



## Seewiesen Colloquia

Speaker invited by: Dept. Gahr

Thursday, January 24, 2013, 13h, House 4, Lecture Room

### Singing in the fast lane: The neuromechanics of sound production in vocal vertebrates

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Sound is the fastest, most accurate, and information-rich modality for communication in all vertebrates, with human language at the pinnacle of complexity. Just like human infants, songbirds learn their song through imitation learning, mimicking their parents. Songbirds have therefore become an important model system to understand the neural processes and pathologies underlying human speech production and language acquisition. My research aims at unravelling the question "How are neural signals translated into sound". This field operates at the border of neuroscience and biomechanics. As such, neuromechanics integrates both experimental and computational approaches from physics, molecular biology, physiology and neuroscience. We find that sound production systems are pushed to the extremes: tissues violently collide at 100,000 times/sec and extreme performing superfast muscles contract up to 250 times/sec. While focused on songbirds, I use a comparative approach to find unifying principles of motor control and discover new model systems across the vocal vertebrates, from birds to fish, from mice to whales

## Who is Coen P.H. Elemans?

- 2004 PhD cum laude Wageningen University, NL
- 2005 NIH postdoctoral fellowship University of Utah, USA
- 2008 Carlsberg Foundation fellowship University of Southern Denmark, DK
- 2010 Assistant Professor, University of Southern Denmark, DK.

## Selected publications:

- Düring D, Ziegler A, Thompson CK, Faber C, Muller J, Scharff C, Elemans CPH (2012) The songbird syrinx morphome: a high-resolution, three-dimensional and interactive map of the zebra finch vocal organ. *BMC Biology*
- Elemans CPH, Mead AF, Jakobson L, Ratcliffe JM (2011) Superfast muscles set maximum call rate in echolocating bats. *Science* 333: 1885-1888.
- Elemans CPH, Laje R, Mindlin GB, Goller F (2010) Smooth operator: Avoidance of subharmonic bifurcations through mechanical mechanisms simplifies song motor control in adult zebra finches. *J. Neuroscience* 30, 13246–13253.
- Elemans CPH, Mead AF, Rome LC, Goller F (2008) Superfast muscles control sound production in songbirds. *PLoS ONE* 3, e2581.
- Elemans CPH, Zaccarelli R, Herzog H (2008) The biomechanics and neuromuscular control of vocalisation in a non-songbird. *Journal of the Royal Society Interface* 5, 691-703.
- Elemans CPH, Spierts ILY, Müller UK, van Leeuwen JL, Goller F (2004) Superfast muscles control dove's trill. *Nature* 341: 146.