

# Sound field studies at the University of Calgary (ACTOR Project)

Friedemann Sallis (musicology)  
Jeffrey Boyd (computer science)  
David Eagle (composition)  
Laurie Radford (composition)

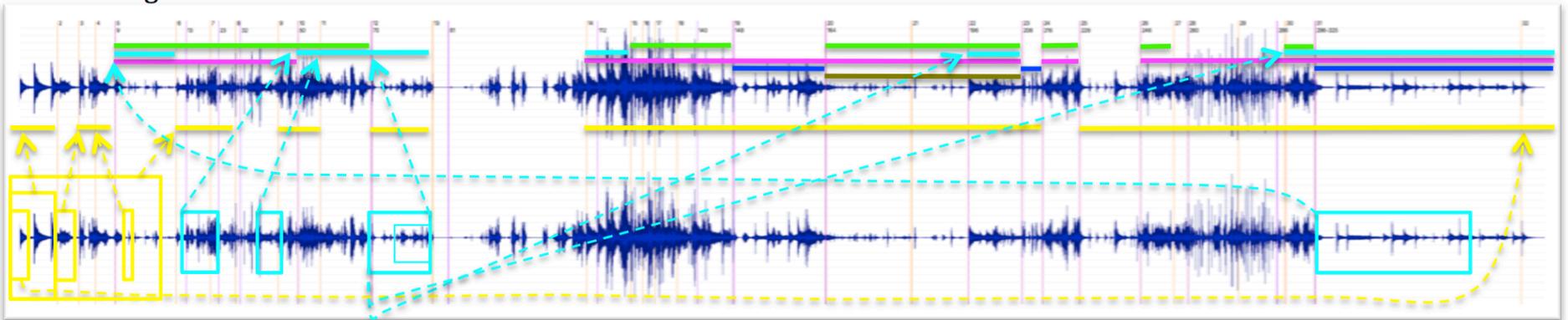
All four professors supervise graduate students in the Computational Media Design Program, housed in the Computer Science Department, Faculty of Science as well as in our respective disciplines.

**Hans Tutschku, *Zellen-Linien* (2007), performed by Xenia Pestova**

Segmentation by Hans Tutschku

bar 1					9	1	2	32	50	70	81	112			1	148	164	196	22	228	24	260	28	296-325							
						3	3							4					0	1	6		6								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Event changes



- = sample playback (pre-recorded + live)
- = "hinher" (record piano, play forward + backwards)
- = playback of pre-recorded segments of *Zellen-Linien*
- = spectral freeze
- = granular synthesis
- = delay

Computer graphics = symbolic model ---> graphic images

Computer vision = images of the real world ---> symbolic model

### **Sound field studies at the University of Calgary (ACTOR Project)**

Friedemann Sallis (musicology), Jeffrey Boyd (computer science), David Eagle (composition), Laurie Radford (composition)

All four professors supervise graduate students in the Computational Media Design Program, housed in the Computer Science Department, Faculty of Science as well as in our respective disciplines.

**Friedemann Sallis and Jeffrey Boyd** are co-recipients of a SSHRC Insight Grant entitled ‘Mapping the acoustic space of live electronic music (2016-20)’. The purpose of this project is to examine the acoustic space of live electronic music. In pursuing this goal we hope to better understand how a sound field, generated by performances of this music, evolves from a central position in the concert space, to what extent this evolution matches the intentions of the composer (as we understand them) and the impact of the performer on this evolution. This interdisciplinary project (musicology, computer science) will approach the study of live electronic music from two complementary perspectives, which constitute the musicological core of this project: the examination of performance and of the creative processes leading to it. Our primary objects of study are *Touch* for piano and interactive electronics (2012) by Keith Hamel performed by Megumi Masaki (to be recorded in Calgary in December 2017) and *Zellen-Linien* for piano and live electronics (2007) by Hans Tutschku performed by Xenia Pestova (to be recorded in Calgary in June 2018).

Our project seeks to better understand music that escapes conventional notation. For example, about half of Tutschku’s *Zellen-Linien* cannot be consigned to the dot and lines of staff paper. Ex. Martin’s diagram of the *Zellen-Linien* comparing the segmentation of the piano part to the patch/event changes of the electronic part.

we will use ambisonic technology to capture the sound field of a performance. This data will then be visualised using computer vision technology. Both computer graphics, computer vision deals with symbols and images, but the flow of information is oppositional. The computer graphic process begins with a symbolic model, which is then rendered into virtual images. Computer vision begins with an image from real world, which is then transformed into symbolic models for study and analysis.

Ex. Jeff's diagram below

Computer graphics: symbolic model ---> graphic images

Computer vision: images of the real world ---> symbolic model

Our projects aims to subject data collected in performances of our objects of study to this technology in order to better understand how the sound fields are generated and manipulated by the performers and how they behave in give concert spaces.

Finally, Library and Cultural Resources of the University of Calgary has agreed to establish a digital archive supported by a descriptive and structural metadata template for audio data captured using ambisonic technology. This digital archive was initially intended to support our SSHRC Insight Grant. However, Library and Cultural Resources has agreed that the digital archive would be made available to all members of the ACTOR Project so that ambisonic data from across the network can be stored and analysed.

Jeffrey Boyd and I, believe that our approach can provide an interesting perspective to the ACTOR project, because we will be focusing on the study of music as a performance event. We will also examine sound colour, not as an abstract concept via conventional notation, but rather as sound energy that occupies and articulates a specific space, an aspect of music that

musicology rarely if ever grapples with. Thus we feel that our project could contribute to sub-axes 1, 3, 5 and 10.

**Laurie Radford** is particularly interested sub-axes 5 and 11. He is interested in creating situations to test and document spatial relevance of sound sources in electroacoustic music and acoustic performance, as well as the impact of room acoustics on how orchestration is received. He is also interested in studying ‘issues in blending and juxtaposing acoustic and electroacoustic sound sources. The sound/electroacoustic studio and the performance facilities of the School of Creative and Performing Arts would be used for compositional and evaluative exercises that address and query these objectives. Students from the areas of Composition, Sonic Arts and Musicology would be recruited to assist (as test subjects and as administrators) with the planning and testing situations. Students from the Performance area would be recruited to contribute to the study of acoustic performance in a variety of acoustic environments. Comparative analysis of acoustic and spatial relevance of sound sources in electroacoustic and acoustic performance, as well as issues of blend in ‘mixed’ music, could also be organized and undertaken between several institutions and student/faculty groups.

**David Eagle** intends his contributions to the ACTOR Project to focus on sub-axes 11, 5, 10 and 1.

11 &5) Together with Radford, he intends to use composer/performer research ensembles to examine networked music performance; to explore the role of spatialization in instrumental and electroacoustic orchestration and issues in the blending and juxtaposition of acoustic and electroacoustic sound sources.

10) He hopes to develop a framework in which timbre can be conceived and used as a form-bearing element in music and to contribute to a theory of the role of timbre in the perception of formal functions in music.

1) Together with Sallis and Boyd, he will explore aural sonology, acousmograph and sound field analysis approaches to develop new aural analytical techniques for sound-based as opposed to pitch-based music.