

Science, Music, & Yoga: An Interview with a Top Evolutionary Biologist



[Ulrich Kutschera \(click for Wikipedia bio\)](#) is a leading evolutionary biologist who has published ten books and over 250 scientific articles, including major papers in *Science*, *Nature*, and other high-impact journals.

Ulrich is Chairman of the Dept. of Evolutionary Biology at the University of Kassel, Germany, and a Visiting Scientist at Stanford.

Ulrich recently joined Palo Alto's [Systems Biology Group](#), Co-Founded by Avalon's Director, **Steve Farmer, PhD**, and its Medical Director, **David Furman, PhD**. Ulrich is now visiting both Stanford and Avalon.

Ulrich and Steve are currently writing a comprehensive review on systems biology, which is rapidly revolutionizing nearly all biological research. Systems biology at its deepest is a sort of biological "theory of everything" that studies the links between biological systems of all scales — from gene regulatory networks to immunology to brain-culture studies and global ecosystems.

Systems biology has deep implications for scientific studies of preventive medicine and lifestyle modification, including those parts involving yoga. It plays a key role in all of Avalon's Teacher Training Programs.

Links Between Science and Music

Besides being a prolific scientist, Ulrich is also a talented composer of neo-classical piano & synthesizer music.

Steve and Ulrich recently sat down to discuss Ulrich's biological work and the relationship between science and music — reflecting a bit on yoga as well. Excerpts are given below.

Steve Farmer. Ulrich, you have a long-term attachment to Stanford and the Bay Area. How did that start out?

Ulrich Kutschera. After I finished my PhD in Germany, some 20 years ago, I spent two years as a Stanford post-doc. I fell in love with the area, splitting my time between music, laboratory work, and field work. One of my early field discoveries involved the [Golden Gate Leech](#) — officially known as *Helobdella California*. I think that qualifies me as a real Californian (laughs)!

Steve. How does your work as a biologist fit in with your music?

Ulrich. My father was a painter, and my family was always into the arts. When I was 9 years old, I began intensive studies of the piano and classical music, studying Haydn and Mozart and Clementi, etc. However, my real love was improvisation, which appealed to me due to its spontaneity.

This so angered my conservative piano teacher that in rebellion I stubbornly stopped formal studies for 5 years, playing only what I liked. I eventually restarted my formal musical training to perfect my skills, and at the university spent almost as much time studying music theory as theoretical biology.

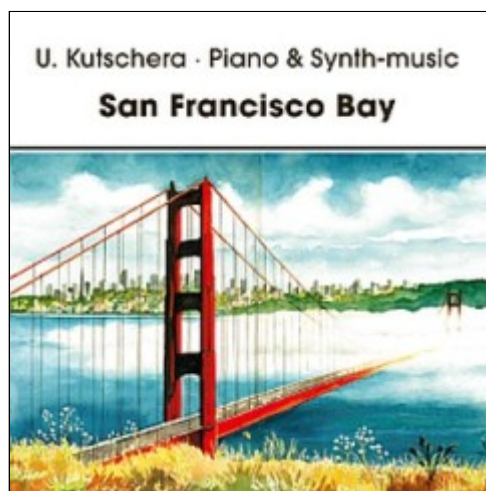
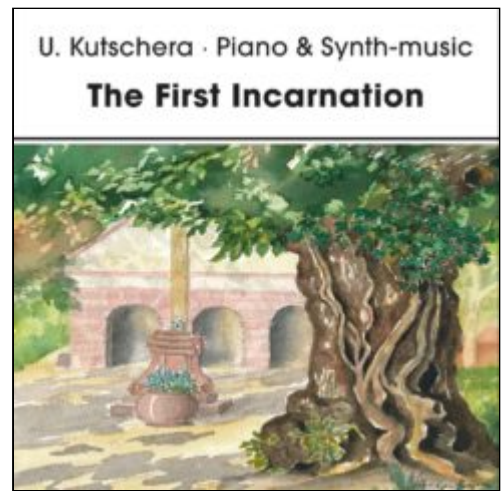
In 1983, two years before I earned my doctorate, I recorded my first album, *The First Incarnation*, which sold well in Europe. So by the time I came to Stanford, I was already seriously composing music. When not in the laboratory or in the field, or building theoretical models in evolutionary biology, I spent lots of time practicing in the Stanford Music Department.

Steve. A perfect marriage of systems biology and music! You probably know **Denis Noble's** early classic in the field, [The Music of Life: Biology Beyond Genes](#) (2005).

Ulrich. Even long before Noble's work, from 1985 to 1987, while at Stanford, I was publishing papers involving both plants and animals, taking my cue from Darwin's interests in botany as well as zoology. I always picture him as an early systems biologist! While my experiments were running in the lab, I'd run off to the Music Department to play the piano.

Steve. You have recently produced two CDs of neo-classical music, *The First Incarnation*, 1983-2017, expanding on your first album, and *San Francisco Bay*, 2016. Why did it take you so long to release so much of your music?

Ulrich. Throughout my career, I've always given first priority to scientific research and publication. Music has been a passion and hobby, not more. But the success of my past CDs and the urging of a lot of friends has recently motivated me to produce a series of best-of-Kutschera volumes. The two CDs you mention are now out, and four more are in preparation.



Steve. *San Francisco Bay*, 2016, has gotten positive reviews from the musicologist Gary Lemco, who hosts a popular classical music show on the Stanford Radio Station, KZSU. [Lemco describes your album here.](#)

Ulrich. Yes, indeed. And the Stanford station has often played my music.

Steve. As an evolutionary biologist *and* composer, how do you view the relationship between science and music?

Ulrich. Scientists constantly try to answer big questions based on incomplete evidence, or just guesses about potential evidence. Where do the solutions to these questions come from? In my case, like many scientists before me, new theories often unexpectedly rise in a flash, intuitively, and only later are confirmed by experiment.

As a composer, I am dependent on similar intuitions. The central motifs of every track on my CDs emerged intuitively. I can't really explain where these melodies came from. I view them as arising mysteriously, from previous unexplored depths.

Later, they evolve and give rise to full compositions I record in the studio. It sometimes seems I'm the passive recipient of the music, a bit like the way the Greeks viewed their creations — inspired by the Muses.

Steve. Do you see any relationship between yoga and music?

Ulrich. I do, but it is a relationship of a different sort. I think that yoga and music both exemplify a key principle in systems biology. Change your body's posture or shape, or meditate, or practice controlled breathing, and — as I know you teach your students — correlated changes follow involving hormone flows, immunological and autonomic responses, emotions, and cognition, etc.

That all reflects the most basic principle in systems biology, insofar as human physiology goes: any change in one bodily system affects all others. That's very different from older reductionist views of biology.

And so too with music. When you listen raptly to a composition, brain signals, heart rates, emotional responses, and thought patterns, etc., change in sync. That's key to a systems biology approach to music as well as yoga. Great yoga teachers might be viewed as composers and conductors of "bodily music", so to speak.

So music is a kind of yoga, or yoga a kind of music — take your pick!

For more on Ulrich's music, see www.uvasonar.de/pool/comp/ukutschera.