SOHO:

Brooks, Anthony Lewis

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SOHO: Sonification of Hybrid Objects
A Disappearing-Computer Research Atelier
Final Report

Mestre, Centro Culturale Candiani, june 10–21, 2002

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1 Structure of the Atelier

The atelier has been structured into

- Hands-on workshops: small task forces have been set to address specific problems;
- Open seminars and short presentations: on a daily basis, pre-scheduled seminars have been presented to the SOHO participants and to the general public. During the atelier, several short presentations have been offered to the participants to discuss specific projects and research lines.
- Performances: three public events presented the results of SOHO research in a artistic context.

2 Hands-on Workshops

Impact model: tuning and control A robust and realistic impact model has been made available as a software module. Around it, models of rolling, crumpling, breaking, bouncing, etc., have been developed. In this activity, a small task force has worked at scaling the control parameters, interfacing with gestural devices, and preparing plugins for different platforms. Damien Henry's graphical extensions of the software `pd` have been studied for real-time visualization and control of sonic events.

Sound models for CARE-HERE CARE-HERE is an EU project concerning the control through movement of both audible and visual material as a therapeutic aid. The workshop has been used for face-to-face discussions between CARE-HERE and SOb, analysing and discussing the SOb models and ascertain their usefullness with regard to theraphy and rehabilitation requirements. The CARE-HERE EyesWeb environment has been used to control a bowed string sound model using arm's gestures. This kind of

sound model is interesting because stable periodic (Helmoltz) motion is achieved only by appropriate combination of bow pressure and velocity. Mapping these model parameters into coordinates of spatial movement results in effective auditory motion feedback.

Sounds for SHAPE SHAPE is a EU project concerned with examining assemblies of hybrid objects. Hybrid objects are entities which mix physical and digital manifestations while combining multiple modalities of presentation. The collaboration between SHAPE and SOb has touched the following areas:

Week I Device use sonification, Navigation and orientation sounds, Sonifying gesture. These aspects have been investigated by construction of a prototype augmented cabinet of curiosity, where sounds and light projection were used to trigger the emergence of affordances for direct manipulation.

Week II Synthesized environmental soundscapes, data sonification. The feasibility of using SOb sounding objects in complex applications and performance environments has been investigated, with experimentation in the two public performances of the week.

FonoBump The FonoBump is a sort of hyper-turntable based on the impact model and on custom hardware/software assemblies that have been constructed and tested during the workshop. Artistic use of the FonoBump has been shown in the Hyper-DJSet performance where two realization of the FonoBump have been played: one based on a mouse controller, the other based on a modified version of Mathews' Radio Baton. Cooperation with the MEGA project has allowed real-time capture and processing of visual gestures of the DJs.

SOb vs. Modalys Modalys is a software for modal synthesis developed at IRCAM-Paris. A comparison between the models proposed by the SOb project and those used in Modalys has been carried out. In particular, it has been understood how the approach used in Modalys for the simulation of impacts between rigid bodies and resonators can be adapted to solve occasional problematic situations encountered when using the SOb impact model.

Friction model A flexible friction model is under development as a software module. In this activity, a small task force has worked at tuning, scaling the control parameters and interfacing with gestural devices. During the atelier, a dynamic friction model using waveguide resonators has been implemented as a `pd` plugin, in collaboration with Stefania Serafin (CCRMA, Stanford University).

Spatialized SObs The use of simple spatial effects in conjunction with sounding objects has been discussed, with the goal of enhancing the effectiveness of interaction. Namely, the use of synthetic depth cues for sonic browsing has been proposed.

Vodhran The Virtual Bodhran is a model of the traditional Irish frame drum. The peculiar bodhran playing technique poses hard problems to the sound

and interface designers. Different gestural devices has been tried and coupled with a specialized impact model:

Polhemus Fastrack As demonstrated in the concert on june 20, a player used a bodhran stick with a 6-dof fastrack sensor to capture the complex beating movement, while the other hand, with a second sensor was used to tune the size of the virtual bodhran.

Modified Mathews' Radio Drum As demonstrated in the concert on june 20, a player used a bodhran stick, modified with cables to transmit radio signals, and played the antenna like a bodhran. While the position across the antenna controlled the striking position of the model, the fundamental frequency and dampening was manipulated by another person through the off-the-shelf KAOSS pad and a set of knobs. The same person also played the "metronome rhythm generator" and then used the x-axis of the KAOSS pad to control the metronome tempo.

Clavia DDrum The ddrum is a commercial available electronic drumpad (courtesy of http://www.musicalbox.com and http://www.clavia.com) and the midi velocity out from the control unit was used to excite the physical model. For the pad used there was also poly aftertouch, which was used to control the dampening of the model. The ddrum is a nice interface to play the model because of it's tactile feedback to the player and the lack of cables to the sticks used for playing.

Psychophysical assessment of models Some psychophysical tests have been run and some others were designed using the models and applications used and developed in SOHO. In particular:

Onomatopoeic Sounds An experimental survey on the onomatopeoic description of sounds has been initiated;

Browsing and Sorting The framework for an experiment on sonic browsing, mixing real and cartoon sounds in the same space, has been established;

Model-based Psychophysical Scaling Using the impact model as a reference, a thin control layer has been added to provide a terser parametric set, and a new set of psychophysical scaling tests has been planned in order to achieve perceptual scaling of parameters.

3 Open Seminars

SOb: Sounding Objects *D. Rocchesso (Univ. Verona), R. Bresin (KTH - Stockholm), M. Fernström (Univ. Limerick).* Design and development of efficient, versatile, and responsive sound models for human-artefact interaction.

Hyper-instruments *S. Serafin (CCRMA-Stanford).* Extension and cloning of traditional musical instruments with sound synthesis by physical modeling and computer graphics. Physics based models of musical instruments are interesting from different perspectives. Scientists, being able to reproduce the

sound of a particular instrument, show that its physics has been understood. Composers and performers can take advantage of the computer to create sonorities that cannot be obtained in reality. This seminar presented physics based models of traditional and untraditional instruments whose musical applications are increased by the use of computer graphics and interactive controllers.

CARE-HERE: Technology for therapy *T. Brooks (Kulturcentrum, Lund), R. Trocca (Univ. Genova)* Control through movement of audible and visual material as a therapeutic aid. The seminar showed, by means of several video sequences, how sound is an indispensable component of a rehabilitation system, and how dynamic sound models can potentially offer a great benefit, as compared to sample playback.

MEGA: Multimodal expressive environments *G. Volpe (Univ. Genova), G. De Poli (Univ. Padova), A. Vidolin (Cons. Venezia).* Design of multimodal devices to analyse and render the expressiveness of human gestures in the performing arts. The development of Perceptual Parametric Spaces, where each point is associated with a set of acoustic or visual parameters that can be correlated with the expressive characteristics of a musical piece or o coreography.

Perception of Sounding Objects *G.B. Vicario (Univ. Udine).* The phenomenology of perception of everyday sounds. Much can be learned from visual phenomenology, even though the emerging structures and laws can not be readily translated into the auditory domain. The complex relationship of visual and auditory objects with the dimensions of space and time complicate the construction of a set of audio-visual gestalt principles.

Modalys *N. Misdariis and J. Bensoam (IRCAM-Paris).* Modalys : a physical modeling sound synthesis engine based on modal theory. Modalys has been developped at IRCAM, within the Musical Acoustics team, since 1987. It is a sound synthesis software based on the physical modeling approach that means that it tends to reproduce not the sound signal itself but the physical mechanisms responsible for sound. Moreover, Modalys rests on the modal theory to describe dynamics of vibrating structures and includes description of physical interactions like hit, pluck, bow, ... etc. This specific approach gives to Modalys the characteristic of modularity that allows it to be considered as a virtual 'luthier' workshop. The possibilities of the software have been exposed and illustrated by sound examples, and new results based on finite-element modelling of struck objects have been presented.

SHAPE: Hybrid objects *J. Bowers and S.O. Hellström (KTH - Stockholm).* Design of hybrid (physical and digital) objects for public environments.

AMBIENT-AGORAS: roomware *C. Müller-Tomfelde (Fraunhofer-Darmstadt).* Designing interactive (and sounding) furniture to enhance everyday human activities. Future workspaces are based on an integrated design of virtual information spaces and real architectural spaces. The computer equipment will be, on the one hand, more and more integrated into the physical environment, and on the other hand portable and mobile. In the Ambient Agoras project several prototypes of artifacts are specified and developed to meet the requirements of more informal cooperation and serendipitous communication in teams.

New forms of interaction have to be designed to enable people to take advantage of hybrid environments. Sound can be a crucial for this design, due to the its characteristics in time and space.

AGNULA: open-source and multimedia *M. Trevisani and N. Bernardini (Tempo Reale - Firenze).* Linux multimedia distributions.

4 Short Presentations

D. Henry XGUI: a 2D graphical user interface for `pd`;

T. Hall Conceptual design of an augmented cabinet of curiosities;

T. Brooks and R. Trocca Finding useful sounding objects for rehabilitation tasks;

T. Serafini Simulation of Tube Amplifier;

K. Falkenberg Hansen Realization of hyper-dj-sets;

M. Rath Impact and rolling sound models explained;

E. Brazil Visualization of sounding objects;

B. Moynihan and M. Fernström Design of a survey on onomatopoeic sound descriptions;

R. Burro, B. Giordano, and M. Grassi Summary of results of recent experiments on the perception of object and event properties from impact sounds.

5 Performances

Hyper-DJSet Two DJs *(1210 Jazz and Mika Snikars - Stockholm)* improvise using standard and hyper turntables. Live electronics set by *J. Bowers* and *S.O. Hellström (KTH - Stockholm)* . For the concert in Mestre, 1210 Jazz and Mika Snickars have been playing together again for the first time in a long while. The audience appreciated a varied and virtuoso performance in world class showcasing what turntablism is all about. 1210 Jazz and Mika Snickars played together with a third DJ, Fanatik, in the all-scratch band Scratchaholics. This group gained considerable popularity in short time and defined scratch music for both the general public and other DJs in Sweden. Suffering the loss of the irreplaceable Fanatik, however, they disbanded Scratchaholics. Generally when playing together, one DJ takes the role of rhythm section while the other improvises and soloes over the beat. With four record players and two mixers, two DJs can produce quite intricate and exciting music. The results of the efforts on developing hyper-DJ tools with FonoBump have been presented and incorporated in the concert. http://www.speech.kth.se/soho

SHAPEd Performance . Within the SHAPE project different ways of interacting with sounds and complex sound generating models have been developed. The sound models, played live by *John Bowers and Sten-Olof*

Hellström, are loosely based on physical modelling and granular synthesis techniques. The performance has incorporated ideas and techniques emerging during the course of the Atelier. A new set of possibilities for sound experimentation has flourished as a result of this performance and of the discussions that followed.

the Vodhran *Niall Keegan (flute) and Sandra Joyce (bodhran) - Limerick*, performed Irish-flavored tunes and improvisations, responding to the attacks of the hackers of the virtual bodhran. Namely, in the middle part of the concert, John Bowers, Mikael Fernström, and Sandra Joyce acted on a variety of gestural devices, playing several instances of the vodhran in a colloquial fashion.

6 Schedule

june	10	11	12	13	14
9–12 14-17	Impact model: tuning and control				
			Sound models for CARE-HERE		
hands-on workshops	Sounds for SHAPE (I)				
	FonoBump: implementation and testing				
17-19 open seminars	SOb: Sounding Objects (Rocchesso, Bresin, Fernström)	Hyper-instruments in hyper-spaces (Serafin)	CARE-HERE: technology for therapy (Brooks, Trocca)	MEGA: Multimodal expressive environments (Camurri, De Poli, Vidolin)	Perception of Sounding Objects (Vicario)
21-23 concerts					*Hyper-DJSet*

Table 1: Week I

june	17	18	19	20	21
9–12 14-17	Friction model: tuning and control				
			Spatialized SObs		
hands-on workshops	Sounds for SHAPE (II)				
	Vodhran: implementation and testing				
	SOb vs. Modalys				
			Psychophysical assessment of models		
17-19 open seminars	Modalys (Misdariis, Bensoam)	SHAPE + *SHAPEd Performance* (Bowers, Hellström)	AMBIENT-AGORAS: roomware (Müller-Tomfelde)	AGNULA: open-source and multimedia (Bernardini, Trevisani)	Summary of results
21-23 concerts				*the Vodhran*	

Table 2: Week II

Weekend

Discussions and exchanges have continued over the weekend (june 15–16) in the form of informal meetings and private hacking sessions.

7 Participants

Federico Avanzini received in 1997 the "Laurea" degree in physics from the university of Milano. From november 1998 to november 2001 he pursued a Ph.D. degree in computer science at the university of Padova, with a research project on sound and voice synthesis by physical modeling; his Ph. D. thesis is titled "Computational issues in physically-based sound models". From january to june 2001 he has worked as a visiting researcher at the Lab. of Acoustics and Audio Signal Processing, Helsinki University of Technology, where he has been involved in the "Sound Source Modeling" project. In march 2002, he received a research grant from the University of Padova, with a project on physically-based sound models in human-computer interaction. He holds a Conservatory degree in piano, and has lately been trying to play trumpet. www.dei.unipd.it/~avanzini/

Joël Bensoam is a researcher in acoustics at IRCAM – Paris (Instrumental Acoustics Team) and Phd thesis student from the University of Maine. His specialties are physical modeling applied to sound synthesis, digital computing by Finite Element Method and Boundary Element Method, linear and non linear mechanics, contact problems in elasticity. Hi got a Master in Physics, and the DEA in Physical acoustics from the University of Paris XI Orsay, University of Maine.

Nicola Bernardini was born in Rome and got his diploma at the Berklee College of Music - Boston. He has written works for electronic instruments, computer and traditional instruments. He has contributed to the creation of electronic work of several composers such as Giorgio Battistelli, Luciano Berio, Aldo Clementi, Alvin Curran, Adriano Guarnieri and Salvatore Sciarrino. He teaches Electronic Music at the "C. Pollini" Conservatory in Padova. In the beginning of 2001 he succeded to Luciano Berio as the Artistic Director of the Centro Tempo Reale in Firenze, and in this position he is coordinating the European Project AGNULA (IST-2001-34879) dedicated to Free Software and Multimedia.

Gianpaolo Borin received his "Laurea" degree in Electrical Engineering from the University of Padova in 1990, with a thesis on sound synthesis by physical modelling with G. De Poli and A. Sarti. Since then he has been doing research at the Centro di Sonologia Computazionale, University of Padova. In the meantime, he has been working as a Consultant Researcher for Generalmusic S.p.A. . His current research interests include algorithms and methods for the efficient implementation of physical models of musical instruments, mainly in the area of the piano family. At present, he works both as a professional developer, a network consultant and a project manager in an italian software house. He is subcontractor in the SOb project.

John Bowers is coordinator of the SHAPE project at the Royal Institute of Technology (KTH), Stockholm and studies music at the School of Music, University of East Anglia, UK.

Eoin Brazil is a Research Assistant in the Interaction Design Centre at the University of Limerick. Currently working on the Sounding Object (SOb)

project. In 2000, he graduated from UL with a B.Sc. in Computer Systems. He worked previously as an intern developer at Motorola B.V. in Swords, Co. Dublin developing programs for various Computer Aided Manufacturing (CAM) systems. His research interests include user interface design with an emphasis on sonification, information visualization, distributed systems and software engineering methods.

Roberto Bresin is a researcher in music acoustics working at the Department of Speech Music and Hearing at KTH, Stockholm, and at the Department of Psychology, Uppsala University. He received a Master in Electrical Engineering from Padova University in 1991 and a PhD in Music acoustics in 2000 from KTH. His main research interests are analysis and rendering of music performance, music perception, emotion in music, tools for music education, ringtones for mobile phones, artificial neural networks for musical applications. He is coordinator for the KTH group in the EU funded projects SOb and AGNULA. He is also working in the MEGA European project and in the Swedish project called Feel-Me. http://www.speech.kth.se/~roberto/

Tony Brooks born Wales, 1956, is a performing and conceptual artist and researcher. He has presented his work at numerous international conferences and events, lecturing widely at universities, colleges, and institutes worldwide. His work, titled "Soundscapes," is currently being researched at the Center for Brain Injury, Copenhagen University, Denmark, with the support of a government grant. He has a company which is centered around the research and development of a concept based on non-verbal communication through interacting with music and images. His work was recently based at the Center for Advanced Visualization and Interactivity (CAVI) in Aarhus, Denmark. He is involved in two EU projects: Mobile Immobile and CARE HERE.

Roberto Burro was born in 1975, in Verona. He received his Laurea in Experimental Psychology from the University of Padova. Since January 2001 he is a PhD student at the Department of General Psychology at the University of Padova. Since April 2001 he is involved in the SOb project. His main interests concern perception and psychophysics.

Antonio Camurri is an Associate Professor at University of Genova where he teaches the courses of "Software engineering" and "Multimedia Systems". He is the founder and scientific director of the Laboratorio di Informatica Musicale at DIST, member of the board of Directors of AIMI (Italian Association for Musical Informatics), member of the Executive Committee (ExCom) of the IEEE CS Technical Committee on Computer Generated Music, Associate Editor of the Journal of New Music Research. His research interests include computer music, multimodal intelligent interfaces, interactive systems, KANSEI information processing and artificial emotions, models of representation of music and multimedia knowledge. He is author of several scientific international publications, and served in the scientific committees of international conferences. Systems and research developed in his Lab have been used in public performances, including several EU initiatives, the Venice Biennale Architettura, the Luciano Berio's

opera Outis at Teatro alla Scala, Milano (1996), permanent interactive installations at Città dei Bambini Science Center and Acquarium of Genova (1997-2000). He is or has been local coordinator for the EU projects Esprit 8579 MIAMI, TMR MOSART, IST CARE-HERE, and he is the Coordinator of the EU-IST Project MEGA (http://www.megaproject.org/). He manages contracts with research institutions (e.g. Waseda University, Tokyo) and private companies. He served as a reviewer in EU projects on the I^3 (Intelligent Information Interfaces) and other Esprit initiatives. He is owner of patents on computer systems, algorithms and multimedia systems.

Sergio Canazza is a research associate at the Centro di Sonologia Computazionale of the University of Padova, where he works in the MEGA IST Project.

Sofia Dahl is an engineer and a drummer, and a doctoral student working in the Department of Speech Music and Hearing at KTH, Stockholm. She has taken a special interest in the percussionists' interaction with their instrument, and her work has involved studies of movement patterns as well as timing. In addition to the work of developing control models for sound models within SOb, she is also involved with extraction expressive features from performances within the MEGA project. http://www.speech.kth.se/~sofiad/.

Alexander Danielsson (1210 Jazz) 1210 Jazz from Stockholm, Sweden, is first and foremost a battle-DJ. His speciality is scratching, and he has developed a personal style with lots of unique techniques and an inimitable melodic approach. 1210 Jazz has participated in a number of DJ battles, both national battles and world competitions. His technical abilities are astonishing. Over the years he has worked with different people in all kinds of contexts. Lately his scratching could be heard together with a large world-music influenced band called "Universal Riddim". 1210 Jazz will soon release his third album for DJ use. http://www.speech.kth.se/soho

Giovanni De Poli is associate professor of Computer Science at the Department of Electronics and Computer Science of the University of Padova, where he teaches classes of "Fundamentals of Informatics" and "Processing systems for Music". He is the Director of the Centro di Sonologia Computazionale (CSC) of the University of Padova. He is a member of the Executive Committee (ExCom) of the IEEE Computer Society Technical Committee on Computer Generated Music, member of the board of Directors of AIMI (Associazione Italiana di Informatica Musicale), member of the board of Directors of CIARM (Centro Interuniversitario di Acustica e Ricerca Musicale), member of the Scientific Committee of ACROE (Institut National Politechnique Grenoble), Associate Editor of the international Journal of New Music Research. His main research interests are in algorithms for sound synthesis and analysis, models for expressiveness in music, multimedia systems and human-computer interaction, preservation and restoration of audio documents. He is author of several scientific international publications, and served in the Scientific Committees of international conferences. He is in involved in European research projects: COST G6 - Digital Audio Effects (National Coordinator); MEGA IST

Project - Multisensory Expressive Gesture Applications (Local Coordinator); MOSART IHP Network (Local Coordinator). Systems and research developed in his Lab have been exploited in collaboration with digital musical intruments industry (GeneralMusic). He is owner of patents on digital music instruments.

Filippo Fanò is a student of the University of Siena, graduating in "Scienze della Comunicazione" with a thesis on SOb and SHAPE related aspects of human-artefact interaction, under the supervision of Patrizia Marti and Mikael Fernström.

Mikael Fernström received his primary degree in Electronic Engineering and Telecommunications from Kattegattskolan in Halmstad in Sweden 1975. He then worked in industry as inventor, electronics engineer, industrial designer, manager, composer and company director, principally in Sweden. He worked with AVAB Electronics in Gothenburg, from 1976 to 1979 building and designing sound and light equipment for theatres. He set up ILF Innovation and developed the business between 1980 and 1989. During this period he developed a number of patents for Signal processing of EMG-signals, Heat-pump control-system, Optical Interconnects, etc. In 1989 the company was taken over. He stayed on until 1991, when he took the opportunity to move to Ireland to work as a freelance consultant. From 1996 he worked as a Research Officer in the Interaction Design Centre at the University of Limerick, primarily on the development of Multimedia Browsing Systems and the use of sound in computer interfaces. In 1998 he was awarded an M.Sc. by research by the University of Limerick and appointed as Lecturer. Subsequently he spearheaded the development of a new taught Masters degree in Interactive Media at UL and was appointed Course Director. He is one of the co-designers of the LiteFoot interactive floor. His research interests cover Computer Science, HCI, Electronics, Sound, Music, Multimedia, History, Archaeology and the Performing Arts. In 1999 he was commissioned by the Irish Pavilion at EXPO2000 in Hanover, together with Mr. Sean Taylor of the Limerick School of Art and Design, to create Bliain Le Baisteach, a multimedia artwork, which was also sponsored by the Art Council and Met Eireann. He is currently working on his Doctoral research in Ecological Sound Design in the context of Human-Computer Interaction. In 2001 and 2002 he has been awarded research grants for collaboration with Dr. Joe Paradiso of MIT Media Lab to develop new interactive surfaces within the scope of Media Lab Europe in Dublin. He is the lead researcher at UL on the Sounding Object project. He is a Member of the Audio Engineering Society; Member of the International Society of Ecological Psychology and Member of the Electronic Music Foundation.

Federico Fontana is a PhD student at the Department of Computer Science of the University of Verona. He graduated from the University of Padova in 1996. In 1997 he was an engineer at UH S.A. (Barcelona, Spain) working on the design of acoustics and vibration test processes. In 1998 he worked at CSC (Centro di Sonologia Computazionale) of the University of Padova in the field of physical modelling of resonating objects and spatialization in small enclosures. He has been consulting for General-

music - Software Division and for the DPG Audio&Automotive Division of STMicroelectronics, in the development of real-time systems for audio processing. He was a visiting researcher at the Laboratory of Acoustics and Audio Signal Processing of the Helsinki University of Technology from January to May 2001. He participates in the European Project IST 2000-25287 SOb - the Sounding Object, and in other two research projects. http://profs.sci.univr.it/~fontana/

Bruno Giordano graduated in Experimental Psychology with the thesis "Timbre Psychophysics in piano tones" at the University of Padova, in 2001. Since July 2001 he has been involved in the SOb project. Since January 2002 he is a PhD student at the Department of General Psychology at the University of Padova. His main interests concern timbre perception, ecological acoustics, psychophysics theory and methods, and visual perception.

Massimo Grassi was born in 1971, in Padova (Italy). Hearing psychologist. Graduated 'cum laude' at the University of Padova with a research project on the perception of out of tune musical scales, he is a PhD student in the Department of General Psychology of the same University. He has collaborated frequently with the Hearing Research Group of the University of Sussex (Brighton, UK) where he was working on the subjective duration of sounds increasing or decreasing monotonically in sound pressure level. He is now working on perception of ecological sounds under the European project SOb.

Tony Hall is a PhD student and research officer in the Interaction Design Centre, Department of Computer Science and Information Systems, University of Limerick, Ireland. Tony's research interests are the affects of ICT on learning and teaching in higher education, and the novel use of technology to enhance children's learning.

Kjetil Falkenberg Hansen studied musicology (to cand. philol. degree) at the Norwegian University of Science and Technology (NTNU) in Trondheim from 1996 to 2000. He now works at the Department of Speech Music and Hearing at KTH in Stockholm where he studies performing aspects and acoustics of the expressive DJ playing style called scratching. Currently he is involved in the SOb and AGNULA projects.
http://www.speech.kth.se/~hansen/

Sten-Olof Hellström is a composer and researcher at the Royal Institute of Technology (KTH), Stockholm and is working on a PhD in composition at City University of London, UK.

Damien Henry born in 1974, is an acoustic engineer who has been doing experimental electronic music for seven years. He has been working for LA-Kitchen (http://www.la-kitchen.fr) on a `pd`-based experimental mp3 streamer. As an artist, he has designed sound and music for the performance http://www.h8fulworld.net/. In the last year, he has been working to make `pd` more powerful as an interactive and graphic tool (http://dh7.free.fr/).

Sandra Joyce is a much in-demand performer, and a renowned bodhrán player and traditional singer. She is currently recording for her debut solo album, due for release in Autumn of this year. In a duo with Niall Keegan, Sandra's performing career has taken her to India, the US, Hungary, Belgium, Austria and Sweden. They recently performed at the prestigious Celtic Connections Festival in Glasgow and also at the Barbican Centre in London, along with Mícheál ó Súilleabháin, Brian Kennedy and the Irish Chamber Orchestra. http://www.ul.ie/~iwmc/research/sanbiog.html

Niall Keegan is one of Ireland's most exciting and innovative players of the Irish traditional flute. Born in London of Irish parents, he has been living and working in Ireland for 12 years. Along with Sandra Joyce, he is joint course director of the first Master of Arts in Irish Traditional Music Performance at the Irish World Music Centre, University of Limerick. Niall's debut album "Don't Touch the Elk" received rave reviews on both sides of the Atlantic (see press below) . His playing featured on the BBC/RTE television series "A River of Sound" and also on the 1995 Eurovision interval act "Lumen", with Micheal O Suilleabhain. He has made several TV appearances, including on the RTE's Late Late Show, the TG4 series Geanntra and on RTE and BBC Radio. In a duo with Sandra Joyce, Niall's performing career has taken him to India, the US, Hungary, Belgium, Austria and Sweden. They recently performed at the prestigious Celtic Connections Festival in Glasgow and also at the Barbican Centre in London, along with Mícheál ó Súilleabháin, Brian Kennedy and the Irish Chamber Orchestra.

"..Keegan is a consummate virtuoso destined for the big stages, or there's no justice" (The Irish Times)

"Keegan's playing is clever and full of invention...much of his playing is nothing less than breath-takingly spectacular" (The Examiner)

http://www.tartantapes.com/niall-tracks.html

Aleardo Maestrini , experimental psychologist. He does research at the University of Udine, where he collaborates in the SOb project.

Mark Marshall Graduated with a B.Sc. Degree in Computer Systems from the University of Limerick in 2001. Currently working on an M.Sc. by Research under the title of "Human Gesture Control of Virtual Sound Objects". Research interests include sound modelling, digital signal processing, and technology for interaction with computers.

Nicolas Misdariis Acoustician, Born on september 1969, in Paris. Graduate from a college of university level specializing in professional training on mechanics, in 1993, he made a specialization on acoustics within the Acoustical Laboratory of Maine University (LAUM, Le Mans). Since 1995, he worked at Ircam where he took part in several projects concerning different fields of research such as psycho-acoustics and perception, room acoustics, musical acoustics and sound synthesis by physical modeling, etc. Apart from that, he has studied jazz music and worked saxophone since 1987, playing among several small groups and big bands. http://www.ircam.fr/.

Bridget Moynihan (B.Sc.) is a Research Assistant in the Interaction Design Centre at the University of Limerick, currently working on the Sounding Object (SOb) project. She previously worked on other European and national projects, mainly as a web developer. Her research interests include interaction design, user-interface design and evaluation, web usability analysis and gestural recognition for musical instrument.

Christian Müller-Tomfelde is a researcher at FhG-IPSI's division AMBIENTE "Workspaces of the Future" in Darmstadt/Germany, where he joint in summer 1997. Before he worked at the Center for Art and Media Technology (ZKM) in Karlsruhe on a project of the Media Museum of the ZKM concerning interactive and virtual room acoustics. At IPSI he was involved in the i-LAND project and in the design of the roomware components of the first and second generation. He is active on the fields of human-computer interaction, auditory display, computer-supported cooperative work and disappearing computer. http://www.ipsi.fraunhofer.de/ambiente http://www.Ambient-Agoras.org http://www.roomware.de

Laura Ottaviani received in December 2000 the "Laurea" degree in Computer Science from the University of Verona. Since 2001, she is a Ph.D. student in Computer Science at the University of Verona. She participates in the European Project IST 2000-25287 SOb - the Sounding Object. Her main interests are auditory perception and auditory display. She is also interested in auditory scene analysis, topic of her Master thesis. http://profs.sci.univr.it/~ottavian/

Matthias Rath received the "Laurea" degree in Mathematics in 1998 from the University of Bonn. His studies of Electronic Composition at the Folkwang-Hochschule-Essen are currently interrupted after the intermediate diploma in 2001, by his work for the SOb project in Verona. He is working on his PhD thesis on model-based sound design. http://www.sci.univr.it/~rath.

Davide Rocchesso received the "Laurea" degree in Electrical Engineering in 1992 from the University of Padova, summa cum laude. He received the Ph.D. in Industrial Electronic and Computer Engineering from the University of Padova in 1996. His doctoral thesis was about structures and algorithms based on feedback delay networks for sound processing. In 1994 and 1995 he has been visiting scholar at the Center for Computer Research in Music and Acoustics, Stanford University. He received post-doc scholarship from the University of Padova and the Centro Tempo Reale, Florence. Since 1998 he is assistant professor at the University of Verona. He has been member of the boards of directors of the Associazione di Informatica Musicale Italiana (AIMI) and of the Centro di Sonologia Computazionale (CSC) of the University of Padova. He worked in several industrial projects concerning sound processing. He taught several classes in sound processing, operating systems, and computer graphics at the Universities of Padova, Verona, and P. Fabra - Barcelona. He has been reviewer and opponent for Ph.D. theses of the Helsinki University of Technology. He is the coordinator of the EU project "SOb - the Sounding Object", financed by the European Commission as part of the "Disappearing Computer" initiative. He participates to the National project

"Sound models for human-computer and human-environment interaction" (COFIN2000). Davide Rocchesso gave several lectures in international institutions, and invited talks in international conferences. In december 2000, he organized the COST-G6 Conference on Digital Audio Effects. He authored about 60 publications in conference proceedings, books, and journals. http://www.sci.univr.it/~rocchess.

Stefania Serafin was born in Venice, Italy, in 1973, where she received her "Laurea" degree summa cum laude in Computer Science from the University of Venice and where she studied violin at the music Conservatory B. Marcello. From 1997 to 1999 she moved to Paris where she worked in the Analysis-Synthesis team at Ircam, Pompidou center and she received a DEA (master-like) degree in Acoustic, Signal Processing and Computer Science applied to Music. Since 1999 she is a PhD student at the Center for Computer Research in Music and Acoustics of Stanford University working with Prof. Julius O. Smith III. Her main interests are on physical models of (un)traditional instruments enhanced by HCI and computer graphics. http://www-ccrma.stanford.edu/~serafin

Thomas Serafini graduated in mathematics at the University of Modena with a thesis on numerical methods applied to the simulation of nonlinear circuits. Since then he has been a developer for IKMultimedia, and he is now a PhD student in Mathematics at the University of Modena.

Mika Snikars is by many considered to be *the* DJ in Sweden, covering a vast list of musical styles and frequenting the most prestigious clubs in Stockholm. Mika is an excellent all around DJ, but as a turntable drummer he exels. In "drumming" the DJ builds up new rhythms off short shounds. Over the years he has developed his own mystic scratch flow that defies description. Mika Snickars manages both a record label and a record store and has done a number of remixes/edits. He is also considered to be one of the top record collectors in Sweden.
http://www.speech.kth.se/soho.

Marco Trevisani was born in Verona. He studied architecture, at Politecnico di Milano, piano and music composition with private teachers and then at Musik Hochschule in Vienna, with Tamas Ungvary and Dieter Kaufmann, and there he was also introduced to computer music. He spent 5 years at CCRMA (Center for Computer Research in Music and Acoustics), Stanford University, as visiting composer, then he taught composition and music synthesis at New York University for three years and was visiting composer at CMC (Computer Music Center), Columbia University in 1997. Since the year 2000 he has been living in San Juan, Puerto Rico, devoting his time to composition, concerts and development and promotion of free software. In 2001 organized the International Computer Music Conference (ICMC) in La Habana, and since 2002 he 's collaborating with Centro Tempo Reale, Florence, as senior engineer in the AGNULA project. http://www-ccrma.stanford.edu/~marco/

Riccardo Trocca is a researcher in the CARE-HERE project at the DIST, University of Genova.

Giovanni Bruno Vicario is Professor of General Psychology at the University of Udine, and local coordinator of the SOb project. He recently published the book "Psicologia generale. I fondamenti", Laterza, 2001.

Alvise Vidolin teaches Electronic Music at the Conservatorio di Venezia and at the Civica Scuola di Musica di Milano. He also teaches Computer Systems for Music at the Universit di Padova where he works in collaboration with the Centro di Sonologia Computazionale since 1974. He served the Biennale di Venezia as Director of the Permanent Laboratory of Computer Music. He co-founded the Associazione Informatica Musicale Italiana and served as its president from 1988 to 1990. He has published several scientific works and is actively involved in scientific research. As a live-electronics performer, he collaborated with Claudio Ambrosini, Giorgio Battistelli, Luciano Berio, Aldo Clementi, Wolfango Dalla Vecchia, Franco Donatoni, Adriano Guarnieri, Luigi Nono, Salvatore Sciarrino.

Gualtiero Volpe is a PhD student at DIST-University of Genova. He received his degree in computer engineering from the University of Genova in 1999. His research interests include intelligent and effective human-machine interaction, modeling and real-time analysis and synthesis of expressive content in music and dance, KANSEI information processing and artificial emotions. Currently, he is a member of the staff of the DIST Lab on Musical Informatics. He is involved in the analysis and mapping of expressive information within the MEGA and CARE-HERE projects.

David B. Wohl is a composer/sound designer of concert and commercial music, living in Colorado, USA. He received his Doctorate in composition from McGill University, Montral, his Masters degree from Northwestern University, and his Bachelor degrees from Oberlin College and Roosevelt University. Dr. Wohl's concert works are colorful and eclectic, among which are "The Soft Moon" for chamber orchestra, "Piano variations", "Once Spoken" for extended percussion, harp, violin, bass clarinet and flute, "Between Times" for concert choir and "Apache Wedding Blessing" (tenor, flute, vibraphone). His electro-acoustic music includes "This Speaking Body", "Larimer County Exchanges" and "The Bourgeois Gentleman", among many others. He is the recipient of seven ASCAP Special Awards for his works, and has been commissioned three times by the Colorado Council on the Arts. His music for T.V., theater and video have included soundtracks for two Emmy award-winning T.V. series. He currently composes for Discovery Channel, Animal Planet and Food Channel, as well as for film. Dr. Wohl's upcoming commission. "Playtudes" (electronics, trumpet, violin and clarinet), will be premiered by the Front Range Chamber. An accomplished improviser, Dr. Wohl teaches keyboard improvisation at Colorado State University (USA), School of the Arts.

8 Institutions

Università di Verona, VIPS Lab. http://vips.sci.univr.it

Università di Udine http://www.uniud.it

University of Limerick, IDC http://www.idc.ul.ie/

Royal Institute of Technology (KTH), Stockholm. Speech, Music, and Hearing Dept. http://www.speech.kth.se/

Royal Institute of Technology (KTH), Stockholm. Centre for User Oriented IT-design.] http://cid.nada.kth.se/

IRCAM, Paris http://www.ircam.fr/

CCRMA, Stanford University http://www-ccrma.stanford.edu/

Fraunhofer IPSI, Darmstadt http://www.ipsi.fraunhofer.de/

Università di Genova, DIST http://www.dist.unige.it/

Università di Padova, DEI http://www.dei.unipd.it

Centro Tempo Reale, Firenze http://www.centrotemporeale.it/

9 Disappearing Computer Projects

SOb the Sounding Object http://www.soundobject.org

SHAPE Situating Hybrid Assemblies in Public Environments http://www.shape-dc.org/

AMBIENT-AGORAS Dynamic Information Clouds in a Hybrid World http://www.ambient-agoras.org

10 Other EU Projects

AGNULA A GNU/Linux Audio distribution http://www.agnula.org/

CARE-HERE Creating Aesthetically Resonant Environments for the Handicapped, Elderly and REhabilitation http://www.bris.ac.uk/carehere/

MEGA Multisensory Expressive Gesture Applications http://www.megaproject.org/

11 Sponsors

the Disappearing Computer IST Future and Emerging Technologies. http://www.disappearing-computer.net

Comune di Venezia

COFIN2000 Ministero dell'Università e Ricerca Scientifica e Tecnologica. project "Models for sound in human-computer and human-environment interaction".

12 Acknowledgment

MusicalBox http://www.musicalbox.com

Clavia http://www.clavia.com/