Technicall

> Advances in communication aides continue to hit society at an ever-quickening pace. Are we ready to talk about where we go from here?
> By Richard Yonck

Communication. Every living thing does it in one manner or another. Plants, animals, even protozoans rely on communication in the course of their daily efforts to survive and thrive in their environments. Yet out of all the world's communicators, none do it so well or in so many varied ways as we humans do. But if we think we're the great communicators now, consider how we'll be talking to each other in the not-so-distant future.

From earliest pre-history, people conveyed their thoughts and intentions almost exclusively through speech and gesture. We were an oral society, dependent on the immediate presence of whomever we were speaking with. Once our audience moved out of sight or beyond the range of our voice, communication abruptly stopped.

Then writing and recordkeeping developed, gradually becoming increasingly intricate and nuanced. The invention of the printing press allowed writing to be mass produced, and before long, ideas and information were being distributed far and wide. This broad dissemination of knowledge contributed directly to the European Renaissance and the Scientific Revolution that followed. A relatively short time after that (at least in historical terms), the Industrial Revolution set the stage for the invention of numerous new communication devices. In the span of less than a century, the telegraph, telephone, and television were all invented, making near-instantaneous communication at a distance possi-

y Speaking

Augmented reality (AR) is the overlaying of virtual information onto our physical environment. In the last year, these applications have really started to take off, especially on smart phones. These devices are a good match for AR because of their connectivity, portability, and GPS, which provides useful location information. You've probably already seen simple uses of AR in televised sporting events, such as displaying football first down lines. Augmented reality applications will eventually be used to add highly interactive digital content to everything from work environments to social activities.

Before long, various types of heads-up displays and virtual retinal displays will pair up nicely with AR technology. Instead of looking continually at your smart phone, these devices will overlay the information directly over your field of vision. While it's unlikely we'll see everyone walking around the streets wearing these, they're well-suited to manufacturing, repair, and service jobs where hands-free access to contextual information is a plus. Within a decade though, bionic contact lenses may begin to make these earlier devices obsolete. These lenses would directly overlay virtual displays onto the wearer's field of view and are under development by a number of research groups including a team at the University of Washington.

As with so many modern devices, universal translators once belonged to the realm of science fiction, but not for much longer. Machine translation methods are becoming increasingly sophisticated and accu-

ble. (The Greek root "tele-" means distant, so its use as a catchall prefix at the time was very appropriate.)

The 20th century continued to witness the development of more methods and devices for moving information around. At the same time, the time frames in which these were being developed were shrinking at an almost clock-like rate. Satellite communications, cable television, cellular telephones, the Internet and the World Wide Web, Wi-Fi, wireless and Bluetooth—the ways we communicated with each other continued to grow.

Taken by itself, any one of these technologies would have been world changing. Together, they have transformed our planet into a truly global society—one in which ideas are generated and shared nearly at the speed of thought.

But this, as they say, is only the beginning.

During the coming decades, the ways we communicate will continue to diversify and, perhaps more importantly, they'll continue to *virtualize*. This is a long trend that has been developing since the invention of writing allowed us to communicate with someone who wasn't in our presence. The telephone and other electronic devices continued the trend. More and more, we're able to interact with everyone and everything without the need to be physically present.

At its outset, each new technology is novel, strange, foreign, and not infrequently viewed with suspicion. But as time passes and users become familiar with it, acceptance becomes the norm. The technology becomes transparent to us and "disappears" in terms of our awareness of it.

So how will we be communicating in the years to come? The current decade will certainly build on the foundations and recent advances in communications and computing. As these fields continue to converge, we'll see *augmented reality* become increasingly present and sophisticated.

rate. According to Franz Och, Google's head of translation, "We think speech-to-speech translation should be possible in a few years." Google's intention is to eventually be able to do real-time speech translation for all of the world's

6,000-plus languages. Single-language translators are also being developed by the U.S. military for use in the field. As translation devices improve, it's only a matter of time before all language barriers become irrelevant.

Beyond this, possibly in the 2030s, methods that tie directly into our sensory systems will begin to allow sight, sound, smell, taste, and touch to be transmitted from one person to another. Such technology may allow professional "beamers" to create experiences that can be shared with and used to entertain others. In essence, you'll not only be able to walk a mile in someone else's shoes, but in their body as well. It might even be possible for lovers to share sensoriums, experiencing their partner's sensations as though they were their own.

Eventually, thoughts too will become part of the global conversation. Already there are methods for controlling computers, wheelchairs, even games with our minds. It's reasonable to assume this technology will get better with time. While developing the means to receive thoughts will be a good deal more difficult than sending them, recent research suggests this isn't an insurmountable problem. Advances in stimulating and inhibiting individual neurons by MIT neuroengineers give a small hint of future capabilities.

There can be little doubt all these new technologies will create considerable upheaval in existing fields. Already the music and publishing industries are seeing tremendous sea changes brought about by new media, forcing them to rethink their business models. Such disruptions are only more likely to arise as new methods of communication develop.

Ultimately, communication is about interconnecting with other people and the world around us. In recent years, our social interactions have been reflected, expanded, and transformed by media like Facebook, YouTube, and Twitter. In all likelihood, social media will become increasingly ubiquitous, a continuously available aspect of our lives no matter where we are. More and more, they'll contribute to our daily reality with virtual representations routinely overlapping with our physical world. Sound, vision, even thoughts will one day be transmitted effortlessly. But perhaps most importantly, as with most technologies, this will all become invisible to us. As with the cell phone of today, we'll eventually think nothing of all this techno-magic, becoming truly aware of it only when it's not available.

All of these new technologies will bring their own sets of unintended consequences. Technical issues related to security and privacy will no doubt recur with each new iteration. Social and moral debates will try to address matters such as addictive behavior, truth in advertising, and infidelity. But as we've always done in the past, we'll learn how to correct or live with any problems that may arise…because we'll be able to communicate what

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we think about it to each other.

Communication technologies and the media they make possible have already transformed the world many times over. Today we can connect with more people in more ways than we ever have before. Yet this conversation is far from over. We're going to have a lot to talk about as we continue creating new ways to communicate in the years and decades to come. ⋔

Richard Yonck is a foresight analyst with Intelligent Future in Seattle, Wash. His previous futures articles for the Bulletin were "The Future of Advertising" (August 2008) and "Get Smart" (October 2009).