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33⅓ rpm[1]

33⅓ revolutions per minute is a weird number for a technical standard. For one thing, it doesn't produce a finite decimal, just an endless string of threes. For another, it isn't even completely accurate. Rotations per minute, or rpm, is not a simple or straightforward matter when we are talking about a needle, affixed to an inflexible arm, that spirals from the outside to the inside of the record.[2] Although—theoretically—the rotation of an LP on its spindle is always 33⅓ revolutions per minute, as the needle moves from the outside to the inside of the LP, the length of one trip around the record decreases. This means that the needle travels a shorter distance on each successive trip around the record. As a result, the needle moves more and more slowly at it approaches the center of the record, even though the record continues to spin at a theoretically constant speed. In technical terms, the needle's linear velocity decreases, while the record's angular velocity remains the same. An LP record is an analog format, meaning that the variations in the surface of the record index variations in the sound that will come out of the speakers. Those variations have to occur over a smaller space in the inner grooves. More of the recording is crammed into a smaller space: this is why artists or their producers usually placed the singles closer to the outside of the LP. As the needle moves toward the center of the record, one encounters more distortion and fewer high frequencies because there is less room to store the instructions for playback. Today writers talk about mp3s and other digital formats as more or less "lossy," but decades before various forms of digital data compression became concerns, mastering engineers, producers, and musicians were already treating records as

1. Many thanks to Adrian Freed, Timothy Edgerton, Anna Feigenbaum, and Mike McGary. Extra thanks to Sara Marcus for some brilliant editorial suggestions.

2. It turns out that revolutions per minute (see what I did there?) has a bit of a hazy history. James Watt established the unit of horsepower in the 1780s, and his formula involved a measurement of "strokes per minute." At some point shortly thereafter, steam engines went from stroking to rotating, and that is likely when "revolutions per minute" came into use. By 1817, when Dietrich Ulhorn developed the tachometer, the concept was already in use. But there is another possibility: centrifugal governors, which were invented to control distance and pressure between millstones in windmills, may also have led to a working concept of "revolutions per minute," or an equivalent concept in Dutch in the seventeenth century. I will pursue this question elsewhere. See Richard Leslie Hills, *Power from Wind: A History of Windmill Technology* (Cambridge: Cambridge University Press, 1994); R. L. Hills and A. J. Pacey, "The Measurement of Power in Early Steam-Driven Textile Mills," *Technology and Culture* 13, no. 1 (1972): 25–43, https://doi.org/10.2307/3102654.

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lossy. The result is an interesting contradiction: the difference between the speed of the needle and the speed of the record's rotation plays a role in the sound and organization of countless albums, yet that difference is concealed by the standard that tells you how to play back the record. For this reason, revolutions per minute isn't even considered a unit in the International System of Units (which is the modern form of the metric system). In distinction, the units of measurement for digital media—cycles per second (hz) and bits—all exist as units within this system. A measurement that is not a measurement, a unit that is not a unit: a perfectly romantic way of describing the time of the long-playing record.

Most media formats and standards are intermedial, in that they refer to other media formats and standards rather than some external reality that exists as a stable referent outside them. Digging far enough into the history of 33⅓ rpm, it is possible to find nice, arbitrary, round numbers: in this case, ten inches and 1,000 feet. The story goes back to the 1920s and to early attempts to create sync sound for film. Western Electric began by experimenting with then-standard ten-inch 78 rpm records and, by 1926, found a way to get them to run for up to eleven minutes. Eleven minutes was the standard for a reel of film, because twenty-four frames per second, multiplied by 1,000 feet of film, gets you eleven minutes of play time. If the goal was to synchronize sound and image, then the running time for both media should be the same. Using two physical formats—a ten-inch record and a 1,000-foot reel of film—led to our magic 33⅓. Of course, this was all theoretical: one skip of the record and synchrony was lost. Western Electric's sync sound discs were not LP records. They played from the center to the outside edge—the opposite of today's LP; and they were not made of vinyl, separated into tracks, or subject to the RIAA curve or any of the other standards that would shape LP production later in the century.[3]

And yet, despite—or perhaps because of—all of these mediations, the surface of the record does produce something tangible when it interacts with the needle, electricity goes through the amplifier and into the speakers or headphones, and sound comes out to tickle the ears of the hearing. Scratch the record, or leave it dusty, and the record produces a nicely audible rhythm. The crackle of the record served as a mark of authenticity for countless hip-hop recordings and is now part of the vernacular of digital audio production. One company, Izotope, produces a plug-in called "Vinyl" that even simulates the sound of wear on a record, so that artists can add it to their digital tracks without the inconvenient work of actually sampling a record. Artists themselves have gone further. Maria Chavez, for instance, cuts up pieces of records and places them on top of one another to generate sampler-like rhythms from the surfaces of the records as the needle bounces from one record to the next and back again. But her work is more like sculpture than sampling: the art is in the manipulation of the physical medium and the playback apparatus. She is not, strictly speaking, sampling. In some ways, the sonic results of her work are a secondary effect.[4]

3. Douglas Gomery, *The Coming of Sound: A History* (New York: Routledge, 2005), 79. For more on formats and standards, see Jonathan Sterne, *MP3: The Meaning of a Format* (Durham: Duke University Press, 2012).

4. Maria Chavez, *Of Technique: Chance Procedures on Turntable* (Brooklyn: Maria Chavez, 2012). See also "New Sounds Presents: Maria Chavez" https://youtu.be/ruDZM-mrTpA?t=134 (accessed 7 April 2021), https://www.izotope.com/en/products/vinyl.html (accessed 7 April 2021).

The rhythms produced by records evoke many potential relationships to time, but they all begin in a relationship where the temporality of recording and playback are supposed to line up with one another. The link between recording and playback is never guaranteed, and the 33⅓ rpm standard labors (and motivates labors) to help produce synchronization. Jason Stanyek and Benjamin Piekut use the term "sync culture" to describe the awareness of temporal disjointedness that occurs when the lack of synchronization is a technical hurdle: Did the musicians tune down a half step, or is the record player slow? Or: Why are the characters' mouths moving out of time with the soundtrack?[5] 33⅓ is a tool for lining up recording and playback, and it produces audible rhythms, but it might also be the aesthetic vestige of an industrial rhythm. In Elizabeth Freeman's terminology, 33⅓ rpm is *chrononormative*: it figures the work of recording and playback as an "economy of force" to be kept in careful balance. Freeman was writing about the transformation of a moral discourse about time and labor into a technical discourse about energy, efficiency and fatigue.[6] But what is 33⅓ if not a technical discourse that shapes energy and expectation? The 33⅓ rpm standard implies a demand for regularity: we made it at this speed, you listen back at this speed. But it is an industrial imagination of time forged in the industrial age, like the very idea of revolutions per minute itself. The difference between linear and angular velocity already gives the lie to the idea that records move at a single speed; so do the varying speeds of real record players in the real world. It would be more accurate to say that at any given moment, LPs are moving though a set of constantly shifting speeds: linear and angular velocities, but also the rhythms of the music coming off the disc, the slow erosion of the medium that comes from its use, and the lived times of listeners. This is why playback is a social term even if seems like it should just be a matter of simple mechanics. Industrial, geological, fragmented, and rhythmic temporalities are on offer as the record spins round. Every time people groove along to a record, they also reorient their bodies in relation to—or departure from—those modalities of time. 33⅓ rpm is a standard, but it is also a suggestion. ■

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6. Elizabeth Freeman, *Time Binds: Queer Temporalities, Queer Histories* (Durham, NC: Duke University Press, 2010), 3.