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NTU CENTRE FOR
CONTEMPORARY
ART SINGAPORE



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Tomás Saraceno

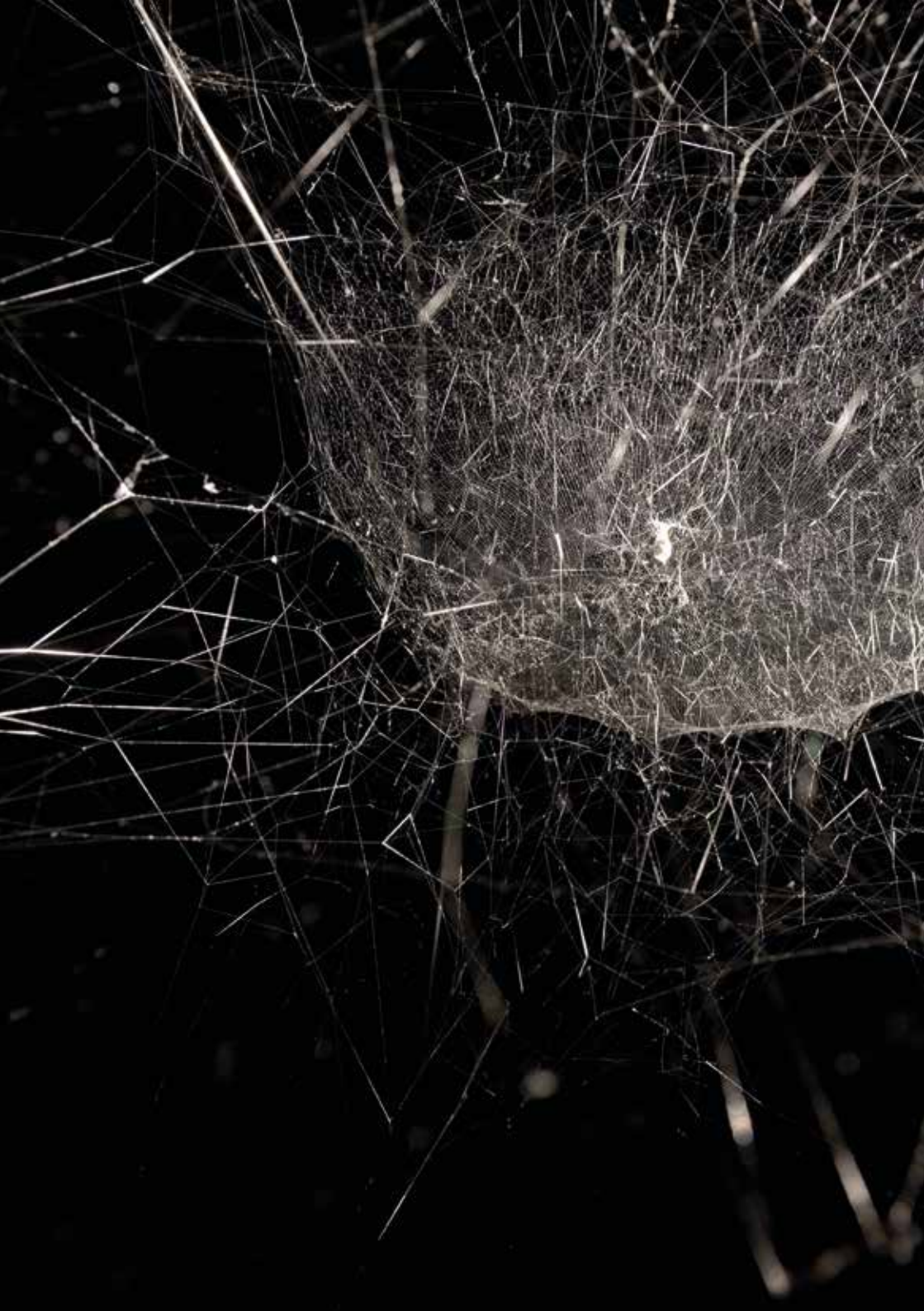
ARACHNID
ORCHESTRA.
JAM SESSIONS

23 October – 20 December 2015



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NANYANG TECHNOLOGICAL UNIVERSITY



Tomás Saraceno

ARACHNID ORCHESTRA. JAM SESSIONS

NTU CCA Singapore is pleased to present for the first time in Singapore the pioneering and visionary work of the Berlin-based artist, **Tomás Saraceno**. Situated at the intersection between art and science, Saraceno's artistic practice is an invitation to conceive alternative ways of knowledge, experience and interaction with others. Spanning across various fields of knowledge, from astronomy to arachnology, from architecture to music, his highly transdisciplinary and collaborative projects are ambitious attempts to pave the path towards a world of sustainable environment. His visionary structures and images that often make use of the most basic elements such as air, sunlight or wind are informed by ecological concerns and could be seen as propositions for a better future.

As with the systems he develops, his works are never self-reliant; on the contrary they come together as a result of maximal, energetic collaborations between different parties: arachnologists, artists, curators, cultural theorists, philosophers, sociologists, geographers, etc. Interdisciplinary collaboration is a constant attribute of his work and a tool for complex production that resists the reductionist dichotomies between different forms of knowledge.

Saraceno is well-known for his inflatable and airborne biospheres inspired by the morphology of soap bubbles, cloud formation or spider webs taking the form of large-scale, visually impactful and interactive installations.

For one of his most celebrated series presented in various institutions, *Cloud Cities*, a model for floating urbs, the artist constructed aerial structures that can be inhabited by people with a low environmental impact. *Cloud City* was also presented on the roof garden of the New York's Metropolitan Museum of Art in 2012 where Saraceno constructed a large-scale habitat out of modular structures interconnected with transparent and reflective materials. Visitors were invited to enter and walk through these structures experiencing a possible, future form of dwelling.

An extension of *Cloud Cities* and his aerial artworks, *On Space Time Foam*, was created in 2012 for Hangar Bicocca in Milan, Italy. This multi-layered installation consisted of plastic membranes suspended 24 metres above the ground. Each level had a different air pressure and reacted to the movement of visitors in each layer, creating an extraordinary interactive experience for its temporary 'inhabitants'.

Cover: Tomás Saraceno, *Vanitas*, George Kolbe Museum, Berlin (2014). Courtesy of the artist

Left: Tomás Saraceno, *Cosmic Jive: the Spider Session*, Museum for Contemporary Art Villa Croce, Genoa (2014). Courtesy of the artist

On Space Time Foam questioned how individual movements, actions and behaviours affect others close by, and introduced the issue of social relativity to Tomás Saraceno's works, an aspect that is further explored in the exhibition at NTU CCA Singapore.

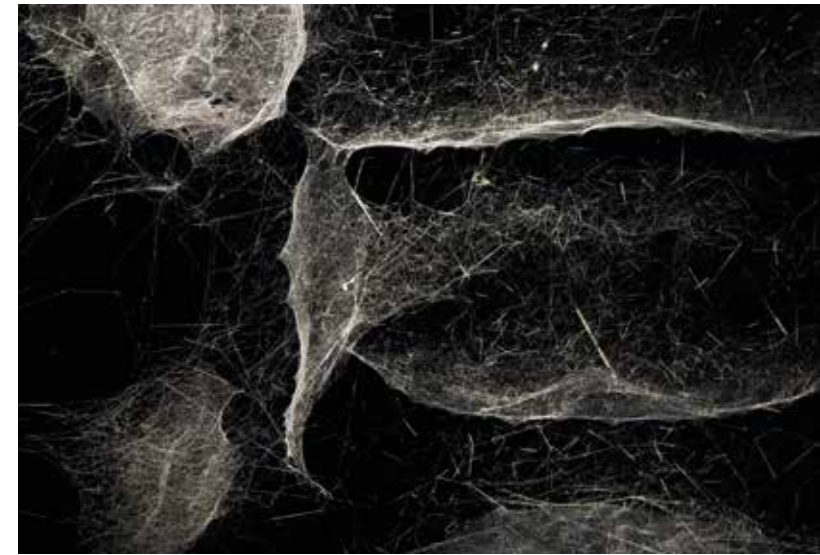
A long-term research of Saraceno and his studio is dedicated to spider webs. This research is in line with other projects of the artist where he investigated how structural patterns in cloud formation or soap bubbles can represent complex macrocosmic structures at a micro level. His interest in spider webs has been triggered by the often used visual analogy between the spider web and the scientist representation of the origins of universe. Paradoxically, as the artist noted, despite the ubiquity of such a visual metaphor, the three-dimensional web is still to be properly explored and measured¹.

One of his most spectacular arachnid inspired installations, *Galaxy Forming along Filaments, Like Droplets along the Strands of a Spider's Web* was exhibited at the Italian Pavilion for the 53rd Venice Biennale in 2009. Saraceno further expanded on this work, in collaboration with world leading arachnologists and researchers from MIT, among others, by being the first to scan, analyse, and reconstruct a three-dimensional spider web subsequently presented at Bonniers Konsthall, Sweden in the following year. This project was embraced by scientists worldwide. Saraceno has continued to pursue his research at the European Space Agency (ESA) with a proposal to send spiders into space, testing the conditions of micro-gravity and its impact upon spiders' sociability, web building and the spider web itself.

The artist's fascination with the spider webs derives not only from its architectural formation, but also its physical properties. "Spider silk is one of the strongest materials known. In fact, its strength is about that, or even larger, than the strength of steel," noted Markus Buehler (Professor, Civil and Environmental Engineering, MIT) in a conversation with Saraceno².

To weave the web is a highly complex endeavour. In order to understand such laborious work, the biologist William Eberhard uses a strong visual analogy³:

"Perhaps it is easiest to appreciate an orb weaving spider's achievements if you put yourself in her place, and imagine what it would be like if you were attempting to build a new orb. To start, you must first blindfold yourself: the spider's eyesight is very poor, her eyes are on the wrong side of her body to see the web's lines as she hangs below them, and in any case she often works at night.



Tomás Saraceno, *Semi-social musical instrument SXDF-NB1006-2: built by four *Cyrtophora citricola*, eight weeks* (2015). Courtesy of the artist

[...] The closest human analogy would be that of a blind man who must explore and climb through the tangled branches of trees on the basis of touch, leaving a silk line behind wherever he goes."

The silk produced by the spiders is used for multiple purposes. This includes the use in the production of egg sacs, for movement, as shelter, as food (some species recycle their web) and most importantly, to catch prey.

As the biophilosopher, Jakob von Uexküll noted, the web weaving is itself the product of a metaphysical process that highlights the complex inter-relational and perceptual processes defining the animal world. The spider weaves the web "in order to represent in its web a well-made mould a fly"⁴. However "he weaves its web before it has ever met a physical fly. The web can therefore not be a representation of a physical fly, but rather, it represents the primal image of the fly, which is physically not at all present".

Yet the spider webs developed in Tomás Saraceno's studio are rarely an individual product, but rather the outcomes of collaborative endeavours between social and semi-social spiders leading to hybrid structures. This artistic experiment of bringing different species into single frames comes from Saraceno's interest in the social realm of animals, and articulates the artist's vision for new models of cohabitation between human and non-humans.

¹ Tomás Saraceno in conversation with Professor Markus Buehler, MIT November 2013, <http://arts.mit.edu/reverberations-spiders-and-musical-webs/>

² Idem

³ William Eberhard, *Art Show in Cosmic Jive: Tomás Saraceno The Spider Sessions*, p. 40. Museo d'Arte Contemporanea di Villa Croce, Asinello Press: Genoa, Italy, 2014

⁴ Jakob von Uexküll, *A foray into the worlds of animals and humans*, p. 158. University of Minnesota Press: London, 2010

**ARACHNID
ORCHESTRA.**

JAM SESSIONS at NTU CCA Singapore is a new production of Tomás Saraceno that shifts his explorations of the spider webs towards the realm of sound. The line of this artistic research is an attempt to turn the spider web into a musical instrument embodying the incredible structural properties of spider's silk and the spider's sophisticated mode of communication through vibrations.

While spiders do not possess an auditory system for hearing sound, they perceive the reality around them with pressure and vibrations that always involve movements of the body or specific structures, such as web plucking. This also renders a cobweb as a sensory object, making it an extension of an invertebrate's body. Such mode of communication is not always perceivable to human ears and has reached a high degree of versatility amongst arachnids serving different purposes that punctuate the spider's life: seduction, hunting or social interactions. Researchers have looked into the role of vibrations especially in courtship acts, and how spiders transfer through distinct vibratory signals information on their identity, mating status and quality diminishing the risks for the male spider to be mistaken for prey.

However, Saraceno's interest into spider's mode of communication through vibrations is predicated on hypotheses of play and creativity that ask for a more complex understanding of the animal world.

Preparations for *Arachnid Orchestra. Jam Sessions* began a year ago with spider field trips across Singapore. Spiders such as the *Psecrus singaporensis*, the *Golden Orb Weaver*, the *Twig-Like Feather-Legged*, and the *St. Andrews Cross* species worked collaboratively and collectively in a special laboratory at NTU CCA Singapore.

Working together with arachnologists and sound engineers, Saraceno developed a series of musical instruments that are able to translate the vibrations of the spiders into acoustic rhythms. The exhibition presents different types of arachnid music instruments classified in strings, percussions and aeolic. Various musicians will respond to these spider vibrations in three live performances (jam sessions) throughout the duration of the exhibition in the attempt to push further the boundaries of interspecies communication.

Ute Meta Bauer & Anca Rujoiu

(Curators, *Arachnid Orchestra. Jam Sessions*)



Tomás Saraceno, *Hybrid solitary, semi-social instrument ESO 137-001*: built by one *Nephila kenianensis*, one week and a pair of *Cyrtophora citricola*, four weeks (2015). Courtesy of the artist

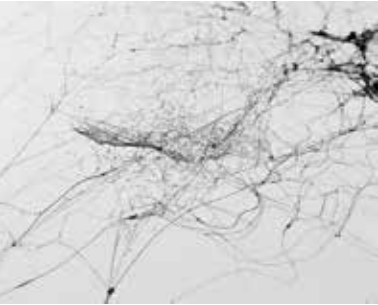
Tomás Saraceno (b. 1973 in Argentina) lives and works in Berlin, Germany. Saraceno's oeuvre could be seen as an ongoing research, influenced by the world of art, architecture, natural science and engineering; his floating sculptures and interactive installations propose and explore new, sustainable ways of inhabiting and perceiving the environment.

He attended the International Space Studies Program in 2009 at NASA Ames in Silicon Valley, California. The same year, Saraceno presented a major installation for the Italian Pavilion at the 53rd Venice Biennale, and was later on awarded the prestigious Calder Prize. Since 2012, he is Visiting Artist at MIT Center for Art, Science & Technology (CAST). Saraceno's work has been shown internationally, in solo and group exhibitions such as *Le Bordes du Monde*, Palais de Tokyo, Paris (2015); *In orbit*, Kunstsammlung Nordrhein-Westfalen, K2, Düsseldorf (2013-15) and *On Space Time Foam*, Hangar Bicocca, Milan (2012-13), amongst others. His work has also been exhibited in public museums such as Museum for Contemporary Art Villa Croce, Genoa (2014), The Metropolitan Museum of Art, New York (2012), and Hamburger Bahnhof, Berlin (2011-12).



ARACHNID ORCHESTRA

The Performers



Tomás Saraceno, *Solitary, semi-social mapping of The Southern Pinwheel with neighboring galaxies: built by one Nephila clavipes, three weeks and twelve Cyrtophora citricola spiderlings, four weeks* (2015). Courtesy of the artist

CYRTOPHORA CITRICOLA (Forsskål, 1775) Tropical Tent-Web Spider

Cyrtophora citricola is an iconic colonial spider, with a distribution from East Africa and West Africa to the Mediterranean and as far as India. Recently it has also reached the Americas. Its individual web contains a tightly woven sheet with vertical threads attached to it, forming a tent-shaped orb web. In evolutionary terms, this is a new form, and a very complex one that takes the spider a long time to build. The three-dimensional prey-capture webs are stacked one on top of the other, much like flats in an apartment block.

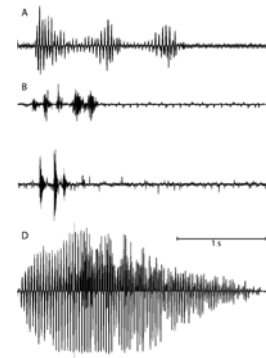
Each web has a single owner and the individual webs are connected to one another by frame threads. Up to a few thousand spiders can inhabit a single tree, covering the tree with their silk. When an unfortunate insect flies into the colony, the spider senses the impact through vibrations transmitted through the silk threads alerting nearby spiders that then converge on the prey. However, only one spider, usually the web owner, will finally capture and feed on the insect. Their vibrational communication is additionally important for courtship and to defend the colony.



Tomás Saraceno, *Semi-social mapping of the merging Abell 520 formed from a violent collision of massive galaxy clusters: built by a large two-generation colony of Cyrtophora citricola, six months* (2015). Courtesy of the artist

Wasps are the main enemies of colonial *Cyrtophora*. When a wasp attempts to attack a *Cyrtophora*, the spider will shake its web violently to deter the wasp, and these web vibrations induce other spiders in the colony to equally shake their webs. Soon the entire colony is “humming” with vibrating webs. Males of *Cyrtophora citricola*, which are smaller in size than females, wander through the colony in search of a virgin female and when one is located, the male begins to court her by plucking and strumming on the threads of her web. If the female approves of his courtship song, they will mate. However he must choose his mate wisely, given this might be his only chance to mate as he is then eaten by the female. This may be the reason why their intricate courtship songs and dances may last up to several hours.

Dr. Yael Lubin



Comparative sonogram capturing the vibration patterns of three different *Heteropoda* spider species. Courtesy of Peter Jäger

HETEROPODA VENATORIA (Linnaeus 1767) Common Huntsman Spider

This spider species is distributed around the tropics and lives in natural habitats as well as in human settlements. Although the species was described by the great Swedish natural scientist Carl von Linné from South America, its origin lies in Southeast Asia. Like most members of the huntsman spiders *H. venatoria* is a nocturnal predator ambushing for prey without a web.

When it comes to courtship, the male spider searches for a mate using his chemo-sensilla, chemo-sensitive receptors used to recognise and trace female’s sexual pheromones. When he successfully finds one he immediately initiates his courtship behavior. There are several elements that should ensure that he is perceived by the female as mating partner and not as prey. First he raises his second pair of legs, the longest of all four pairs, and performs a waving movement. The signal is clearly an airborne one and is strengthened by erectile hairs that are situated on the spider’s leg, enlarging the active part of the legs and thus acting as an air paddle. Additionally, he drums with his abdomen, the hind part of his body, on the substrate which he uses as a “sound board”. A prevailing characteristic among spiders is the ability to “hear,” not through a timbal-like organ as in humans, but rather through *trichobothria*, thin hairs emerging from their legs. These individual hairs once exposed to air currents act as movement detectors and respond to airborne stimuli. So-called slit sensilla, tiny slits in the exoskeleton, inform the spider about vibrations through the substrate. Hence, the female receives a mixture of signals that enables her to recognise her conspecific partner. She may respond with drumming to encouraging him to continue his performance or to climb on her body.



Common Huntsman Spider rehearsing with Wolf Spider duet on *Drum-set M33, NGC 598* (2015). In collaboration with Dr. Roland Mühlethaler. Courtesy Studio Tomás Saraceno

When vibrations of two different species are recorded and analysed one can easily find differences in the frequency, strength and pattern of these signals, showing the importance of this behavior for the reproductive success of a species.

Dr. Peter Jäger

NEPHILA PILIPES (Fabricius 1793)

Giant Golden Web Spider

Nephila pilipes is often held up as one of the more extreme examples of size disparity between sexes, with giant females and dwarf males. The body of the yellow-and-black female can be as big as our thumb, making the species the largest web-building spider in Singapore. By comparison, the red males are minuscule, measuring no more than a long grain of rice.

The female spins a large and strong vertical orb or wheel-like web that has a golden or yellowish tinge when viewed from certain angles. Several tiny males hang around the web of the giant female, often before she reaches adulthood. As soon as she is sexually matured, they would compete with one another for the chance to mount on the coveted female. These sexually active males have been observed to engage in aggressive chasing and web-shaking fights with one another.

The conspicuous webs of *N. pilipes* are commonly sighted along forest and mangrove fringes, and in wooded rural areas. It is widespread throughout tropical Southeast Asia, parts of South Asia, the Pacific and Australia.

N. pilipes were reportedly consumed by some Thai villages as food, eaten either raw or cooked. Natives in the highlands of Papua New Guinea have also been reported to harvest *N. pilipes* as food.



Semi-social *Nephila* web plucking on *Semi-social musical instrument SXDF-NB1006-2*: built by four *Cyrtophora citricola*, eight weeks (2015). Courtesy Studio Tomás Saraceno

PSECHRUS SINGAPORENSIS (Thorell 1894)

Singapore Lace-sheet Weaver

Psechrus singaporensis is one of two spiders named after Singapore, the country where the original specimen was collected and described. It can also be found in Peninsular Malaysia and Sumatra in Indonesia.

This species inhabits the forests and heavily wooded wasteland in Singapore, often living between tree crevices and under overhanging edges of mud walls. The web is an interesting three-dimensional structure made of two components: a dome-shaped tent in the centre and a funnel-like retreat at one end. The spider hangs upside down under the tent and waits for passing prey. When disturbed, *P. singaporensis* flees into the retreat at lightning speed.

Psechrus singaporensis captures its prey in a web made of non-sticky bluish woolly silk, quite unlike the viscid silk of *Nephila*.

Joseph K. H. Koh with the support of **Joanna M. L. Yeo**



Psechrus singaporensis,
Courtesy of Joanna M.L. Yeo

Joseph K. H. Koh has been documenting Southeast Asian spiders outside his previous duties as an ambassador and senior government official since 1972. His research has led to several scientific papers describing new spider species from Singapore and Brunei, a pictorial field guide of Singapore spiders (1991) and another on Borneo spiders (2014). Mr Koh retired in 2012 as the Singapore High Commissioner to Brunei Darussalam. He is currently an Honorary Research Affiliate at the Lee Kong Chian Natural History Museum of the National University of Singapore.

Joanna M.L. Yeo has been studying and photo-blogging Singapore and Malaysian spiders under the guidance of Joseph K H Koh since early 2014. She was previously a Science Educator (Life Sciences) at Science Centre Singapore and was involved in technology and food writing.

Dr. Peter Jäger is currently the Head of Arachnology at the Senckenberg Research Institute in Frankfurt, Germany as well as Co-Editor of the *World Spider Catalog*, the most used internet tool in the field of Arachnology. Jäger received his doctorate from Johannes Gutenberg University in Mainz for his groundbreaking research on huntsman spiders in the Himalayas. He has discovered more than 300 species of spiders in the last years, including a rare species in Malaysia that he named *Heteropoda davidbowie* after the legendary British rocker to raise awareness of endangered spiders and their threatened tropical habitats.

Dr. Yael Lubin is currently the President of the International Society for Arachnology. She received her Ph.D. from the University of Florida and conducted ecological research in Papua New Guinea, Panama and the Galapagos Island, Ecuador before joining Ben-Gurion University of the Negev in Israel in 1985. Lubin investigates the evolution of sociality, mating systems and sexual selection in spiders, the ecological mechanisms determining species diversity in spiders, and spiders as biocontrol agents in agro-ecosystems.

ARACHNID ORCHESTRA

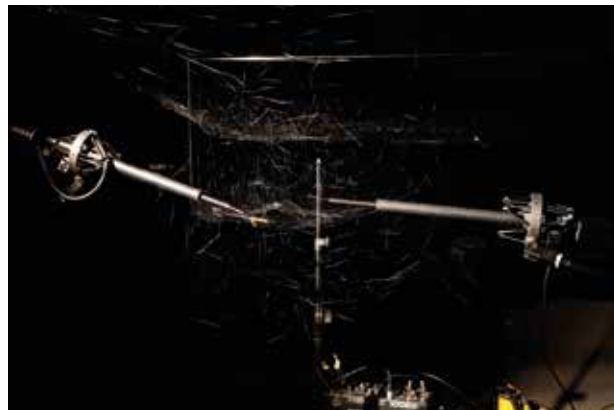
The Arachnid Music Instruments

STRING INSTRUMENTS

The string instruments of *Arachnid Orchestra* record the vibrations of a spider on its web due to special sensory devices – transducers and laser Dopplers that are able to capture, translate into acoustic output subtle vibrations on a web being tuned. However vibrational signals can also be produced by tremulation. Often the spider's abdomen is shaking and the vibrations are travelling through the substrate (e.g. plants). Some spiders can detect the conspecific signal (mating signal) over a distance of one or more meters. In order to pick up vibrations on a spider web, two different string instruments were developed. One instrument includes Piezo microphones attached to the spider threads whereas the other instrument makes use of a laser vibrometer.

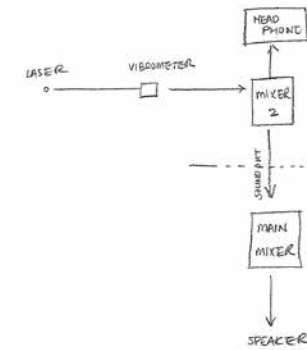
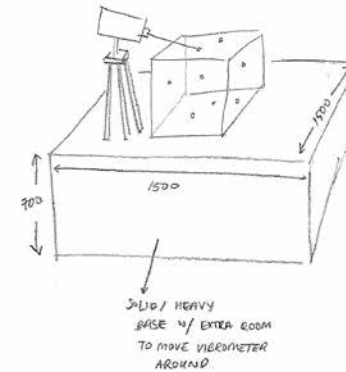


Spider Salon: Jam session with Evan Ziporyn with *Cyrtophora citricola* duet on *Semi-social musical instrument SXDF-NB1006-2*: built by four *Cyrtophora citricola*, eight weeks (2015). Courtesy Studio Tomás Saraceno

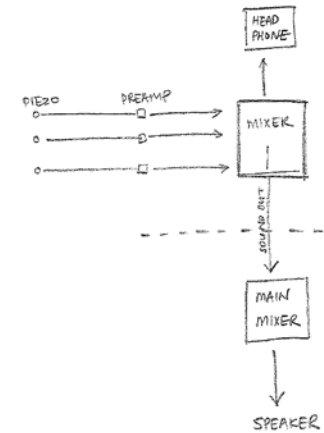
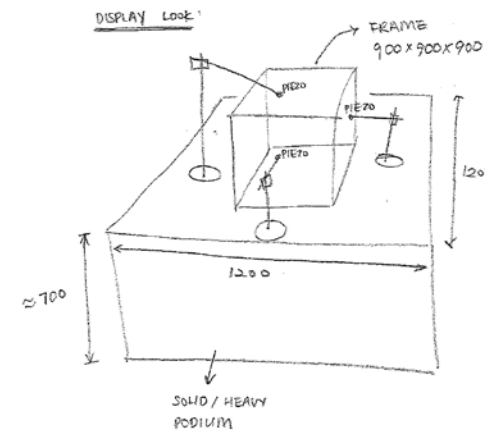


Test set-up to detect vibrational communication using Piezo elements (2015). Courtesy Studio Tomás Saraceno

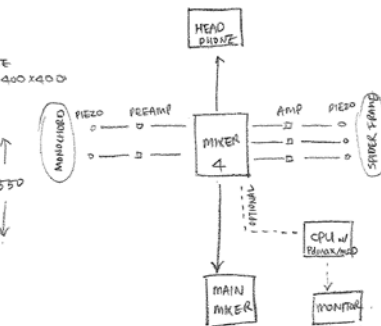
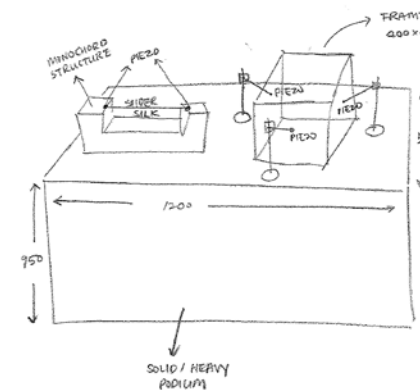
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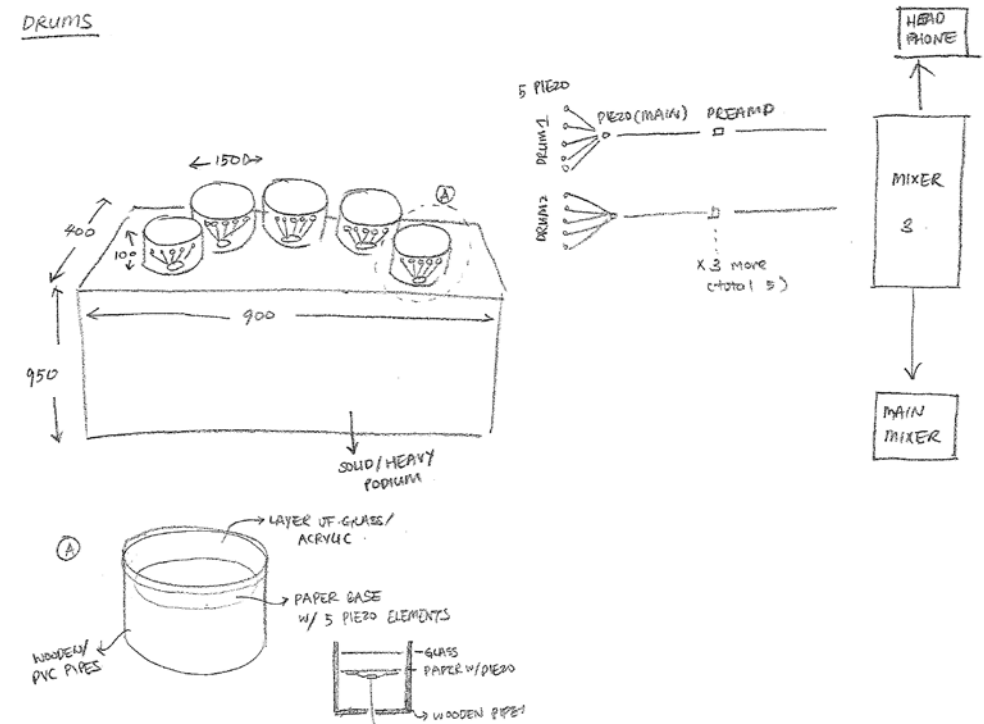
Test set-up to detect drumming using laser vibrometer (2015).
Courtesy Studio Tomás Saraceno

PERCUSSION INSTRUMENTS

The main element of the percussion instrument is a sensitive membrane that allows the recording of the drumming spiders and their soundings. These spider species use their musical skills in mating rituals, as males drum to communicate with a female, ensuring they won't be mistaken for a prey. Drumming signals can easily be picked up using a membrane (drum) on which a spider is placed. The spider uses its pedipalps, legs or the body to drum.

Depending on the substrate, the signal can even be heard directly, however this instrument features Piezo microphones devices attached to a membrane and a laser vibrometer pointing to a membrane or to the spider to pick up their signals.

DRUMS



Percussion performance of a Wolf spider (*Lycosidae*) quartet recorded, video still (2015). Courtesy Studio Tomás Saraceno



Percussion performance of Wolf spiders (*Lycosidae*) recorded using a laser vibrometer (2015). Courtesy Studio Tomás Saraceno

Some spiders produce stridulation sound (transmitted through the air) which involves the friction of rigid parts of the body that act as 'pars stridens' and 'pectrum'. These spider species have been described as "purring spiders" partly because the percussive sound, when generated on a dry surface, can be audible to the human ear over distances of several metres. To capture the signals, another percussion instrument has been designed making use of small sensitive directional microphones.

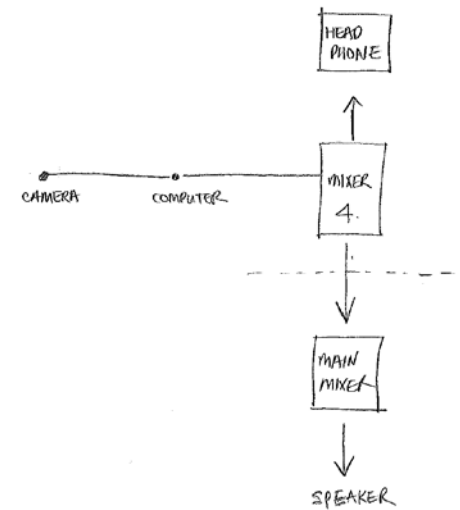
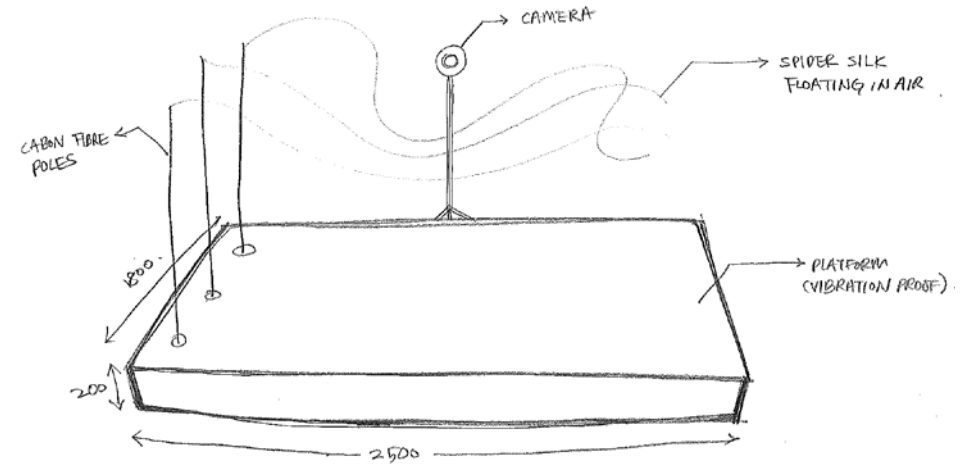


Sonification Experiments with Floating Spider Silk. In collaboration with Odysseus Klisouras, Studio Tomás Saraceno (2015). Courtesy of the artist

AEOLIC INSTRUMENT

The aeolic instrument was developed in relation to *Stegodyophus dumicola* spiders from Africa, which have been observed to do social ballooning. Ballooning is a method by which spiders use air as means of travelling and colonising new areas. Usually, young spiders climb to an elevated location, perform a “tiptoeing” behaviour and release silk into the air, until they have enough lift to fly. The wind instrument is based on the *Theremin* and altered to optically capture the on-going movement of floating spider silk and transform it into fluctuating sounds frequencies.

AEOLIC INSTRUMENT



All the arachnid music instruments have been conceived and designed by Studio Tomás Saraceno (2015). For a detailed list, check the exhibition layout inside the brochure cover.

Technical drawings by Julie Hyun, NTU CCA Singapore Manager, Exhibitions

FIELD TRIPS



Field trips at the MacRitchie Reservoir, Singapore (2015). Courtesy of the artist

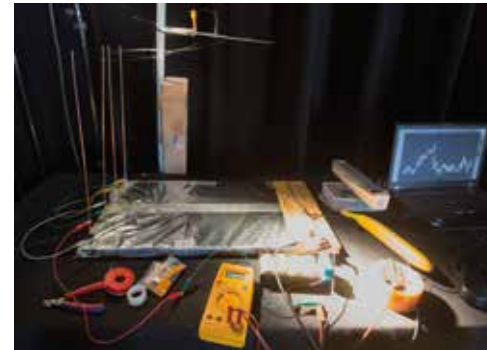
SONIC EXPERIMENTS



Studio rehearsals for *Arachnid Orchestra*. *Jam Sessions*, NTU CCA Singapore (2015).
Courtesy Studio Tomás Saraceno



Studio recording of wolf spiders (*Lycosidae*) performance with laser vibrometer (2015). In collaboration with Dr. Roland Mühlethaler and Dustin Jaschko, research student.
Courtesy Studio Tomás Saraceno



Measurement of the potential difference of the electric field produced by the movement of a spider silk from *Stegodyphus dumicola* in an air channel. In collaboration with Jo Gryg.
Courtesy Studio Tomás Saraceno

EDUCATION AND PUBLIC PROGRAMMES

NTU CCA Singapore provides an array of opportunities for various audiences to engage with our exhibition.

As an extension of the exhibition, a dedicated website www.arachnidorchestra.org operates as a research platform and playful hypertext of musical tuning.

All the programmes take place at the NTU Centre for Contemporary Art Singapore, Block 43 Malan Road, Gillman Barracks. Free admission to all programmes.

SAT, 24 OCTOBER 2015

4.00 – 6.00pm

Panel discussion including **Tomás Saraceno**, artist; **Peter Jäger**, arachnologist and **Elizabeth A. Povinelli**, critical theorist and filmmaker. Moderated by **Ute Meta Bauer**, NTU CCA Singapore Founding Director, **Anca Rujoiu**, NTU CCA Singapore Curator, Exhibitions and **Magdalena Magiera**, NTU CCA Singapore Curator, Outreach & Education

This panel will be an opportunity to gain a deeper understanding of Tomás Saraceno's new production '*Arachnid Orchestra. Jam Sessions*' at NTU CCA Singapore and how it situates in his wider investigations of spider web building and interspecies communication.

Live Performances – Jam Sessions

Structured as a series of live performances, these sessions provide a space for improvisation and interaction between arachnids and guest musicians.

7.00 – 9.00pm

Live performance by **arachnids** and **Brian O'Reilly**, musician & Lecturer, LASALLE College of the Arts, Singapore. Introduced by **Peter Jäger**, arachnologist, Germany.

For the performance, Brian O'Reilly will be using multiple instruments for different ways of interacting with the sounds generated by the arachnids. The first system is a modular synthesiser, followed by an electro-acoustic contrabass and electronic, finally gongs and cymbals also with electronic treatments. In this performance, the musician will aim for the spider sounds to directly modulate the sounds he will be producing in order to create an integrated electro-acoustic ecosystem where the sounds being performed and generated directly influence each other.

SAT, 7 NOVEMBER 2015*

4.00 – 6.00pm

Live performance by **arachnids** and **Bani Haykal**, artist, Singapore. Introduced by **Joseph Koh**, arachnologist, Singapore.

*Part of Art Day Out! at Gillman Barracks

Entitled, *variations on hello*, Bani Haykal's performance pursues Saraceno's idea of a feedback mechanism between spiders and humans as a form of interspecies communication. The work will incorporate a set of materials to transmit vibrations to the spiders, in the attempt that specific frequencies and rhythmic patterns will trigger a response.

WED, 2 DECEMBER 2015

7.00 – 9.00pm

Live performance by **arachnids** and **Joyce Beetuan Koh**, musician & Vice Dean, Interdisciplinary Studies, Nanyang Academy of Fine Arts (NAFA), Singapore. Introduced by **Etienne Turpin**, philosopher, Indonesia.

Joyce Koh's performance is informed by the image of the spider web as a sonic canvas, where the spider travels and leave traces of its musical *footprints*. By mapping the movements of the spider as it is constructing its web with a three-point visual capture, Koh will interpret the data set as musical articulations and create a musical score for three musicians.



Brian O'Reilly performance with gongs and cymbals. Courtesy of Brian O'Reilly

CONTRIBUTORS

Dr. Peter Jäger is the Head of Arachnology at the Senckenberg Research Institute in Frankfurt, Germany (refer to page 13 for full biography).

Elizabeth A. Povinelli teaches in anthropology and gender studies at Columbia University, New York. She was previously editor of *Public Culture* and her most recent books are *The Empire of Love* (2006) and *Economies of Abandonment* (2011). Her writing and filmography focuses on the conditions of *otherwise* in Late Liberalism. She is a founding member of the Karrabing Film Collective.

Brian O'Reilly is a lecturer at LASALLE's School of Contemporary Music. He works within the fields of electro-acoustic composition, sound installations, moving images and noise music. Also he is a contrabassist focusing on uncovering the inaudible textures and hidden acoustic microsounds of his instrument through the integration of electronic treatments and extended playing techniques. He performs with moving images and modular analog synthesiser under *Black Zenith* and contrabass as well as electronics with the *Game of Patience*.

Bani Haykal experiments with text and music. As a soloist, he works primarily with acoustic instruments, both traditional and/or hacked, and his studies revolve around narratives, structured improvisation and spoken word. He is a member of *OFFCUFF* and *b-quartet*. Haykal was also a member of the Singaporean avant rock band *The Observatory*. Haykal was a recipient for the Young Artists' Award (2013) and has been selected for the 2015 President's Young Talents exhibition currently presented at the Singapore Art Museum.

Joseph Koh is a Singaporean arachnologist (refer to page 13 for full biography).

Dr. Joyce Beetuan Koh is Senior Lecturer and Vice Dean of Interdisciplinary Studies at the Nanyang Academy of Fine Arts since January 2014. She writes concert music, works in dance collaborations, creates sound installations and multimedia productions. Her music has been performed by BBC Symphony Orchestra, Stavanger Symphony Orchestra, Australia Song Company, amongst others. She participated at major festivals including Birmingham Frontiers Festival, Biennale Musiques France and Concertgebouw Netherlands. Her recent multimedia works include *Future Feed* (Arts Fission Company, Singapore Design Centre, 2015), and *Moving Sketches* (Soundislands Festival, Singapore, 2015)

Etienne Turpin is a philosopher studying, designing, curating, and writing about complex urban systems, political economies of data and infrastructure, aesthetics and visual culture, and Southeast Asia colonial-scientific history. He is a member of the SYNAPSE International Curators' Network of the Haus der Kulturen der Welt in Berlin, where he is a co-editor of the *intercalations: paginated exhibition* series as part of the Das Anthropozän-Projekt. He lives and works in Jakarta, where he is director of an exact office and co-director and co-principal investigator of PetaJakarta.org.

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