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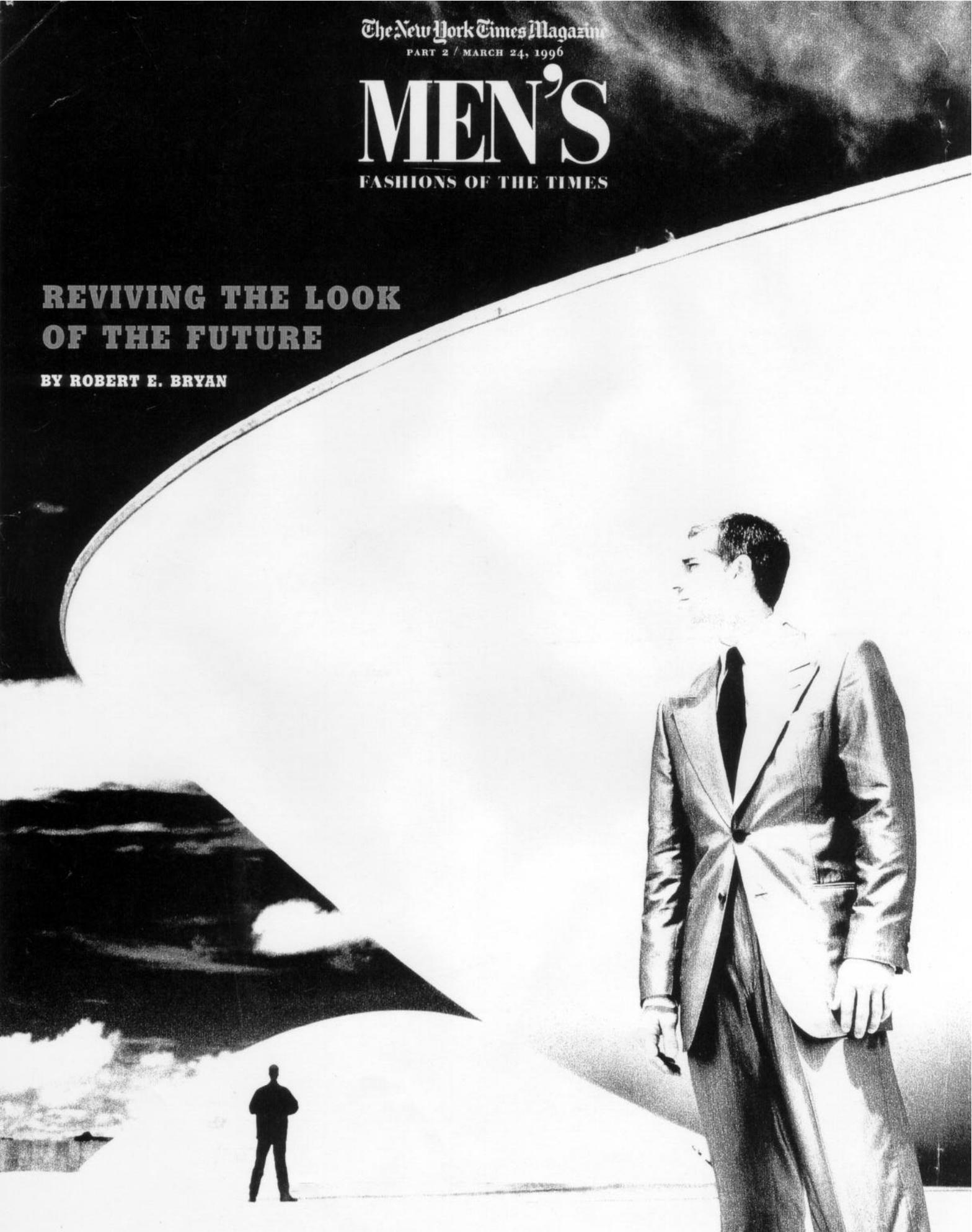
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MEN'S

FASHIONS OF THE TIMES

REVIVING THE LOOK OF THE FUTURE

BY ROBERT E. BRYAN



DIGITAL DRESSING, OR SOFTWARE TO WEAR

BY NEIL GERSHENFELD

SHOES that think? Ties that talk? A shirt that changes color? The long-predicted convergence of computing and communications is finally happening, thanks to the Internet. But the arrival of the talking computer is going to pale compared with that of the walking computer, as the very fabric of computing changes when the network is unplugged from the wall and wraps itself around us in smart clothing. World Wide Web, meet the Person Wide Web.

Sound farfetched? But when you think about it, what manufactured material receives the most attention from the most people? Clothing, of course. It surrounds us during the day and during the night, when we work and when we play. We spend an inordinate amount of time selecting and maintaining it, but what do we ask in return? Not much more than that it look good. Given all the money and effort that goes into dressing ourselves, we should demand much more.

Perhaps the most radical aspect of smart clothing is going to be just how ordinary it will look. New kinds of materials and mechanisms will be embedded in our clothes and accessories, enabling them to sense, compute and communicate. The oldest of technologies — clothing — can help us fix the newest, managing our information overload.

Yesterday's vision of tomorrow's fashions featured lots of nice swoopy, streamlined details, presumably just the thing Flash Gordon needed for the occasional re-entry. But it didn't do anything. Until now, we haven't expected more active roles for our clothes; somewhere along the way we've forgotten that Maxwell Smart's shoes really were useful.

Consider your shoes. You rarely go anywhere without them, they have plenty of unclaimed space in the sole, and they've got a great untapped energy source (in the electricity captured from the mechanical power of walking). What better place is there than a shoe sole for placing your portable computer? But a shoe computer will never be accepted if, like Max at a predictably inopportune moment, you have to take it off to use it. Last year

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The next wave
of the computer
age gives a
whole new
meaning
to 'smart
fashions.'

at the Massachusetts Institute of Technology's Media Lab, Thomas G. Zimmerman and I developed a technique that solves this problem: It turns your body into a data network by sending tiny harmless electrical signals through it, enabling, for example, two people to exchange digital business cards between shoe computers with a handshake. To log on, you boot up; simply getting dressed equips you for your day's informational needs.

The traditional focus of the computer industry has been on the central processors, but as Joel Bimbaum, Hewlett-Packard's senior vice president of research and development, points out, "peripherals are central" (since people interact with their computers through the external accessories, such as printers and keyboards). It's a small step to shift the focus from the computer's peripherals to

your own, which have long been claimed by such clothing accessories as rings, shoes and glasses. It's now becoming possible for these long-dormant objects to wake up, raising the interesting question of whether to go to Egghead or Brooks Brothers to accessorize an outfit.

Beyond accessories, there are a number of new functions in store for fabrics. Special thread materials — polymers and alloys that have electromagnetic properties — can be sensed from a distance. For example, instead of a name tape sewn onto a collar, the collar itself can become the identification, providing a beacon to help parents find lost children or, perhaps less helpfully, for your boss to find you.

There are already fabrics that can vary their thermal properties, but new kinds of fibers that contract in response to an electrical current, chemicals or temperature may be woven in to make clothing that can both act and react; your tie may loosen itself if you are too hot.

New kinds of dyes that can change color in response to voltage, light or heat can be used on fabric, so that even the appearance of your clothing can be modified by downloading new software. A shirt made out of such materials could not only cut down on the size of your wardrobe by changing colors each day, it could also display the time or the day's headlines on your sleeve.

Such capabilities are certainly intriguing, but not quite enough to justify upgrading your clothing. Perhaps the most important reason for acquiring smart clothes will be that they can serve as a shield, helping bring you the information that you do want while screening out that which you don't. The lure of this kind of assistance has some people now wearing cumbersome but powerful early versions of smart clothing.

Steve Mann, pictured on the following page, is one of the Media Lab's best-dressed doctoral students. Mann wears small cameras that feed into a computer screen inside the lenses of his eye wear. He can transfer the images the camera sees to the Internet by wireless communications, via an antenna that sends and receives radio signals. The system lets him enhance what he sees (need more magnification to read? have trouble seeing in the dark? want to look backward when riding a bicy-



Steve Mann, a doctoral student at M.I.T., has updated his bulky 1980's computer wardrobe, left, with a sleeker and lighter version for the 90's. His current rig, right, has a computer screen and camera in the eye wear, a hand-held keyboard and an Internet-connected computer.

cle?), augment it with extra information (he can display his temperature and heart rate, for example), and even share it with others (you can look through Steve's eyes at <http://www.wearcam.org> or by doing an Internet search for wearcam).

When one of his fellow cyborgs, Thad Starner, took a seminar I was teaching, the display glasses of his wearable computer enabled him to see both me and the notes (taken with his hand-held keyboard) on my already downloaded lecture.

This blurring of real and virtual worlds is one of the most profound implications of wearing smart clothes. When you speak, you might be addressing someone next to you, you might be using your lapel to converse with someone thousands of miles away, or you could be talking to your shoes. If you hear voices or see spirits, it may just be an incoming call. As the real and virtual worlds coalesce around you, your immediate neighborhood will be as large or as small as you choose.

When today's road-warrior pulls out a cellular phone, laptop and pager, he or she is malting something

of a fashion statement that announces, "I'm digital." As these functions disappear into our clothing, how we choose to announce our digital presence is going to grow in importance. A roomful of people transmitting information can literally "network," sharing data about interests and abilities. Exposing ourselves digitally like this raises obvious privacy and security concerns, but there are good cryptographic techniques that can address these issues. The harder questions will be social: Do we need gestures beyond handshakes and kisses to manage communication?

Ultimately, fashion is going to mean more than fabric. On the Internet, nobody knows if you're in your underwear. (I suspect that an awful lot of morning E-mail gets answered that way.) In a virtual meeting, 3-D graphics and audio will let you look like literally anything — Arnold Schwarzenegger or a kangaroo — as the meeting is actually being conducted. Once that happens, the (currently very hard-to-find) 3-D designers who can dress your virtual representation are going to

be at least as important as the designers who now dress the real you.

It's not unreasonable to see the development of smart clothing as a new evolutionary stage in our development as a species. It was a big step for molecules to work together to form cells, for cells to form organisms, for organisms to learn to form families, and for families to choose to form communities. But what happens if the collective knowledge of the entire community can be available to all of its members?

Smart clothing shakes the very foundation of our notion of an indivisible personal identity. Like each of these other evolutionary steps, it will happen if the collective benefit outweighs the individual loss of autonomy. Indeed, the enthusiasm of the people living with the current crude versions suggests there is something much deeper than novelty attracting them.

While the emergence of a new form of life is perhaps a bit much to expect from a new tie, don't be surprised when someone asks, "What channel is your Chanel?" ■