

An abstract painting by Lei Liang titled 'Six Seasons'. The artwork is a vibrant, multi-colored composition featuring thick, expressive brushstrokes. The palette is dominated by deep blues, bright reds, and stark whites, with accents of yellow, green, and black. The brushwork is dynamic and layered, creating a sense of movement and depth. The overall effect is one of intense energy and emotional resonance.

LEI LIANG

Six Seasons

Marco Fusi

KAIROS





# Lei Liang (\*1972)

## Six Seasons (2022) for violin and viola d'amore

1	Season 1: New Ice	09:30
2	Season 2: Darkness	08:00
3	Season 3: Sunrise	09:40
4	Season 4: Migration	11:00
5	Season 5: Cacophony	08:26
6	Season 6: Bloom	08:49
7	Coda	05:12
		<b>TT 60:37</b>

Marco Fusi, violin / viola d'amore

Charles Deluga, live DSP / spatialization

Lei Liang, live DSP

## Six Seasons

The Chukchi Sea, north of Alaska, is one of the most inaccessible places to humans on earth. Six seasons in the Arctic, according to the Inuit, are not demarcated by a fixed calendar, but by what we hear in the changing environment.

Hydrophones were placed about 300 meters below the sea surface at a seafloor recording location 160 kilometers north of Point Barrow. They capture the sound of sea ice, marine mammals, and the underwater environment throughout an entire year.

Our journey begins on 29 October 2015, just three days after new ice had started to form – the birth of ice.

Lei Liang



New media artist Mingyong Cheng responds to *Six Seasons* by reimagining the Arctic with creative computing and generative AI, merging the serene motifs of traditional Chinese paintings with the Arctic landscapes.

## Songs from the Sea

Oceanographer Joshua Jones and composer Lei Liang started their sonic exploration of the Arctic in 2018. *Six Seasons* (for any number or improvising musicians) was completed in 2022. Marco Fusi (violin and viola d'amore) joined the collaboration

in 2024 to create an ambitious solo version of the work. The three collaborators spoke on zoom on 2 July 2024, to reflect on their work together. The transcription of the conversation was then edited by the co-authors.



**FUSI:**

It is a truly unusual mix of sounds that we created together on this album. I am aware that this very expression may very well represent the vast majority of experimental music written in the last decades, but, even as an aficionado of the genre of unusual sounds, I was particularly struck by the soundscape that the materials of *Six Seasons* presented to me. Somehow, I felt they were coming from a very faraway place, and interacting with their distant fragility and power was a complex process of exploration of a sonic environment that I never entered before. It was not a human space, and I was plunged into the midst of it. I started wondering what I was listening to.

**JONES:**

What we're exploring acoustically is a place and a time in the ocean. We observe that place and time through listening, by capturing all the sounds within the environment. Through analysis of those

sounds, we can observe the different animals and many characteristics of the environment that were present during that time. This scientific study is situated in the Arctic Ocean in a place that's covered by sea ice 9 months of the year. It's far north of even the northernmost community in Alaska and inaccessible to people except aboard one of a few icebreakers that can get there.

We place an acoustic recording device on the sea floor 300 meters deep and it records sound for an entire year at a time. Being 300 meters below the surface of the ocean is an impossible distance for humans to access without a submarine. But we can access this location and observe the environment with sensors that allow us later to visit, in a way, through analysis of the data and through listening. It would be impossible for us to be beneath the ice for 9 months; it would be impossible for us to live on the sea floor. This technology provides a sort of remote sensing station where we can put a hydrophone in place of our own ears.



**FUSI:**

... and we are suddenly able to perceive these unheard sounds, and to familiarize ourselves with them. Through these collections of sound, this raw acoustic data, one can start imagining what it would be like to be there, to respectfully access these impossible spaces. Lei, what was your experience listening to these natural sounds, and why did you come up with the idea of shaping them into *Six Seasons*?

**LIANG:**

Oh, it's incredibly fun and inspiring! I think at the core of musicians' and composers' pursuit is to make impossible things possible. *Six Seasons* reveals a listening space that was not available to us until this moment – we can now, for the first time in human history, place our ears 300 meters below the sea surface while observing the same site from 400 miles above in the sky. Creating art in 2024 means we are able to engage with these

unprecedented resources, and we need to respond to them meaningfully.

We learn to listen to the ocean not only from a computer desk, and we no longer content ourselves thinking about the ocean from a beach chair. Instead, working together as a team, we can construct musically the ice surface as an imaginary “sky,” a sonic ceiling, and to understand what it means to belong – to use Roger Payne’s beautiful phrase – to a “heard” of community of listening animals.

That is something that scientists like Josh and his advisor John Hildebrand make possible for artists like us. It allows us to position ourselves from a much broader and interconnected perspective. The project is not grandiose in an empty way, but rather gives us concrete and quantitative data to work with. Warm water bends sounds downward; sound propagates in water differently than in air; seawater absorbs light much more strongly than air does. How do these facts inform and inspire our

creative practices?

The space between ice surface and the bottom of the ocean encompasses many layers of life cycles. It is a verticality of heterogeneous timescales. The space-time for ice and is different than for mammals, yet they are connected and are parts of larger cycles. Our project is in dialogue with all of these different spaces. It inspired me to explore the idea of “counter-space” instead of “counterpoint” or “counter-lines.”

**FUSI:**

For a performer, space is often something very pragmatic. For someone used to standing on stage, space means first of all the reverb of the hall, and how you need to adjust to that. It also means who else is filling the space, who you are performing for, and who is accompanying you in this performance. *Six Seasons* “moves” in between the actual space of the performance (in our case UC San Diego’s Experimental Theatre, with its changeable acoustic

proprieties) and the marine spaces of Josh’s recordings, with their different sound reflections and propagation. How to perform these counter-spaces was one of the fascinating and complex processes that we developed during rehearsals, coming to conceive some form of multiform environment that was in equal parts affecting and being affected by my location and movements. There is a memorable moment (for me at least) in the performance when I step off stage briefly and then reappear from a different corner; the sounds of marine mammals follow me as they re-enter the Arctic soundscape after the hardship of the ice. Like a reverse Hamelin’s Pied Piper, my sounds and movements gesture to the transitional moment when life returns to the Arctic, as the ice melts and the whales reappear.

Spaces are essential in *Six Seasons*, but, like everything that deals in sounds, time is our natural environment. Josh already mentioned that we are listening to one year of sounds, to the six seasons



of the Arctic. How does time function there? What are the six seasons that we are exploring in this album, and how do they shape the soundscape we hear?

**JONES:**

There is an aspect of our work together where we have to wrestle with a very unfamiliar place but perhaps through a familiar way of being present: listening. Even in the title for the project, we learn from Inuit that this special place in the Arctic has a different richness in its annual cycles. Inuit describe more than four seasons that follow the rhythms of the Arctic environment and the animals there. It might be unfamiliar at least to those of us who are visitors to the Arctic, who live in southern areas of our planet where we're accustomed to summer, winter, spring, and fall. Arctic seasons to the visitor might look like one long frozen season that lasts for most of the year and one relatively short season when the ice and snow melt away to

reveal an ocean. Then underlying that, it's a place with a dark period and a light period of the year. There's an annual sunrise followed by a period with mostly daylight and an annual sunset followed by a period of mostly darkness. And that helps to make it cold enough to freeze the surface of an entire ocean.

We've listened to the sounds of a whole year together and really explored the soundscape. The seasonal structure of this place and so many of the subtleties of the ice and environment and the abundance of Arctic marine mammals that live there have emerged for us. In a small way that's similar to the way Inuit who live there have experienced their seasons. Inuit have a calendar that includes at least six seasons or even more. For most of the year at our study site, the ocean is ice covered and some of the year there's open water. That sea ice cover itself has a life cycle every year. The movements and behaviors and life histories of seals and whales and other wildlife that thrive there are tuned to that

cycle. This richness of the annual pattern of ocean life and the marine environment within the Arctic is one of the topics that we've explored quite a bit together.

**FUSI:**

The sounds really deliver this richness or soundscapes, the six seasons are indeed different sonic worlds, different moments in time. I hear the cold pressure of thick, unbreakable ice above my head, at the peak of ice season, and then, later on, I hear a distant song of a whale, and I realize we are in a different time, when life is coming back, and ice is melting. Each season's soundscape provides a structural anchoring point, and the succeeding of these soundscapes articulates the piece in its overarching structure, in a profoundly experiential way.

Lei, could you share more about how the natural cycles and rhythms of the Arctic have influenced your creative process? How does this shift away

from conventional musical constraints impact the way you perceive and compose music?

**LIANG:**

I felt liberated – a part of my sensitivities was awakened. It's a bit like trying to free ourselves from the confines of traditional musical notation. In Western music, we put things on paper and regulate our musical behavior by using barlines, meters and tuplets. The grids that we impose on musical time often seem limited, because we don't naturally behave within those barlines. When we come to think of the natural cycles and their underlying pulsations, we also realize that the grids are too constraining.

What is the cycle of ice, and the cycles of mechanisms that create these incredible sounds? Or the breathing cycles of the mammals we listen to? Our understanding of how time passes is anthropogenic. But we need to be aware that beluga whales' breathing cycles are about 15 minutes,

while bowhead whales' are 40 minutes. The act of singing means completely different things to these creatures.

For me, that's liberating because it gives us a beautiful alternative to our past practice that confines us. Perceiving the world through our eyes might mean missing some really important signals. We forgot that nature is singing to us in different rhythms and different frequencies, a lot of which are inaudible to human ears or indistinguishable to our cognitive capacity. Different temporal scales affect our sense of spatial scales. This experience has been a way for me to relearn altogether how to listen, how to breathe, and how to tune into the pacing of things that are vitally important to all living things.

**FUSI:**

Our sonic exploration of the Arctic Ocean is, ultimately, a human endeavor. We are placing microphones on the seafloor, collecting and

analyzing sonic data; we are artistically shaping these sounds, on tape and with musical instruments, for the benefit of sharing this experience with other humans.

Still, there is something slow, powerful and “out of scale” in the way I experienced *Six Seasons*: something we can only listen to if we are attuned to different temporal scales, to inhuman breathing patterns. This is not an evocative metaphor, this is the core of performing alongside non-human agents within *Six Seasons*; the marine mammals sing, and their singing extends over phrases that challenge the human concept of unity of sense. Patiently educating our listening (and my performing) to their voices is a way to access a different perception of time, a different breathing cycle. The ice forms and melts in the course of the seasons, like a shiver over the surface of the ocean, like a year-long contraction and relaxation of the surface of the water.



**LIANG:**

I love it when you describe *Six Seasons* as one big cycle because it is indeed one deep breath. Josh mentioned earlier that nature is breathing. We can think of ice seasons (Seasons 1–3) as nature breathing in, and when the mammals come back (Seasons 4–6), nature is breathing out. In that sense, this is a two-part cycle – a continuous inhale and exhale, a year-long breath.

**FUSI:**

It is indeed a cycle, a year-long pulsation, the slowest breath that we can imagine; and it is during the long breathing out that vocal cords can fully vibrate, and the singing emerges. In these seasons the mammals return, and the Arctic is once again filled with their voices. What voices are we listening to, and what animals inhabit the Arctic soundscape?

**JONES:**

Marco, you really took to the concept of pacing

when we first discussed this, that the rhythm of animals and of the environment is very different than ours. In the research, this timing of things like sea ice and winds and animals are among the most important things to determine and we need to do that on different time scales of seconds or minutes to years. If you want to watch a whale or observe it through the sounds it makes, you have to slow down to the pace of the whale. The whale comes up to the surface after a dive and may breathe 5 or 10 times over several minutes. And then it may dive and be gone for 10 or 20 or even 50 or 90 minutes. The animal may make sounds only when it is diving and feeding or perhaps only when it is near the surface and socializing.

A day may include many of those cycles. A whole year includes many of those, and all the while it may be moving across large distances in the ocean. To get a sense of what these animals are doing, whether you are watching them or observing through listening, you have to be able to observe

these rhythms, to slow down to the pace of those animals. This is a central aspect of observing nature through sound.

Once we can observe and identify the different signals and their different time scales and rhythms, we start to assemble a whole soundscape where we can observe these many different characters. Many parts of the acoustic environment are caused by the sea. Ice has annual seasons of formation of ice, consolidation, melt, and break up that occur at a pace we can't just sit down and listen to. That process may take several months in some areas or the whole year in others as you move closer to the poles. Our collaboration enables us to do this, though, through analysis of whole years of underwater sound recordings.

We can become aware of these longer-term cycles. Then through our exploration together, we can listen across all these different scales of space and time in the ocean, even the most inaccessible parts of it, like this place far offshore north of Alaska.

There are animals present in that soundscape, too. Those include numerous extremely hardy marine mammals that can live where it's not possible for us humans. They include several whale and seal species that are only found in the Arctic: belugas and the white whales, which are highly social, deep-diving, toothed whales. Bowhead whales are baleen whales, giant animals that can break thick ice to breathe and move across vast distances to feed on some of the richest blooms of life at certain times and places in the Arctic.

On an annual cycle, the sounds we hear can be dominated by sounds of those animals when the sea ice and conditions allow them to be present at the recording location. These are air breathing animals, so they have to have enough ice-free water to be able to breathe. The whales only need small cracks or leads in the ice to breathe, but there has to be some opening. They can't be there during times of year when the sea ice cover is too thick and without enough reliably open leads. As

soon as there's enough open water each year, the whales return. It's not the same date every year. But it might be the same part of the ice, the early opening, the break-up, the open water period. Some animals, like the belugas and bowheads seem to pass close to the listening site when the ice is melting and breaking up or when the annual sea ice is forming again. For us, as we explore one place through listening over a year, we actually experience the arrival of bowhead whales and belugas as a moment.

There are other animals that do live within the winter ice and flourish during the entirety of the year. Those are the ice-breeding seals: ringed seals and bearded seals. They can maintain breathing holes in the ice if they need to. Those animals are present in all the months when there is ice, but they aren't always making their beautiful sounds. The bearded seal males make their trill sounds during the time of year when they are calling to attract females, before and during their breeding season.

The timing of that season might be different from place to place in the Arctic. Seasonal patterns for bearded seals in each region may also follow the environment and the ice that they haul out on to have their pups. In our exploration of the year in the northeast Chukchi Sea, there's a moment when the sounds of bearded seals arrive. It's earlier than when the whales arrive.

This theme of pacing and of the natural rhythms of life in the Arctic come through in all of our exploration together. For me, I just share sounds and context, then I get to watch and listen to you. Through your artistic practice that I get to follow along with, I have an opportunity to think more deeply about these things. I really learn a lot in a way I would never do sitting at my desk, analyzing a time series of data.

**FUSI:**

I recall the moment of bearded seals' arrival very strongly. It is a pivotal point in my understanding of



the piece. Again, it is human minds making sense of something that is unrelated to them, but I find it somehow necessary, to structure my performing thoughts and strategies: the arrival of the seals feels like a joyous moment! I imagine hearing happiness and excitement in their voices, when they are allowed in the space that will host their breeding season. I hear – or I project – in their singing the curiosity, the excitement and the uncertainty of an existential moment of life. The searching for each other, the attempt to find their mating partner, the exploration of an essential function of their voices – that is, finding others in space. In a beautiful way, their singing becomes a way to locate each other in the depth of the sea.

**LIANG:**

That's absolutely beautiful. I was exploring an important metaphor – echolocation – in our project. We can talk about this in different ways, from the mechanism of it to how vital it is for animal

survival. But as an artistic metaphor, echolocation can be mirrored on many levels, resulting in an infinite number of reciprocities that includes the communication between you and me, Marco. I send you a signal, you filter it, then respond with your own instrument. Almost every moment, there is an artistic echolocation going on, except it's virtual and happens between only the two of us.

**FUSI:**

It was a fascinating aspect of our collaboration indeed. Receiving your materials, discovering how open you are to bouncing ideas back and forth; recording a short sound signal for you, and then having you morph those sounds into something else. These resonances really felt like a dialogue, a way of communicating and finding our ground in a place we did not know before.

**LIANG:**

We can each experiment with something in

our own practice, but the result could not be as meaningful as this. For example, as composers or performers, we can certainly expand the timescale of musical compositions; we can create very interesting, innovative playing techniques in a sound laboratory. In fact, much of experimental music has been exploring these aspects for decades, if not centuries. What makes this project so special for me is that it is situated in a large network of information that we can all become a creative part of.

When we respond to these natural sounds, we are informed of where they came from, how they were made, and why they were important. Not only do we hear interesting sounds, but we also understand the mechanisms behind those sounds that can inform how we play our instruments. This creates a virtual echolocation between us. When your bow touches the violin, Josh perceives how similar that is to air pressure on the ice. There are so many layers of information sharing and brainstorming. Our project

goes beyond a single department or a discipline. It's no longer just an experiment for the artists; it is something much larger.

**FUSI:**

Josh's research work, his collection of audio data, was the source of this all. Knowing his openness to art and music, it is hard for me not to imagine his listening process being somehow affected by his curiosity. I can imagine two different layers of listening experience in his approach: on the one hand, the scientist analyses and structures the material to develop new scientific knowledge; on the other hand, I like to imagine an artistic listening, a marveled surprise arising from the experience of actually hearing these incredible sounds, of almost meeting these mammals. If his artistic ear is a powerful source of inspiration, his scientific rigor was probably even more inspirational to me. The details that Josh shared with us, in the way these sounds move, what produces them, and what they

represent as mirrors of the whole ecosystem were the starting point of my sonic imagination.

I was shown how there are two main categories of sounds: the inanimate sounds (ice, wind, and water) and the voices (the mammals). We decided that different instruments could be associated with these two different sonic categories. The violin became for us the source of all dialogues with what is inanimate; this instrument is played from Season 1 (“New Ice”) up to the end of Season 3 (“Sunrise”), and it responds and plays with the seasons of ice and wind. Somehow, the aligid sounds that the higher instrument of the bowed family can produce are, in my imagination, related to coldness and sharpness; to my ear, their metallic qualities reflect the feeling of tension and pressure that ice and wind exert over water and submarine environment. Conversely, from Season 4 (“Migration”) onwards, live sounds appear in the ocean; marine mammals come back, start singing, dialoguing, approaching each other. For these seasons, the instrument of

choice was a viola d’amore. Such a resonant and rich instrument, with its system of seven playable strings, alongside an ancillary system comprised of other seven sympathetic strings, became a perfect representation of the liveliness of the marine sounds. This system of sympathetic strings is one of the characteristics of the viola d’amore, and it is extremely rare within the realm of Western classical instruments. Each of these strings produces sounds only when the performer plays, on the playable strings system, a sound that is somehow harmonically related to them. If this sound is very close (in pitch) to them, they answer very quickly. If it is a more distant pitch, however, they may answer later in time, or only if the pressure of the played sound increases. Metaphorically, I like to imagine that the viola d’amore is able to respond to some signal, and to remain silent to others; the instrument somehow has its own echolocation system, embedded in the very physics of its wooden body.



**LIANG:**

I couldn't think of a better metaphor than the instrument you chose to play in this project, viola d'amore, which is the viol of love. At the beginning of Season 4 after the violent sound of ice ridging, the moment comes for us to bring in the first sound of the bearded seals of the year. You picked up this instrument – and you referenced the joy of playing this earlier – it's full of joy because the entire piece really is a love song – a love song to the world. The incredible soundscape was previously inaccessible to humans. This sonic world is now transmitted to us with the help of scientists who use “instruments” – hydrophones, computers, memory cards – to capture and transduce data into sounds we can hear. When we hear this magnificent soundscape, what can we do? We pick up our instrument – musical instruments – and we create a love song.

**JONES:**

There's an important example that we can look

back to of how it's like a love letter to earth. If you go back to the 1960s when we are first starting to explore space and the solar system outside of our atmosphere. We start being able to send probes to orbit around the earth. Almost immediately, one of the things that matters to us is that we send people into space too, even though we probably could have done a more cost-effective job of learning about space by sending more machines and sensors to space.

But one of the most memorable things for all of us in human history was when a person stepped off the lunar lander and onto our moon and said to everyone “that's one small step for man... one giant leap for mankind.” The words themselves weren't as important as the fact that one of us stood there. Neil Armstrong and the whole team responsible for Apollo 11 sent a message back to all of us and said, “We're here. Two of us are standing on the moon.” This reminds me an experience that I have repeatedly in our work together. None of us have

been able to visit the Chukchi Sea under ice in winter, or to experience that place from the seafloor. But through your artistic practice, Lei, you have listened to this whole year of sounds and made a beautiful sonic sketch of the whole space and everything that we recorded within it. It's like a series of paintings of what our experience was, exploring the place and time together through listening.

Along the way, you have transformed this into a dialogue with musicians and into a shared experience for all of us. You knew, for example, that it would be important to "send" Marco there. When I'm listening to Marco perform, it makes sense to me why we need people to be present in these places that haven't been able to access and why we care about that. Perhaps it's similar to the way we can sometimes see the beauty of a landscape within a landscape painting better than we can through a photograph. There's an emotional artistic experience that the painter shares, which brings us closer to the place and time.

When a musician stands with you virtually on the sea floor within the soundscape of a remote Arctic sea and expresses that environment and the living characters within it, something special happens. I feel again like one of us has been there, and it's a different experience than what has ever been possible through analyses we might do through a computer. In a way, to me, that feels like a love letter, an expression for all of us that says "we can be here together and share an experience of this place." It's very generous and caring and open. That's how I experience it anyway, and it brings me to tears sometimes to receive that in person.

**FUSI:**

It is making this experience accessible to humankind, to myself, and to our audience. It is very special, and I like to think that it is a respectful experience. It is not an invasion of an endangered space, it is instead a gentle and creative way to enter it, and to share it with others. I really think it is a privilege of

my profession, to be able to experience and share such unique moments, and to play with unheard sounds, along these huge mammals, under the ice of the Arctic, with my instruments. And to bring along the listener, to show them how exceptional, beautiful and fragile these environments are, and how humankind can (and indeed should) love and respect them.

**LIANG:**

Musicians have for centuries been agents of change by using sounds as a powerful means to redefine our identities and resist boundaries. I know how music often challenges artificial borders that separate people. Music can cross those boundaries with imagination, vitality, and creativity. I think we just took that a little further.

**FUSI:**

I believe that music is not at all a universal language, but that is exquisitely human and, like everything

human, is local and ephemeral. I have many issues with the historically constructed value of what we call Western art music; I often perceive it as a somehow problematic heritage of a distant past. While embracing my violin I am well aware that even just its shape is quintessentially representative of this specific segment of all the music that exists. Still, what I hope to do, while holding my instruments, is to broaden their borders, to push the conversation a little further, to reach new, untouched (and sometime uncomfortable) spaces. I would like to imagine that my value as a musician lies in the constant research of a form of dialogue with other(s') sounds, musical approaches, and artistic desires and goals.

This project was indeed a true and beautiful challenge, for me. It was deeply outside of my comfort zone, with its significant length (more than one hour), and its lack of any prescriptive score. I come from years of training centered around “correctly” performing the most challenging scores,

and my experiences as improviser have a much more grassroots origin. I must admit I was rather scared when we started discussing this project and, although I found challenges rather attractive, I was wondering how fit I was for this experience. Luckily, what I did not expect (and what made it all possible) was to encounter two collaborators like Josh and Lei. It is truly inspiring to hear Josh talking about the depth of the ocean, the way sound travels in water, through space and time, how mammals call each other; all this knowledge triggered my imagination, brought me down to the ocean floor, and made me wish to sing with them! And, although I knew Lei's work as a composer, I was deeply impressed by your willingness to put yourself in the role of a sound projectionist, and to perform the piece with me, directing the tapes and gently and respectfully suggesting, directing, or following our Arctic dialogues. In the course of this experience, I felt we were able to dislodge the hierarchical pyramid that structures much of so-called classical

music; there is no longer an all-knowing composer that puppets my every emotion and sound. I have met instead other artists and researchers, sensitive people bringing their knowledge, abilities, and experience to the table. With these precious and unique resources, we went somewhere together, and hopefully we can encourage others to dive into these precious, delicate and endangered sounds.

**JONES:**

This is so wonderful for me to hear these things. Thanks, that made me feel super happy.

I will tell you that listening together is the most impactful parts of the project for me. We observe the ocean acoustically in many places, but just in this research project we recorded 10 years of underwater sound at this listening site, from 2007 to 2018. That's a lot of what we would call data. No human has ever listened to most of those sounds. We use computer processing to analyze it and to find signals and patterns and relationships with

environment.

Just sitting and thoughtfully listening together with Lei and with you, Marco, to even 30 seconds at a time has been important and we've learned and noticed a lot. It's not hierarchical, but being together and just equally listening. I think this has become one of the most special parts of my career, which has been focused very much on learning through listening.

Acoustic oceanographers like me record sound and we learn about the ocean that way. Learning from listening with others, from actually listening to the sounds together. Those are some of the most impactful moments, personally.

**LIANG:**

I would say even though we have talked for decades about interdisciplinary work, music has been relatively self-sufficient and enclosed as a discipline. However, our project allows me for the first time to feel that art and science are truly

inseparable in a deeply interconnected way that we couldn't create without each other.

It makes me feel that we contributed individually with our own creative expertise, but at the same time we were able to set our egos aside and transcend them. We were able to have a collective dream. This has been something I always wanted to do, and it was only possible because of getting together with the two of you, along with everyone involved over the last six years. This collaboration means that music doesn't exist in isolation, it's not an island: we are a part of an ocean.

Lei Liang  
Marco Fusi  
Joshua Jones



# Lei Liang

Chinese-born American composer Lei Liang is the winner of the Rome Prize, the recipient of a Guggenheim Fellowship, a Koussevitzky Foundation Commission, a Creative Capital Award, and the Goddard Lieberson Fellowship from the American Academy of Arts and Letters. His concerto for saxophone and orchestra, *Xiaoxiang*, was named a finalist for the Pulitzer Prize in Music in 2015. His orchestral work, *A Thousand Mountains, A Million Streams*, won the prestigious 2021 Grawemeyer Award for Music Composition.

Lei Liang was commissioned by the New York Philharmonic for the inaugural concert of the *CONTACT!* new music series. Other commissions come from the National Endowment for the Arts, the Fromm Music Foundation, the Boston Modern Orchestra Project, pipa virtuoso Wu Man, among others. Lei Liang's fourteen portrait discs have been released by several prestigious labels. As a

scholar, he has edited and co-edited eight books and editions, and published more than fifty articles.

From 2013–2016, Lei Liang served as Composer-in-Residence at the Qualcomm Institute/Calit2 where his multimedia works preserve and reimagine cultural heritage through combining scientific research and advanced technology. In 2023, the Institute launched “Lei Lab” where he continues to collaborate with engineers, geologists, oceanographers and software developers, to explore what he calls “the unique potential for learning offered by creative listening.”

Lei Liang's recent works address issues of sex trafficking across the US-Mexican border, America's complex relationship with gun and violence, and environmental awareness through the sonification of coral reefs.

Lei Liang received degrees from the New England Conservatory of Music (B.M. and M.M.) and Harvard University (Ph.D.). He is Chancellor's Distinguished Professor of Music at the University of California, San Diego. His catalogue of more than a hundred

works is published exclusively by Schott Music Corporation (New York).

[www.lei-liang.com](http://www.lei-liang.com)



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## Marco Fusi

Marco Fusi is a violinist/violist, a researcher in music performance, and a passionate advocate for the music of our time.

Among many collaborations with emerging and established composers, he has premiered works by Jessie Marino, Giacinto Scelsi, Yu Kuwabara, Salvatore Sciarrino and Kristine Tjøgersen, among others. Marco has performed with Pierre Boulez, Elena Schwarz, Lorin Maazel, Susanna Mälkki, Alan Gilbert, and frequently plays with leading contemporary ensembles including Klangforum Wien, MusikFabrik, Meitar Ensemble, Mivos Quartet, Ensemble Linea. He has recorded several solo albums, released on various prestigious labels. Marco also plays viola d'amore, commissioning new pieces and collaborating with composers to promote and expand existing repertoire for the instrument.

After his Masters in Violin and Composition at the Conservatory of Milan, Marco's received his PhD from the University of Antwerp / docARTES program with a dissertation on the performance practice of Giacinto Scelsi's works for string instruments. He is currently Assistant Professor of Artistic Research at the HEMU – Haute École de Musique Lausanne, and Research Fellow at the Orpheus Instituut of Gent.

[www.marcofusi.net](http://www.marcofusi.net)



© Veera Vehkasalo



## Joshua Jones

Joshua Jones has spent the last 28 years working on the ocean, studying marine mammals and their environment through underwater sound. Jones received his PhD in oceanography from the University of California, San Diego's Scripps Institution of Oceanography (SIO). His current research programs at SIO are focused on the California Current ecosystem and the Arctic, where he directs a long-term study of climate change and shipping impacts on Arctic marine wildlife. This international, collaborative work in the Arctic is conducted in close partnership with Inuit community members and organizations and with regional governments in Canada.

From 2004–2014, Josh directed and produced the interactive exhibit, *Whales: Voices in the Sea*, which has been installed in nine US public aquariums. He also developed the SeaTech program at SIO, a research internship and technology training program based in Sitka Alaska, where primarily

Alaska Native youth conduct research into marine mammals. Josh has developed innovative software and hardware for acoustic observation of the ocean. He is a licensed captain who has worked in all the world's oceans. Along with his ocean science career, Josh has continued to work annually as a charter fishing and wilderness guide in southeast Alaska since 1995.

Josh is the scientific advisor to the Arctic Six Seasons and other underwater listening projects at "Lei Lab." He provided ocean sound recordings, audio engineering assistance, and relevant information about the acoustic data to Lei Lab's sound team.



# Charles Deluga

Charles Deluga is an American composer, field recordist, installation artist, and systems designer exploring the translation of signals across sensory domains. His creative practice brings together ecoacoustics, spatial audio, synthesis, and sound-modulated light to produce immersive contexts for experiencing the intersection of nature and math. Charles has designed and produced A/V systems for architectural media installations across North America, including the Statue of Liberty Museum

and MoMA PS1. He is currently pursuing a Ph.D. in Computer Music at the University of California, San Diego after studying music at New York University and the University of Virginia. Charles has been a member of “Lei Lab” since 2023.



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*Six Seasons* is published by Schott Music Corporation, New York (ASCAP).

# The Creative Team at Lei Lab

Lei Liang	Composer / Artistic Director
Joshua Jones	Oceanographer / Principal Scientific Advisor
Charles Deluga	Spatial Audio Designer / Software Developer
Theocharis Papatrechas	Audio Engineer / Sound Designer
Zachary Seldess	Audio Software Developer
Nicholas Solem	Sound Designer
Gabriel Zalles Ballivian	Audio Engineer

Lei Lab:  
<https://lei-lab.ucsd.edu>

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**Recording Date** 23 February 2024  
**Engineer, Editor, Mastering** Andrew Munsey  
**Producer** Lei Liang  
**Mastering** Schott Music Corporation, New York  
**Cover** based on artwork by Albert Liang

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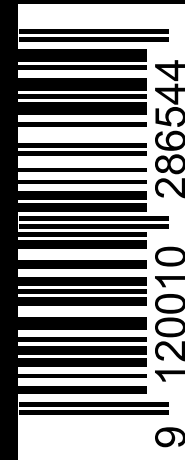
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**LEI LIANG** (\*1972)

**Six Seasons (2022) for violin and viola d'amore**

1	Season 1: New Ice	09:30
2	Season 2: Darkness	08:00
3	Season 3: Sunrise	09:40
4	Season 4: Migration	11:00
5	Season 5: Cacophony	08:26
6	Season 6: Bloom	08:49
7	Coda	05:12

**TT 60:37**



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**Marco Fusi, violin / viola d'amore**  
**Charles Deluga, live DSP / spatialization**  
**Lei Liang, live DSP**



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