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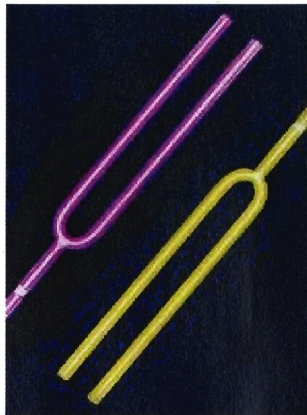
The Biology of ... Perfect Pitch

Name That Tone

Can your child learn some of Mozart's magic?

By Michael Abrams

The psychology annex building at the University of California at San Diego has no elevator, but it has something even better: a singing stairwell. "It's a low F, I think," Diana Deutsch says, pausing on the top step to listen to the wind's howl. Deutsch has a face as round and sprightly as a sixteenth note, a red bob of hair, and a doctorate in psychology. She also has perfect pitch. "I realized I had it when I began taking piano lessons at the age of 4," she says. "It was a great surprise to me that other people could not name notes. It was as if everyone around me was unable to name colors."



Mozart must have known how she feels: He could name a single note from a tolling bell or a chiming pocket watch. Yet only one in 10,000 Americans has perfect pitch, and even professional musicians tend to make do with relative pitch: They can name only the intervals between notes. To approximate perfect pitch, some musicians memorize just one note, usually middle C, and then use relative pitch to navigate to others. But these pitch estimators need a moment of thought to name a note, and they tend to be slightly off. (Granted, the notes themselves are a bit off: In Handel's time, an A above middle C had a pitch of 422.5 vibrations a second; these days, that same A has climbed to 440 vibrations a second.) People with perfect pitch name notes instantly and they're invariably correct.

Composers such as Chopin, Bach, Handel, Beethoven, and Mozart, and performers such as Heifetz, Horowitz, Segovia, and Rubinstein have all had perfect pitch. But only one in 10,000 Americans shares their gift.

Photographs by Monica Bradley

For decades, biologists thought that perfect pitch was a genetic anomaly, passed on from generation to generation. Identical twins are far more likely than fraternal twins to have perfect pitch, and nearly half of all people with perfect pitch have relatives who have it. But studies by Deutsch and others have shown that perfect pitch is far more common than it seems. It's a form of speech rather than a feature of music—and like speech, it can be learned.

The essential idea began to take shape in Deutsch's mind three years ago, when she was studying music perception among people from Vietnam. The study subjects, she found, had no trouble understanding her Vietnamese when she spoke at the correct pitch. "But when I deliberately shifted my pitch—to an extent that would be barely noticeable in English—it was as if I'd said, 'I like your beat,' or 'I like your bite,' when I'd meant to say, 'I like your boat.'" Just to communicate, she realized, Vietnamese have to identify pitches correctly. What seems like magic to Americans is just second nature in other parts of the world.

"The real puzzle about perfect pitch is not why so few people possess it but rather why most people do not," Deutsch says. "Everyone has an implicit form of perfect pitch, even though we aren't all able to put a label to notes. It's as if people suffer from a kind of anomia: They can recognize the note but can't label it. What's learned as a child is the ability to label." In a study published in 1994, psychologist Daniel Levitin at the University of Oregon asked subjects to sing hit songs such as "Hotel California" from memory. Forty percent came within a semitone (the change from F to F-sharp, for instance) of the first pitch on the recording. If someone was a little off-key, it was probably due to their singing ability: They could hear the correct pitches in their heads; they just couldn't reproduce them. "I have perfect pitch, but I sing terribly out of tune," Deutsch says. "Toscanini had perfect pitch, but I've heard it said that he insisted on humming out of tune . . . very irritating to the players. There really is a difference between perception and production."

Deutsch has spent the past few years circling in on this innate sense of pitch through a series of experiments. To demonstrate, she sits me down in front of a microphone and digital audiotape machine and asks me to talk about anything I wish for five minutes. Although she seems interested in hearing about my flight from New York and the malfunctioning flaps on the airplane, she's really after my pitch range. Most people's voices, she says, stay within a single octave—a do, re, mi, fa, sol, la, ti, do, identified by the name of its first and last notes. "Congratulations," Deutsch says, after analyzing my soliloquy, "you're a G-sharp, just like me."

Pitch ranges are often a handy way for people to distinguish males from females and very young children from adults. But Deutsch thinks the distinctions we make are far more subtle. "You can evaluate whether a person is speaking your dialect based on the range of their voice," she says. "Supposing you want, as birds do, to judge if someone's from the same geographic region. You may be able to do so by evoking a pitch range."

The best example of this ability is what Deutsch calls the "tritone paradox." Imagine two tones played one after the other. The first tone is actually two separate notes an octave apart—a high and low C, say—played in perfect unison so that they sound like a single tone. (When Deutsch performs the experiment, she plays six octaves at once, but they still sound like one.) The second tone is a "tritone": a note exactly halfway between the two octaves—a G-flat in this case. Although the G-flat is between the two Cs, some listeners hear it as higher and some as lower, depending on their pitch range. More intriguing still, their responses vary depending on where they were raised.

Pitch ranges are so clearly tied to geography that Deutsch can often guess where her subjects or their parents grew up. Californians tend to have a pitch range that starts and ends around C-sharp; Vietnamese have a range that starts and ends around E. The predictability of those ranges suggests, in turn, that people develop a sense of pitch at a very early age, perhaps even in the womb. "Children probably pick up their pitch range from the voices they hear around them," Deutsch says. "The noise of the mother's voice comes through very loudly during pregnancy."

For most of us, learning to keep within a certain pitch range—and to identify that range in others—is all the voice training we really need. When Deutsch recently asked English speakers to read the same list of words on different days, she found that their pitch for any given word could vary by as much as two notes. But speakers of certain tonal languages, such as Vietnamese and Mandarin, don't have that much room for error. In Mandarin, for instance, the word *ma* can mean "mother," "horse," "hemp," or "to scold," depending on its pitch. In a study presented to the Acoustical Society of America, Deutsch found that tonal speakers hit the same pitches dead on, day after day, and an unusual number of them have perfect pitch.

Certain genes may help some people acquire perfect pitch more easily than others, but Deutsch's findings suggest that almost anyone can learn to label notes—provided they start young. Children who don't learn to do it by the time they learn the rudiments of language may never gain the ability. Deutsch thinks that parents should give young children access to musical instruments, preferably with labeled notes, to help the process along. "I often wonder if I acquired my perfect pitch because I had a color-coded xylophone as a kid," she says, noting that people with perfect pitch have a higher incidence of synesthesia: When they hear a sound, they see a color. Even when they don't, she says, their gift adds an extra dimension to their listening experience, revealing the music's architecture as well as its sound. "It's as though you are seeing the musical score scroll past your eyes."

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Details of Diana Deutsch's study of Vietnamese and Mandarin speakers can be found at www.acoustics.org/press/138th/deutsch.htm.

To learn about perfect pitch, visit www.provide.net/~bfield/whatabs.html and www.provide.net/~bfield/abs_pitch.html.

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