Sound Advice

What's the difference between a CD and an MP3? An AAC file and one that's "Mastered for iTunes"?

By Karen McCally '02 (PhD)

VINYL RECORDS HAVE BECOME VINTAGE items, and with the proliferation of downloadable music files, many think compact discs are headed in the same direction.

Arguably, only one thing has prevented the extinction of CDs: Many a music aficionado has claimed that the sound quality of downloadable music is inferior.

Apple has begun offering an upgraded version of its downloadable files on iTunes. The new format—"Mastered for iTunes"—is billed by the company as "Music as the Artist and Sound Engineer Intended."

All of which leads us to ask: How is sound produced on these various formats, and what does it mean for sound quality?

We asked **Bob Ludwig** '66E, '01E (MM)—winner of a 2012 Grammy Award for his role as mastering engineer on the Super Deluxe Edition of *Layla and Other Assorted Love Songs* (Polydor) by Derek and the Dominoes and mastering engineer for the "Mastered for iTunes" version of *Mylo Xyloto* (Capitol Records), the latest album by Coldplay—to help us sort it out.

THE MASTER: Grammy Award–winning mastering engineer Ludwig says Apple's "Mastered for iTunes" format is "a big step forward."

Vinyl

How sound is produced...

"Sound is produced from vinyl records as a mechanical stylus—attached to some magnets or coils, generating a faint amount of electricity—moves through the grooves in the vinyl. That sound is greatly amplified through your speakers."

...and what it means for sound quality.

"The record player has evolved for more than 125 years and delivers superb sound when everything is clean and the vinyl pressings are good. In fact, it can reproduce sounds beyond the range of our hearing. However, every play deteriorates the grooves slightly, and scratches and pops accumulate easily."

Compact Discs

How sound is produced...

"Compact discs store music in the form of data. That is, they contain digital representations of sound waves. The digital information stored on a CD results from sound wave samplings taken at a rate of approximately 44,000 times per second, measured in more than 65,000 gradations. The CD player contains a digital-to-analog converter and amplifier, which allow us to 'hear' the data as sound."

...and what it means for sound quality.

"CDs offer a pretty high-fidelity representation of analog. They record a very wide dynamic range, reproducing sounds that are very loud, to sounds so soft you can barely hear them. And unlike vinyl records, CDs don't deteriorate with every play."

Downloadable Files

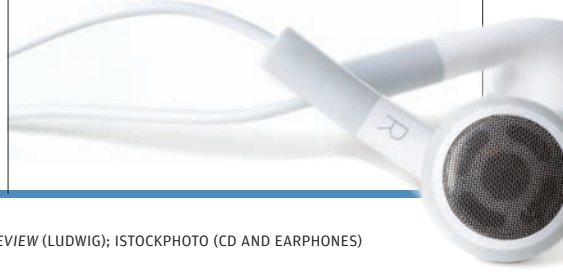
The MP3 and Apple's AAC (Advanced Audio Coding)

How sound is produced...

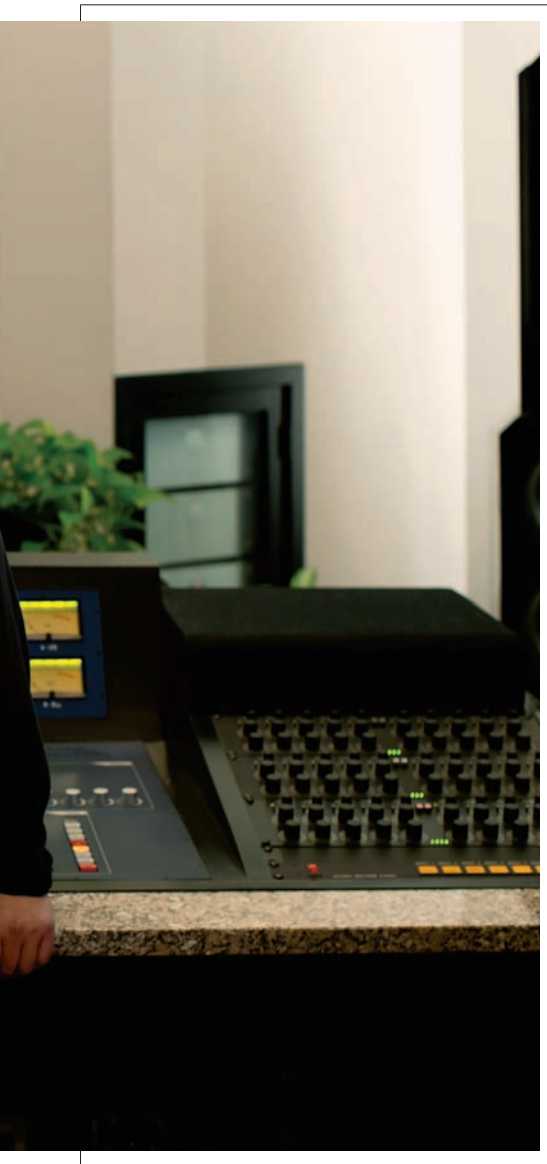
"The MP3 and AAC digital music files that you download onto your computer, MP3 player, or iPod are called 'lossy files.' This means that the files lose much of the data contained in a CD. The advantage is that this makes them easily downloadable and makes it possible to carry an entire music library on a single device."

...and what it means for sound quality.

"Because of the loss of data, most MP3 and AAC files have subtle distortions in them."



KEVIN BRUSIE FOR *ROCHESTER REVIEW* (LUDWIG); ISTOCKPHOTO (CD AND EARPHONES)



AAC 'Mastered for iTunes'

Downloadable files

How sound is produced...

"'Mastered for iTunes' files are made from higher fidelity sources than CDs. In addition, the distortions that you hear on traditional MP3 and AAC files are measurable and removed on the new format."

...and what it means for sound quality.

"'Mastered for iTunes' is a big step forward. Even when you listen to pop music—music that's loud, where dynamic range isn't nearly as important as it is in classical music, for example—you can hear the difference even on small computer speakers." R

In the News

ILENE BUSCH-VISHNIAC '76 NAMED PRESIDENT OF UNIVERSITY OF SASKATCHEWAN

Ilene Busch-Vishniac '76

Ilene Busch-Vishniac '76 has been named the ninth president of the University of Saskatchewan and is the first woman to hold that job at the Canadian university. A mechanical engineer, Busch-Vishniac has held key administrative posts at several top research universities. Most recently, she was the provost and academic vice president at McMaster University in Hamilton, Ontario. Prior to that role, she served as dean of the school of engineering at Johns Hopkins University. Her term begins July 1.

FORMER AMBASSADOR TO LIBYA NOMINATED AS U.S. AMBASSADOR TO GHANA

In April, President Obama nominated **Gene Cretz** '72 as U.S. ambassador to Ghana. From December 2008 until December 2010, Cretz, a career diplomat, served as U.S. ambassador to Libya, the first American ambassador to the north African nation in 36 years. In September 2011, following the late president Muammar Qaddafi's flight from Tripoli and the installation of a new interim Libyan government, Cretz returned to Libya as an envoy. He held that post until May.

CARRIE JOHNSON ADELMAN '97: A 'FUTURE LEADER' IN CANCER RESEARCH

Carrie Johnson Adelman '97 has helped identify the role of a tumor suppressor gene, HelQ, in the development of some inherited cancers, including ovarian cancer. Her discovery won her a Future Leaders of Basic Cancer Research Award from the American Association of Cancer Research. Adelman, a postdoctoral fellow at the London Research Institute of Cancer Research UK, and three other winners received the international award in April.

AMIT GOYAL '91 (PHD) NAMED FELLOW OF MATERIALS RESEARCH SOCIETY

Amit Goyal '91 (PhD), a materials scientist at the Department of Energy's Oak Ridge National Laboratory, has been named a 2012 fellow of the Materials Research Society. The society, which has more than 16,000 members worldwide, is an interdisciplinary professional alliance to promote materials research. A specialist in high-temperature superconductivity and one of 28 fellows selected this year from around the globe, Goyal was cited for "seminal and sustained contributions to the field of small-scale mechanical behavior of materials" as well as professional leadership in materials science.

Bernard Ferrari '70

BERNARD FERRARI '70, '74M (MD) NAMED A JOHNS HOPKINS DEAN

Bernard Ferrari '70, '74M (MD), a surgeon-turned-business consultant who served as a partner at McKinsey & Company before establishing the Ferrari Consultancy, has been named dean of the Johns Hopkins University Carey Business School. Ferrari, who is also a University trustee, becomes the second dean of the business school, which was established in 2007.

MCMASTER UNIVERSITY (BUSCH-VISHNIAC); ADAM FENSTER (FERRARI)