

# REFLECTIONS

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## I INVENT THE COMPACT DISC IN 1961

Those who read this column regularly, or are familiar with my science fiction, will be aware that I am not a particularly high-tech sort of person. My education was in the liberal arts, not in the sciences, and my innate proficiencies run more to the verbal than to the technical. I've made it clear in these essays that in my daily life I claim only the most modest mechanical expertise aside from knowing how to drive and the ability to operate a computer with the sort of skill that any twelve-year-old of today possesses. When plumbing or electrical work needs to be done around the house, I call a plumber or an electrician. Nor do I make mysterious adjustments beneath the hood of my car every Saturday, as my neighbor does. I manage to get along without a smartphone, too (although my wife has one and knows how to operate it, more or less). The same with tablets, iPods, and most other contemporary gadgets. As for my novels and stories, they put more emphasis on character and sense of place than they do on wiring diagrams and descriptions of intricate machinery. Though for a decade or more I maintained a second career as a writer of books on scientific subjects, I concentrated primarily in those on the "softer" sciences, archaeology, history, anthropology. And yet evidence has come to hand that I seem to have invented the compact disc, and described it in considerable detail, back in 1961, a decade and a half before real engineers set out to develop it. (Yes, and former Vice President Al Gore invented the Internet, too. More about that later on.)

The history books will tell you that two big electronics companies, Sony and Philips, started work independently on methods for replacing the phonograph record with a device that could be read optically, thus affording superior sound reproduction without frictional damage to the record. In 1977 Sony was able to display a small disc that could play an hour of music using optical playback of digitally encoded information, and Philips was doing similar experimental work about the same time. By 1979 they were working jointly on the project, and the first public demonstration of what we now know as the compact disc took place on a BBC television program called *Tomorrow's World* in 1981. A little more than a year later, commercial production of CDs had begun.

What, then, was my role in devising the compact disc twenty years earlier?

There once was an excellent magazine called *High Fidelity*, founded in 1951, that specialized in reviewing new phonograph records and audio equipment, and also ran articles about composers, performers, and the history of music. I read it regularly from 1954 on, and, though I was neither a musician nor an audio engineer, I eventually approached Roland Gelatt, the magazine's editor, with some suggestions for articles I might do for it. Gelatt liked my ideas, and I became a regular contributor, beginning with a piece in the September, 1960 issue that capitalized on my reputation as a science fiction writer: "Music for People Marooned on Mars," a variation on the old what-to-have-with-you-when-you-are-stranded-on-a-desert-island idea. I followed this with articles on composers like Leos Janacek and Johann Nepomuk Hummel, then fairly obscure, and one called "The Phantom Philharmonic," a report on recording orchestras made up of free-lance musicians.

I even dabbled in technical stuff, as in an article called "Trends in Transistors," discussing the coming replacement of vacuum tubes with the newfangled semiconductor gizmos then under development. (I was no engineer, of course, but I knew how to

do research into futuristic things like transistors.) And in 1961, when *High Fidelity's* tenth anniversary issue was approaching, editor Gelatt asked me to do something science fictional for it to provide some contrast with the generally retrospective tone of the rest of the issue. I obliged with "The Shape of Sounds to Come," which ran in the April 1961 issue.

That was nearly sixty years ago, and of course the whole project is hardly fresh in my memory. But these days I live in the future I used to write about, and magazine articles from 1961 are readily obtainable with a click or two via Internet search. Someone found my ancient article on the future of audio reproduction and wrote a piece about it for some website, expressing awe at my prophetic abilities, and someone else eventually came upon that piece and called it to my attention, and a couple of months ago I read my own article for the first time in fifty-odd years and, I have to admit, felt a little tingle of admiration, mixed with a certain how-did-I-do-it? bewilderment, at the predictive accuracy therein revealed.

The piece begins as a sort of science fiction story, set in 1984—not just the year of Orwell's famous novel but also a time that was then comfortably in the future, as the year 2040 is for me as I write this today. My protagonist, Jim Collins, punches the coordinates for a seven-to-one martini on his liquor organ and slips the little roll of thermoplastic tape that contains an entire Wagner opera into his player's receiving slot. But just then a friend shows up, an electronics engineer he knows, who wants to demonstrate a device his laboratory is developing just then—"a photoscopic coder, it's called," he says. He jacks it into Jim's video set, Jim turns Wagner off, and the opening scene of *The Marriage of Figaro* blossoms on the screen in bright color. "Kind of a combination home camera, recorder, and projector," the friend explains. He unclips a disc the size of a half dollar and holds it up. "Here's your record," he says. "*Figaro*, complete. Full frequency response, full color replay." Then, dropping out of fictional mode, I deliver a little lecture on the history of sound recording—grooved discs, magnetic tape, etc.—and quickly carry things into the future by describing something called "photoscopic storage," the optical recording and playback of information.

Get this:

"Optical storage will provide an incredible density of information—enough to give us computing machines the size of today's portable radios, and certainly enough to provide ultracompression of musical signals beyond anything dreamed of in disc or tape recording.

"Digital coding is the secret here. Each frequency, each timbre, each tone color can be assigned a code digit representing a voltage. An optical scanner rapidly surveys the sequence of code digits, and a transducer converts them back into sounds emerging from a loudspeaker. The beauty of the system is that it will be free from all distortion; if the digit can be scanned at all it will be scanned accurately, on the go-no-go principle. . . .

"The big drawback of discs is that they wear out—the grooves deteriorate under repeated playing. But the use of photocell optical scanners in place of stylus-tipped pickups will end that problem. The revolving disc will pass under a beam of light that will play the pickup's part in transmitting information from grooves to amplifier. No physical contact between pickup and groove, no friction, no record deterioration, and a guarantee of perfect tracking without a chance for distortion, overloading, or groove-jumping!

"The advent of digital coding will bring about the combining of sight and sound, too, all in the same neat package. The newly invented light amplifier, or LASER, may someday bring about this kind of arrangement. You'll be able to play sight-and-sound recordings of operas and concerts. The same equipment will pick up TV, FM, and other signals. The possibilities are boundless."

There it is. In the long-ago year of 1961 I invent the compact disc, as well as the DVD

and the digital video recorder. I go on also to talk about solid-state audio components and electrostatic speakers and video tubes just a few molecules thick. Where did I get all this stuff, back there in 1961?

I suspect I got some of it from the crowd of electronic engineers who worked with my first wife, an electronic engineer herself at a small research company near Columbia University. Most of them were science fiction readers, and, of course, they kept up with current technological progress, and when I began to quiz them about the future of audio playback they must have started to tell me about optical scanning and all the rest. At that point my professional writing skills, my science fictional ability to extrapolate, and my knowledge of how to do research all came into play, and—*voilà!*—I invent the compact disc!

Of course, there's a difference between inventing something in a magazine article, or a science fiction story, and building an actual working model. Just ask Al Gore, who was much mocked during the 2004 Presidential campaign because he had allegedly claimed to have invented the Internet. What Gore had really said was that during his time in Congress he “took the initiative in creating the Internet,” meaning nothing more than that as a legislator he had worked toward the creation of that mighty network by sponsoring laws that encouraged its development. And, similarly, perhaps my 1961 article had helped in some tiny way to spur the research that by 1979 had resulted in the production of a working compact-disc system. I ask no real credit, nor am I claiming any share of royalties. But, re-reading my ancient article in *High Fidelity*, I do take much pleasure, as a science fiction writer who is supposed to be able to foretell Things to Come, at having described this one particular thing with so much accuracy twenty years before it came into being.