your workout statistics onto a log on your home computer.

Though the chip doesn't reduce injuries or enhance performance, it does make the run more enjoyable.

Footwear futurists say this is just the beginning of how computer technology and athletic shoes will team up. They foresee shoes that will work with the body to pick up cues that could signal trouble and correct for those. If the shoe detects the person has a balance problem, for instance, it will adjust. If a runner's form is putting him or her at higher risk for an injury such as a stress fracture, the shoe could warn the runner.

Even sooner — within six to seven years — futurists expect to see affordable, longer-lasting smart shoes that will sense a person's weight and adjust shoe cushioning, as well as monitor heart rate and pace and offer coaching feedback.

The ultimate goal is to improve performance, O'Malley says. "If we can create shoes that prevent or foretell injury, then athletes can train better and longer, and the best will get better.

"Plus, the longer we can keep people in the game, the more shoes we sell."

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The good news

Consumers never have had so many great running shoe options. The bad news: The number of choices can make runners run for the hills. Here are some tread-buying tips from David Jewell, director of running for Road Runners running-shoe stores.

- Don't wait too long. Shoes wear down at different rates depending on a person's weight and impact, but on average you should replace shoes every 300 miles. (Some runners write the date of purchase on the shoe with a marker, enabling easy calculation if they know their weekly mileage.)
- Go to a store that specializes in fitting folks with athletic shoes. Find a salesperson who can size up your feet, how you run and your plans. Many running-shoe stores have video treadmills or pressure mats that allow salespeople to look at your gait as you walk or run.

- Bring in your old shoes. A good salesperson can tell a lot about how you run by looking at them.
- Wear the socks you plan to run in when trying on shoes.
- Try on both shoes and run outside in them (serious running-shoe stores often suggest you do this), or on the store's treadmill.
- Look for great fit and cushioning. Shoes should feel good right out of the box and should have a nice bounce.
- Don't get hung up on price. If you pay \$20 more than you planned to, consider it a bargain compared with the cost of an injury. Expect to pay about \$90: The price for a decent shoe ranges from \$75 to \$160.
- Don't be vain. Pick the shoe that fits you best, even if others are more stylish.
- Ignore sizes, which vary a lot between brands. Many people run in a shoe a full size bigger than their normal shoes.
- Don't lock onto one brand. (You hear about runners who find out their favorite shoe is being discontinued and go buy 15 pairs.) Be aware of positive changes in other brands. Try, if not a new brand, the next evolution of the brand and model you like.
- Don't get lured by marketing hype. Words such as "high performance" or the fact that some all-star athlete is wearing the shoe are usually meaningless. Pick what feels right and will best do the job.

— Marnell Jameson

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