

Duration

# THE ARITHMETIC OF SOUND

# SATURDAY 18 MAY 2024 3PM ROSINA AUDITORIUM, ABBOTSFORD CONVENT

Approximate duration: 2 hours, 30 minutes (with one 20-minute interval)

	Duration
Claude DEBUSSY (1862-1918) Preludes, Book 1, L. 117 (1910)	5′
i. Danseuses de delphes iii. Le vent dans la plaine	
Matthew Garvie (NSW) piano*	
Henry COWELL (1897-1965) The Banshee (1925)	4'
Francis Atkins (NSW) piano*	
COWELL Aeolian Harp (1923)	4'
Francis Atkins (NSW) piano*	
COWELL Three Irish Legends for piano (1922)	4'
The Tides of Manaunaun	
Francis Atkins (NSW) piano*	
DEBUSSY Preludes, Book 1, L. 117 (1910)	9'
vi. Des pas sur la neige vii. Ce qu'a vu le vent d'ouest	
Reuben Johnson (QLD) piano*	
John CAGE (1912-1992) Amores (1936, rev. 1943)	9'
<b>Po Goh</b> (NSW) prepared piano* <b>Aditya Bhat</b> (VIC) percussion* <b>Steven Bryer</b> (QLD) percussion <b>Jamie Willson</b> (TAS) percussion	
DEBUSSY Preludes, Book 1, L. 117 (1910)	2.5'
viii. La fille aux cheveux de lin	
Francis Atkins (NSW) piano*	
DEBUSSY Preludes, Book 2, L. 123 (1912-13)	4'
ii. Feuilles mortes	
Francis Atkins (NSW) piano*	
CAGE 4'33" (1947-48)	4.5'
<b>Ronan Apcar</b> (NSW) piano*	
INTERVAL	20'

\* ANAM musician whose training is supported by an ANAM Syndicate

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		Duration
DEBUSSY Preludes, Book 2, L. 123 (1912-13)		3.5
iv. Les fées sont d'exquises danseuses		
Timothy O'Malley (VIC) piano*		
DEBUSSY Preludes, Book 1, L. 117 (1910)		4
iv. Les sons et les parfums tournent dans l'air du soir	r -	
Timothy O'Malley (VIC) piano*		
Toru TAKEMITSU (1930-1996) Rain Tree (1981)		12
<b>Aditya Bhat</b> (VIC) percussion* <b>Steven Bryer</b> (QLD) percussion <b>Jamie Willson</b> (TAS) percussion		
DEBUSSY Preludes, Book 2, L. 123 (1912-13)		3.5
x. Canope		
Po Goh (VIC) piano*		
DEBUSSY Preludes, Book 1, L. 117 (1910)		2.5
ix. La sérénade interrompue		
Po Goh (VIC) piano*		
CAGE Living Room Music (1940)		8
Jamie Willson (TAS) percussion Aditya Bhat (VIC) percussion* Steven Bryer (QLD) percussion Reuben Johnson (QLD) piano*	Francis Atkins (NSW) piano* Timothy O'Malley (VIC) piano* Matthew Garvie (NSW) piano* Peter Neville (ANAM Faculty, Head of Percussion) percussion <sup>1</sup>	
DEBUSSY Preludes, Book 2, L. 123 (1912-13)		3
v. Bruyères		
Ronan Apcar (NSW) piano*		
DEBUSSY Preludes, Book 1, L. 117 (1910)		4
ii. Voiles		
Ronan Apcar (NSW) piano*		
CAGE 4'33" (1947-48)		4.5
ANAM Pianists ANAM Percussionists		
DEBUSSY arr. YOUNG Preludes, Book 1, L. 117 (1	910)	3
xii. Minstrels		
<b>Timothy Young</b> (ANAM Resident Faculty, H <b>ANAM Pianists</b>	lead of Piano) director/piano#	

<sup>1</sup> Peter Neville's ANAM Faculty position is generously supported by the Orthwein Foundati <sup>1</sup> Peter Neville's ANAM Faculty position is generously supported by Professor Kerry Landman

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# **PROGRAM NOTES**

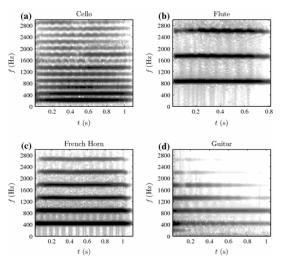
Written by Alex Owens (ANAM Librarian, Robert Salzer Foundation Library)

## **ON MATHEMATICS IN MUSIC**

"Music is a mysterious	"The composer exercises his
mathematical process whose	mathematical alchemy in
elements are part of infinity."	pursuit of universal beauty."
—Claude Debussy	—Tōru Takemitsu

For the first minute and a half of Tōru Takemitsu's *Rain Tree*, only crotales are played: shimmering peals between two percussionists like drops of rain after a storm. The magic of crotales is in their acoustic tricks. When they are struck, the sounds appear to blossom after the initial impact, rather than the expected fading away. In this blossoming is a rich series of overtones which focuses on the second, fourth and seventh partial, and almost none of the fundamental, or "base" frequency. If you listen closely, you can pick out a tone a minor seventh above the "core" of the sound.

Every note an instrument plays isn't simply one tone, it's the sum of a wide range of frequencies that together give our ear the pitch and colour of the note. Using a spectrograph, you can pick the constituent frequencies apart within a note, such as within examples on the left.<sup>1</sup> But the frequencies making up a note aren't random – they all align to the harmonic series, and different instruments focus different parts, or partials, of the note.



The construction of each note can be described with mathematics: harmonic

functions are a type of differential equation which derived from describing the vibrations of strings that now are crucial to physics in engineering, fluid dynamics, and even describing our world through general relativity. Auditory processing is also an exercise in mathematics, where the masses of frequencies picked up by our ears (where each hair in the cochlear picks up one frequency) are interpreted as ratios to give us our experience of pitch, tone colour and harmony.

Perhaps describing the mathematics behind music and sound takes away the magic within its mystery, but the way music both fits and evades our mathematical modelling is itself magical, and our discoveries from music and sound have gone on to benefit broad fields of science. The influence flows both ways: spectrographic analysis was exploited by Gérard Grisey in his *Partiels*, where the harmonic series of a trombone was deconstructed and used as a pitch set for the composition of this work.

Whilst many of the methods we use today to describe and solve harmonic functions were defined by nineteenth century mathematicians (Riemann, Cauchy, Fourier and Laplace, for example), the harmonic series was described by the Ancient Greeks, and J.S. Bach was a budding teenage genius as Isaac Newton and Gottfried Leibniz were inventing calculus. So, when describing music as a "mysterious mathematical process", Claude Debussy lived in a world where the magic was already being deconstructed and simultaneously, new mysteries uncovered.

<sup>&</sup>lt;sup>1</sup> Silvia Maria Alessio, "Non-stationary Spectral Analysis" in Digital Signal Processing and Spectral Analysis for Scientists (Cham: Springer, 2016), 573-642.

## SOUND BEYOND AND BETWEEN: THE NEW PALETTE OF SILENCE

"There is no such thing as an empty space or an empty time. There is always something to see, something to hear. In fact, try as we might to make a silence, we cannot."

–John Cage

Whilst there is no clear evidence Debussy explicitly used mathematics to structure his works, Roy Howat has extensively described theories of the golden ratio and Fibonacci sequences within the linear structure of Debussy's works, where the position of climaxes and modulations as described by their bar numbers frequently line up with golden ratios.<sup>2</sup> In a very generalised way, this can also be seen as breaking from a Beethovian structure where a piece inevitably drives towards climactic conclusion. Instead, Debussy's point of greatest tension occurs more centrally within the piece, thereafter relaxing towards conclusion.<sup>3</sup> The selections from Debussy's two books of *Preludes* being performed today share this non-driving construction, and contain two important gestures to the resultant programming: silence, which John Cage famously pushed to its logical conclusion in the controversial 4'33"; and colour, evolving through Henry Cowell's expansion of piano practice beyond the keyboard to Cage's prepared pianos. Each Prelude bears a descriptive title, but unusually this appears under the final bar. These titles gesture to the movement and character within these preludes, often flowing, dancing and dynamic in their own ways.

The preludes preceding *Des pas sur la neige* ('Footsteps on the snow') are characterised by an encompassing sense of aptly illustrative motion, from the deliberate measured grandeur of *Danseuses de Delphes* ('Dancers of Delphi') to the semiquavers tumbling over each other like the titular winds of *Le vent dans la plaine* ('The Winds in the Plain'). *Footsteps*, in contrast, encourages the audience to listen to the resonances in the often-extended lengths of time between the pairs of notes. Debussy asks for this sound to be "icy and cold", emulating the tranquil stillness of a freshly fallen blanket of snow. Similarly, the trills in *Les fées sont d'exquises danseuses* ('The Fairies are Exquisite Dancers') create a sense of suspension, as if the dancing fairies in question hover too long in their leaps, without truly interrupting the dynamic motion of breathless motion before and after.

*Footsteps* is a noticeable step in the broadening of music beyond the notes on the page, which John Cage then took further, expanding the space between notes to interrogate this space by itself. Cage is noted as a driving force of twentieth century composition, especially for his use of percussion and chance. A collaborative composer ever interested in multidisciplinary works and one-off performance 'events', Cage championed percussion-led instrumentations, in part influenced by his lifelong artistic and personal relationship with dancer and choreographer Merce Cunningham. But it was his philosophy driven by Zen Buddhism that primarily inspired his creations concerning silence.

In his writings and lectures, Cage often referenced an influential visit to an anechoic chamber – a room specifically designed to be sonically isolated and free from any sound. Cage was surprised to hear two sounds, one high and one low, and he later learned that these were his nervous system and his blood circulating. Out of this experience came the inspiration for a roughly four-and-a-half-minute meditation on silence, encouraging the audience to truly listen to their environment, where the sounds around them became the piece. This idea became 4'33", and in this concert it is presented in solo and chamber form. Within the two versions, how does your experience of this work change, and what do you hear? The absence of structured sound may reveal a new world beyond it, and composers including Cage worked to unlock the sounds beyond those deemed acceptable at the time.

<sup>&</sup>lt;sup>2</sup> Such as 3:5, 8:13, where the ratios are consecutive numbers in the Fibonnaci sequence [1,1,2,3,5,8,13,21...]. See Roy Howat, Debussy in Proportion (Cambridge: Cambridge University Press, 1983).

<sup>&</sup>lt;sup>3</sup> Susan McClary explores the implications of Beethoven's structures as contextualised through gender in her landmark Feminine Endings (Minneapolis: University of Minnesota Press, 1991).

# WHAT IS AN 'ACCEPTABLE' SOUND?

"Contemporary music makes almost universal use of materials formerly considered unusable."

-Henry Cowell

At the beginning of Debussy's *La sérénade interrompue* ('The Interrupted Serenade'), the pianist is instructed to play *quasi guitarra* – like a guitar. Open fifths, semiquaver motion and chords spaced as a guitarist give the line a strumming motion. The American composer Henry Cowell, ahead of his time when experimenting with extended techniques in the 1920's, took this a step further in his work *Aeolian Harp*, which calls for the strings of the piano to be strummed like a harp, further removing the resultant sound from the expected strike of a hammer one expects from a piano.

Henry Cowell was an early *enfant terrible* of American piano composition, entrancing and shocking audiences with his performances across the United States and Europe which frequently incorporated extended techniques such as strumming, dense tone clusters, and blocks of notes created by playing with the whole forearm. Cowell went on to teach John Cage, and established the New Music Edition, publishing American composers and publicising their writings.

Cage's interest in percussion saw him writing works for dancers at the Cornish School of the Arts in Seattle whilst he worked there as a dance accompanist. As with our faculty's percussion arrangements, space became a frustrating constraint for Cage, who wished to incorporate as many sounds into performances as he could. Faced with a particularly small space in 1938, Cage instead turned to the piano in the room, placing objects on certain strings to mute and change their sounds and creating an in-situ percussion ensemble within the one instrument. Cage would continue to write for the prepared piano until the end of the 1950's, when the possibilities of electronics exceeded that of piano preparation. In that decade, Cage wrote the landmark hour-long *Sonatas and Interludes* (1946-8, performed yesterday at ANAM), as well as *Amores*, which expands the sound of the piano to create dialogue between it and the percussion ensembles between movements.

Stepping further along this path outlined by Cowell in making use of "materials formerly considered unusable", Cage's *Living Room Music* moves beyond standardised percussion instruments, calling for a range of household objects to be played percussively. This follows the spirit of Cage's fascination with chance – no performance of *Living Room Music* will be the same as the found objects change. As Cage incorporated more of his Zen philosophy into his works, leaning into chance and silence, he noted that his "responsibility" had shifted "from the making of choices to that of asking questions."

# MUSHROOMS AND SENTIMENTAL FRIENDSHIPS

Tōru Takemitsu and John Cage had a long friendship that came out of a 1962 symposium in Japan. Takemitsu, like many of his colleagues, was struck with "Cage fever" in the wake of this symposium. Takemitsu had previously been rejecting Japanese influences to avoid being tokenised as simply a 'Japanese composer', and instead leant into French influences such as Olivier Messiaen and Debussy. Cage, himself influenced by Henry Cowell's tilt towards globalism in creating a new voice for twentieth century composition, was fascinated by Japanese culture and encouraged Takemitsu to explore his country's music, moving to incorporate traditional instruments and philosophy. The two would go on to have a long friendship, and Cage would relay parables whilst mushrooming with Takemitsu.

In an interview in Japan in the 1960's, Cage confessed that he didn't like the "sweetness" of Takemitsu's music. Though Cage wore his experimentalism more blatantly, moving beyond scores to electronics and performance art, Takemitsu's work can be seen as a digestion of all that came before and a refinement of the concepts of silence and colour, weaving together Western and Japanese sounds into his own language.

Today's concert ends with the culmination of these colour experiments with a 'digestion' of Debussy's prelude *Minstrels*, re-scored for percussion instruments by Timothy Young. Cage wrote of and utilised the *klangfarbenmelodie* technique – created by another of his teachers, Arnold Schoenberg, the German compound word describes using tone colour as a device of melodic variation. As Debussy used the various colours of the piano to create journeys within his preludes, and Cage changed the sounds of the piano itself, moving the lines of *Minstrels* from the piano onto the percussion instruments in the room today both liberates them from the keyboard and provides new ways of experiencing the melodies of this quirky final work, as instructed by Debussy to be played "with humour".

"We tend to grasp music within the confines of the smothering superficial conventions of composed music. In the midst of all this the naïve and basic act of the human being, listening, has been forgotten. Music is something to be listened to, not explained." —Tōru Takemitsu



Image: ANAM x Sydney Symphony Orchestra perform Gurrelieder at the Sydney Opera House, March 2024. Image by Daniel Boud, supplied by Sydney Symphony Orchestra.



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