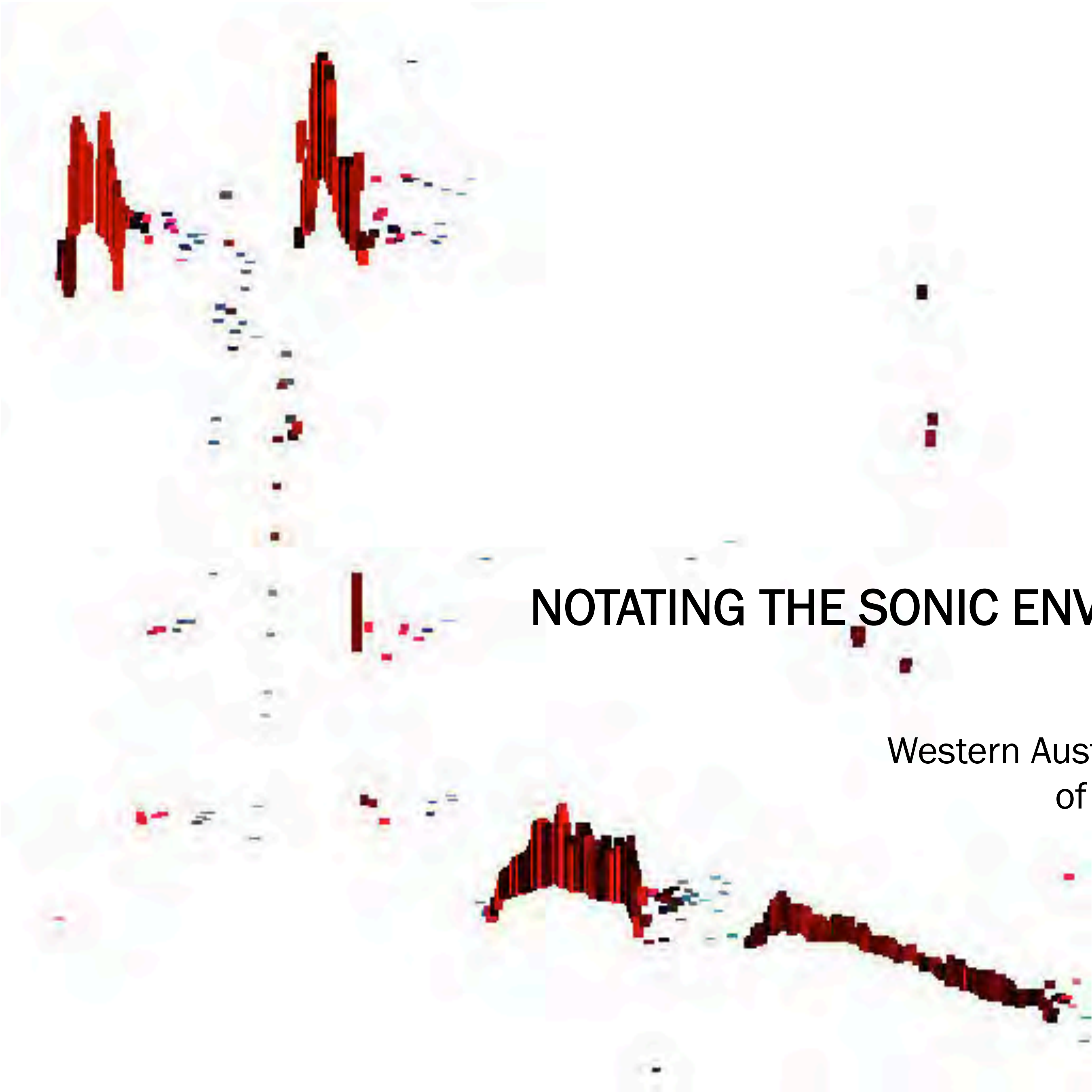

NOTATING THE SONIC ENVIRONMENT

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School of Music
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MODELS FOR THE PRESENT WORK
Alvin Lucier's *(Hartford) Memory Space* (1970) and *Carbon Copies* (1989)

performers imitate the sounds of any indoor or outdoor environment (albeit pre-recorded), "as exactly as possible, without embellishment"

(Hartford) Memory Space

for any number of singers and players or acoustic instruments

Go to outside environments (urban, rural, hostile, benign) and record by any means (memory, written notations, tape recordings) the sound situations of those environments. Returning to an inside performance space at any later time, re-create, solely by means of your voices and instruments and with the aid of your memory devices (without additions, deletions, improvisation, interpretation) those outside sound situations.

When using tape recorders as memory devices wear headphones to avoid an audible mix of the recorded sounds with the re-created ones.

For performances in places other than Hartford, use the name of the place of performance in parentheses at the beginning of the title.

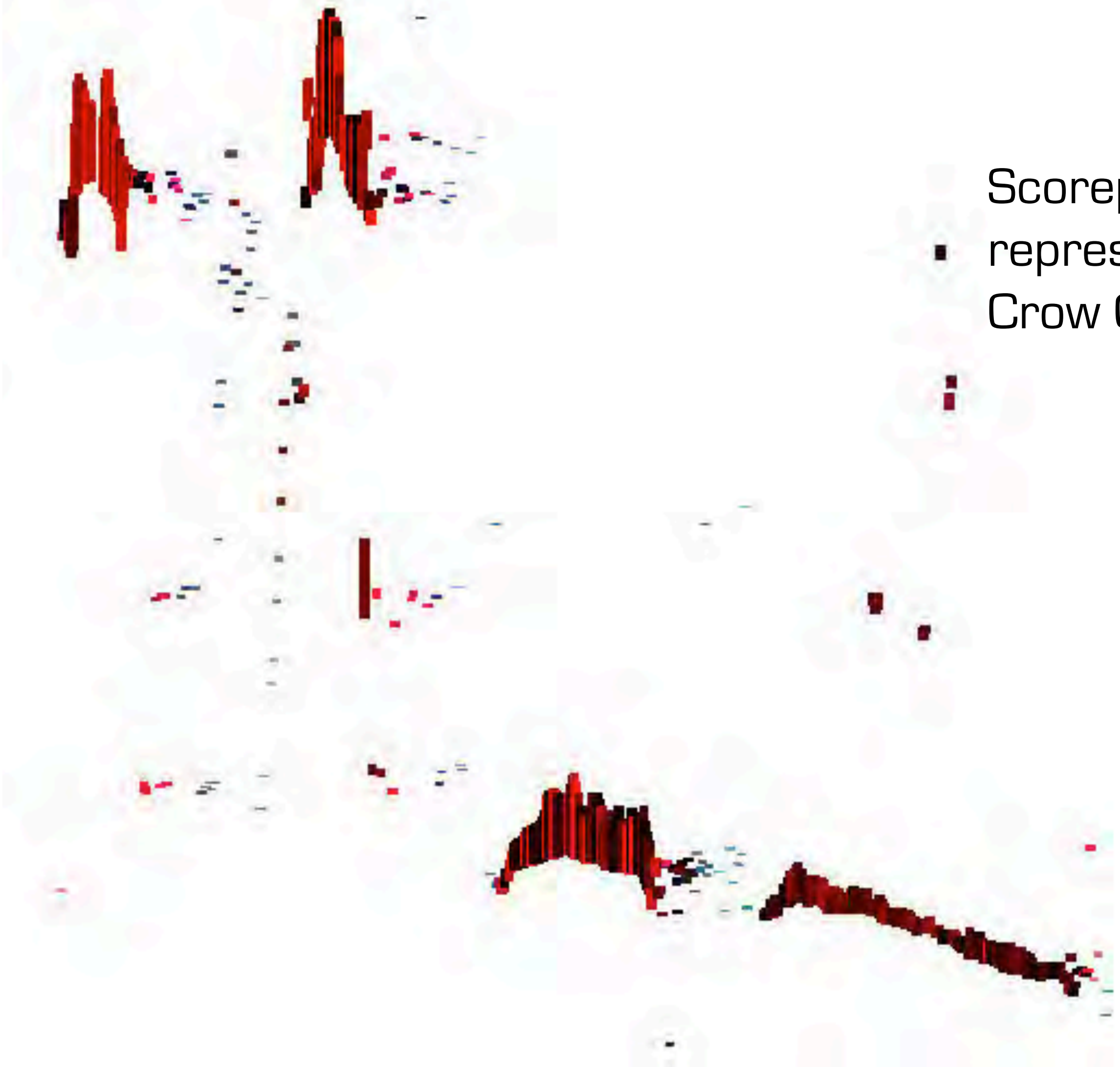
In this project, the objective of interaction between a live performer and environmental sounds was broadened through the addition of a visual representation of the field recording, allowing the performer to see sonic features before they are sounded.

Percussionist Vanessa Tomlinson may use the scoreplayer as a score and/or as an indicator of the sonic features of a recorded environment.

It is envisaged that she will make a field recording and collect objects to play in the vicinity of the performance venue.

Lyrebird Environment Player

Frequency of the strongest sinusoidal component is rendered as vertical height.

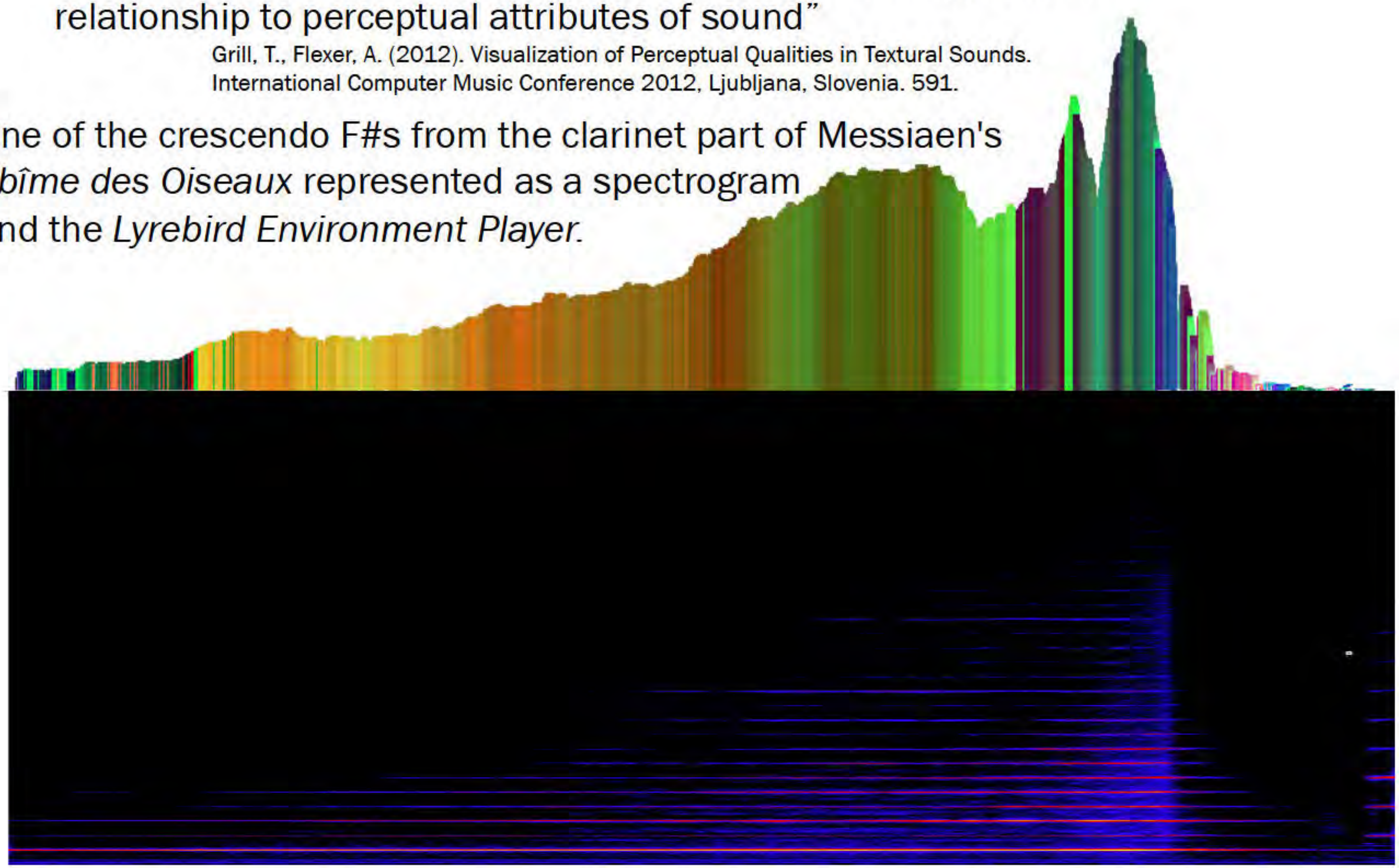


Scoreplayer representation of a Crow Caw

The work employs an alternate form of spectrogram in which, rather than visualizing the energy at every sinusoidal peak, only the strongest peak, coloured according to brightness, noisiness and bark scale analysis

> Spectrogram "visualizations are highly abstract, lacking a direct relationship to perceptual attributes of sound"
>
> Grill, T., Flexer, A. (2012). Visualization of Perceptual Qualities in Textural Sounds. International Computer Music Conference 2012, Ljubljana, Slovenia. 591.

One of the crescendo F#s from the clarinet part of Messiaen's *Abîme des Oiseaux* represented as a spectrogram and the *Lyrebird Environment Player*.

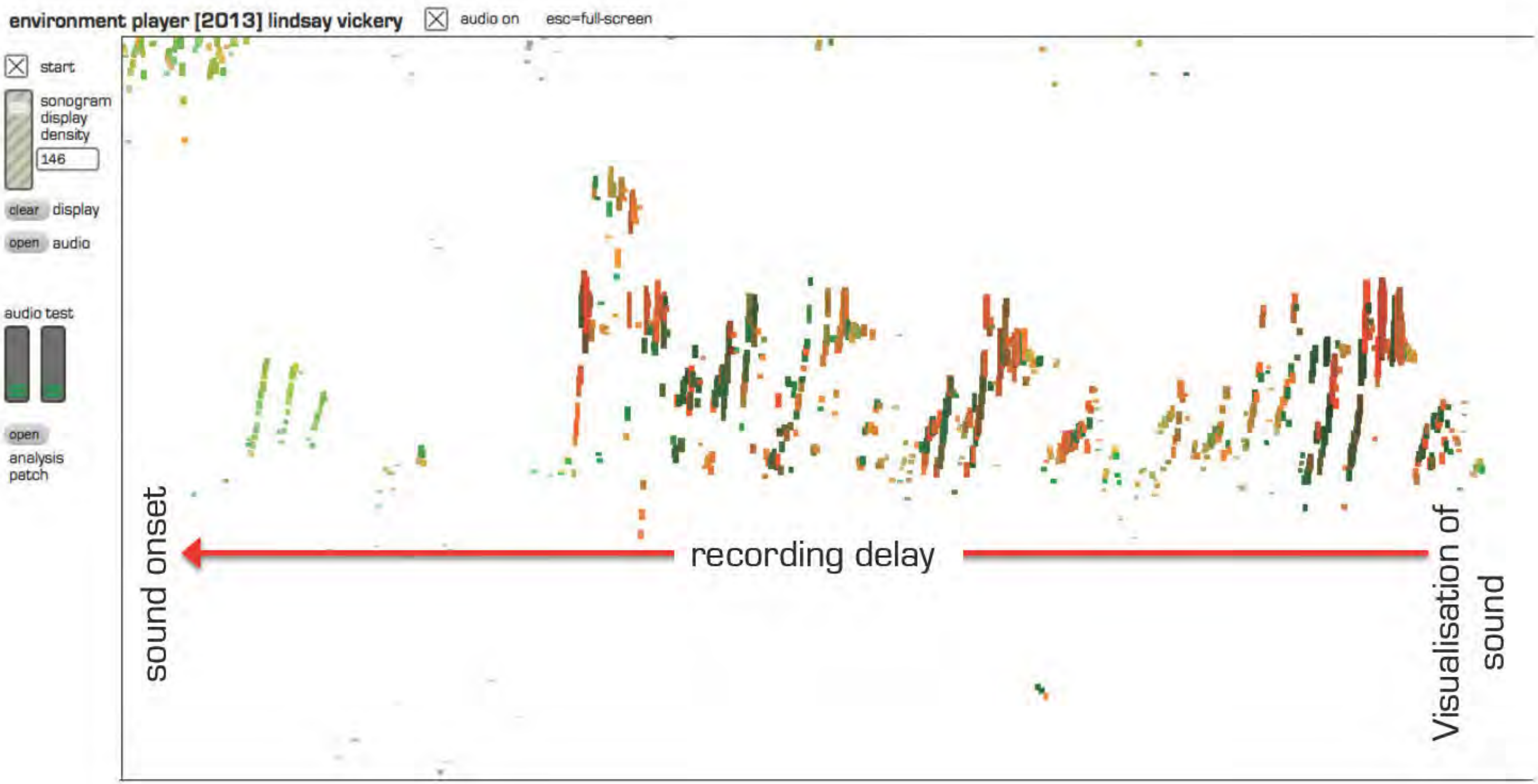


The amplitude of the frequency is represented by the height of the rectangle. The brightness, noisiness and bark scale value of each event determines the shade of the rectangle.

The amplitude of the frequency is represented by the size of the rectangle.

The brightness, noisiness and bark scale value of each event determines the luminance, hue and saturation of the rectangle's shade.

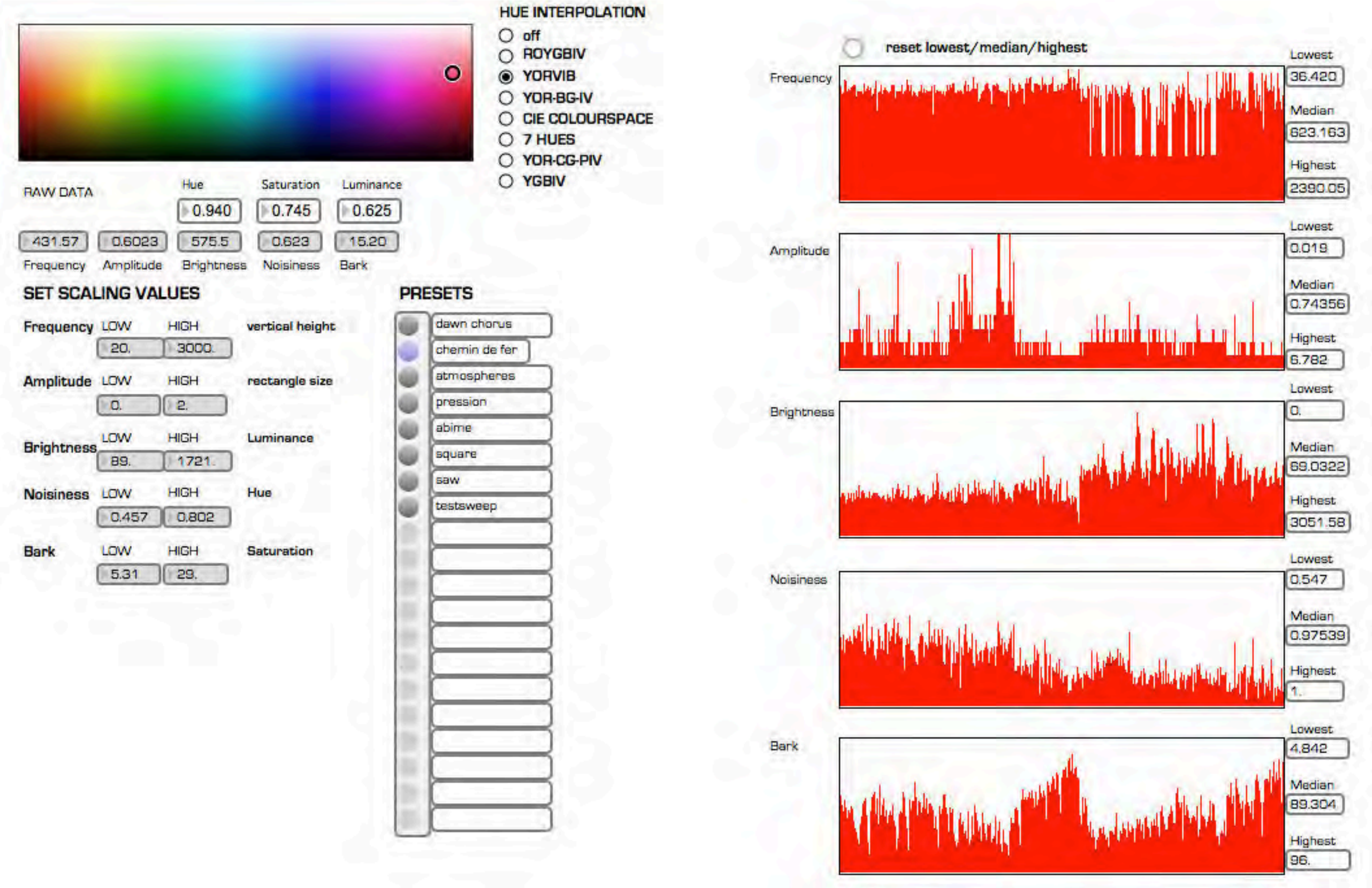
The output is displayed for the performer on the right of the screen and scrolls to the left. The source recording is delayed so that the sound is heard as the visual representation arrives at the "playhead" (the black line of the left of the screen.



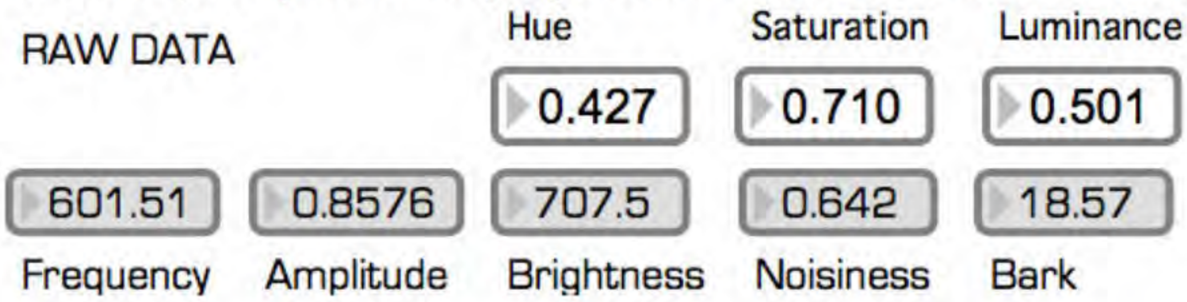
Controls

audio on	turns on audio
esc=full-screen	switch to full screen
start	start audio and visualisation
sonogram display density 145	change the volume of the audio and density of the visualisation
clear display	clear visual display and delay buffers
open audio	load audio file
audio test	indicates level of audio
open analysis patch	opens analysis patch
23 scrollrate	change the scrollrate (and delaytime) in ms/px
reset delay 27600 delay (manual)	delay time may be changed manually
loop	loop the soundfile

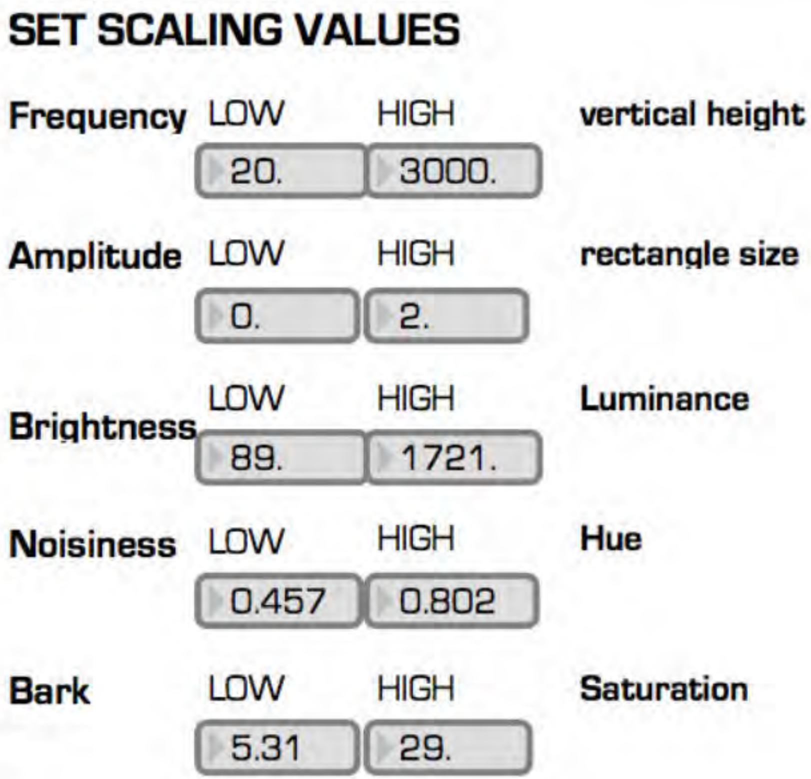
The amplitude, frequency, brightness, noisiness and bark scale value of the recording can be scaled via an analysis patch.



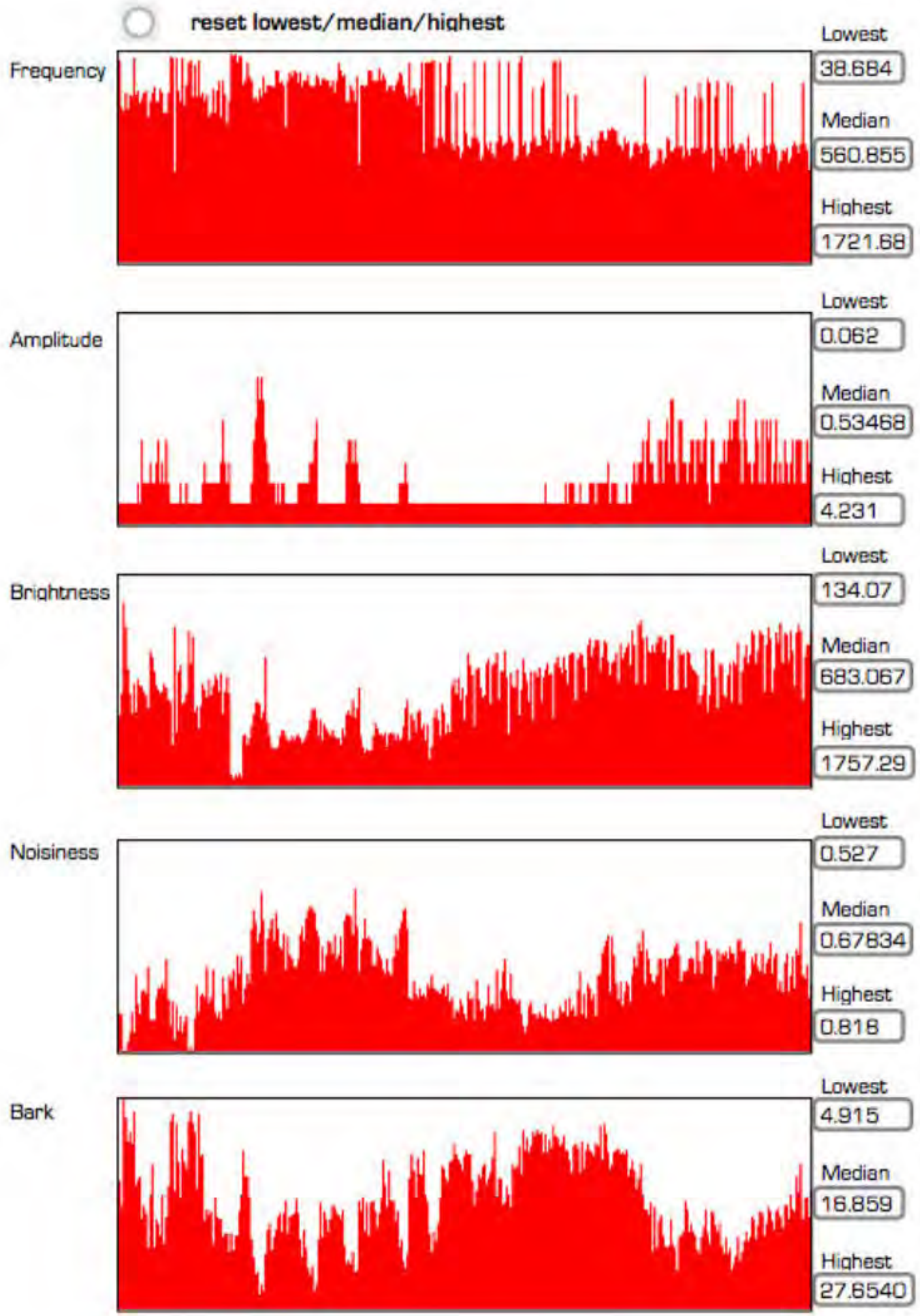
The analysis patch displays the raw values of incoming data.



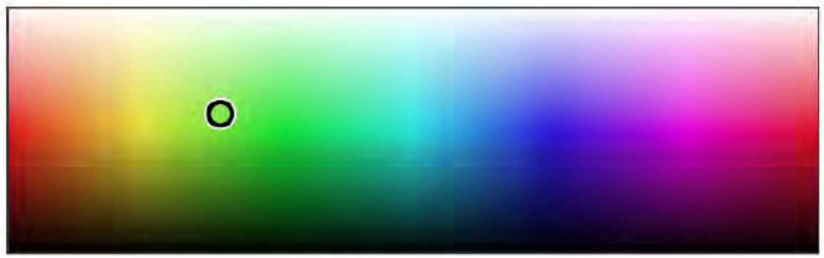
The incoming data can be scaled so that it is visualised across the maximal range in the score.



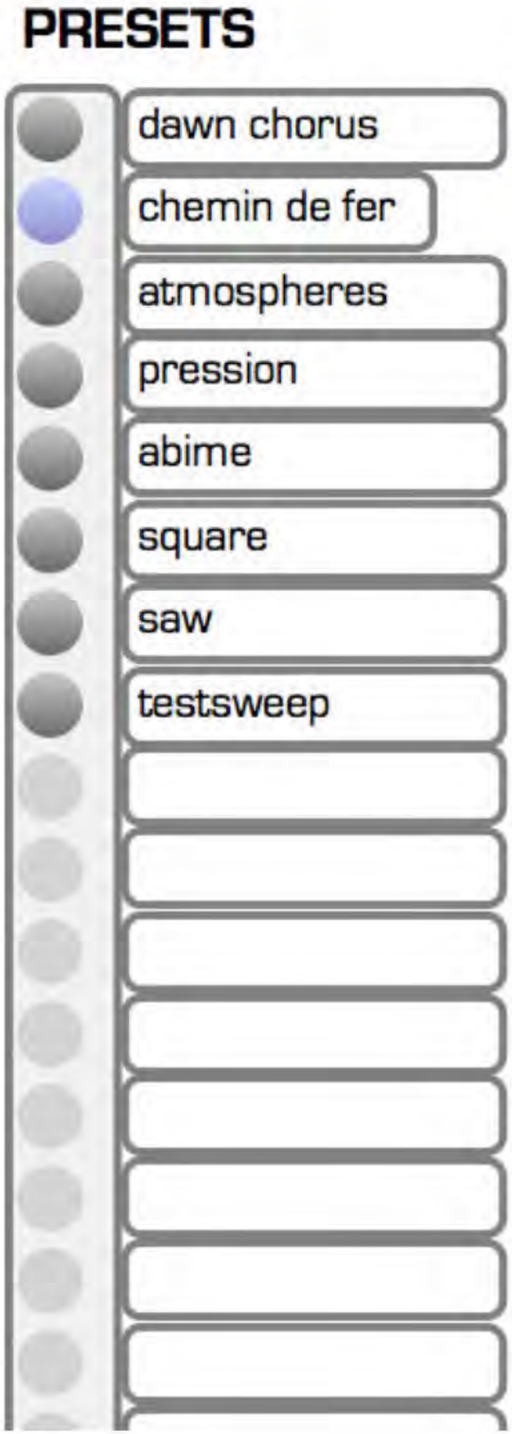
Brightness, noisiness and bark scale are derived using Tristan Jehan's `analyzer~` object. In this patch a bark scale value is obtained by calculating the median deformation of 25 critical bands.



Scaled incoming data is visualised in five scrolling multislider displays. The displays indicate the degree to which the data covers the maximal range for each parameter. The highest, lowest and median values for each parameter are displayed and may be reset.



A colour swatch indicates in realtime the resulting colour variations that are being rendered in the score.

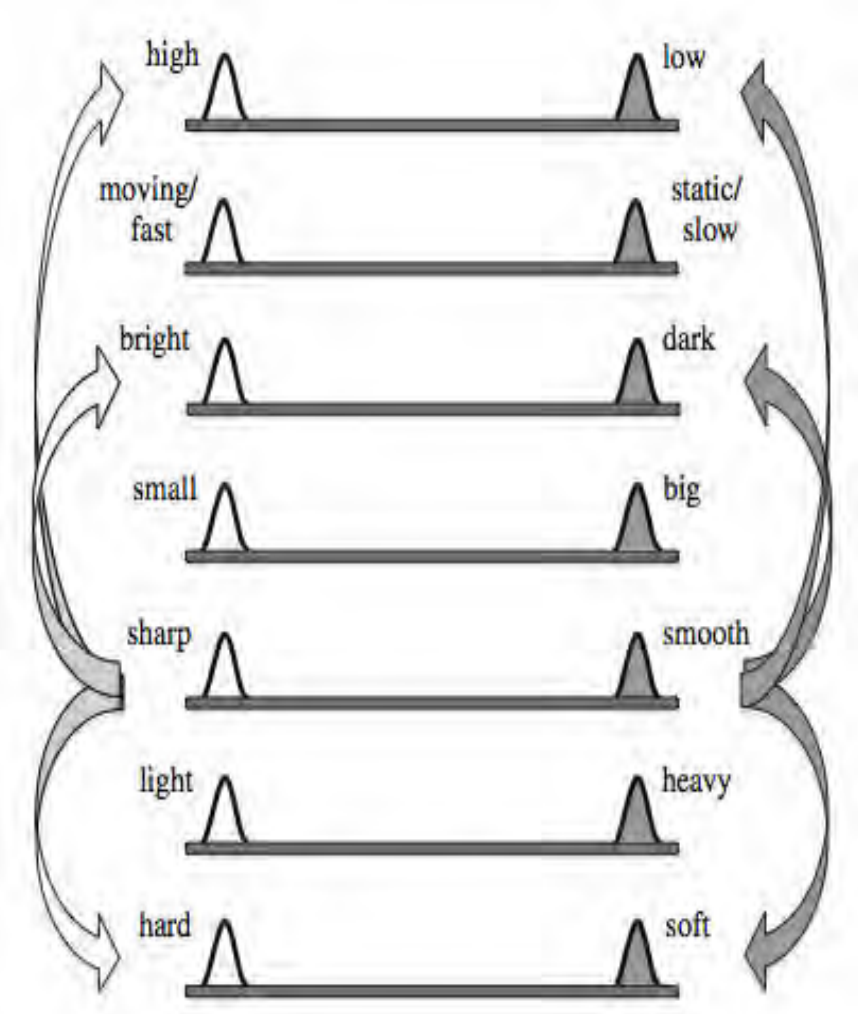


The scaling of different recordings may be stored.

The patch provides a range of hue interpolations.

Hue Interpolations: Representing Timbre with Colour

Representation of timbre with colour is both an art and a science.
There is mounting evidence of cross-modal associations between timbres and colours[1].



In general terms these associations appear to function in a similar fashion to other perceptual correspondences.

"en bloc alignment of the dimensions is context invariant"[2]

These apparently inherent latent mapping inherent cross-modal understandings have been observed in infants as young as 1 year old[3] and pan-culturally[4].

!. Griscom, W. S., and Palmer, S. E. (2013). "Cross-modal Sound-to-Sight Associations with Musical Timbre in Non-Synesthetes." Paper presented at the 13th Annual Meeting, May 10 -15, 2013 Waldorf Astoria, Naples, Florida.

2. Walker, P. (2012). Cross-sensory correspondences and cross talk between dimensions of connotative meaning: Visual angularity is hard, high-pitched, and bright. *Attention Perception and Psychophysics* 74:1792–1809:1806.

3. Wagner, S., Winner, E., Cicchetti, D., & Gardner, H. (1981). "Metaphorical" mapping in human infants. Child Development, 52, 728-731.

4. Eitan, Z., and Timmers, R. (2010). Beethoven's last piano sonata and those who follow crocodiles: Cross-domain mappings of auditory pitch in a musical context. Cognition 114:405–422:419.

Hue Interpolations: Representing Timbre with Colour

Lyrebird follows these implications to derive timbre to colour representation based upon the mapping of:

> Brightness to Hue
> Noisiness to Shade and
> Bark Scale to Luminosity.

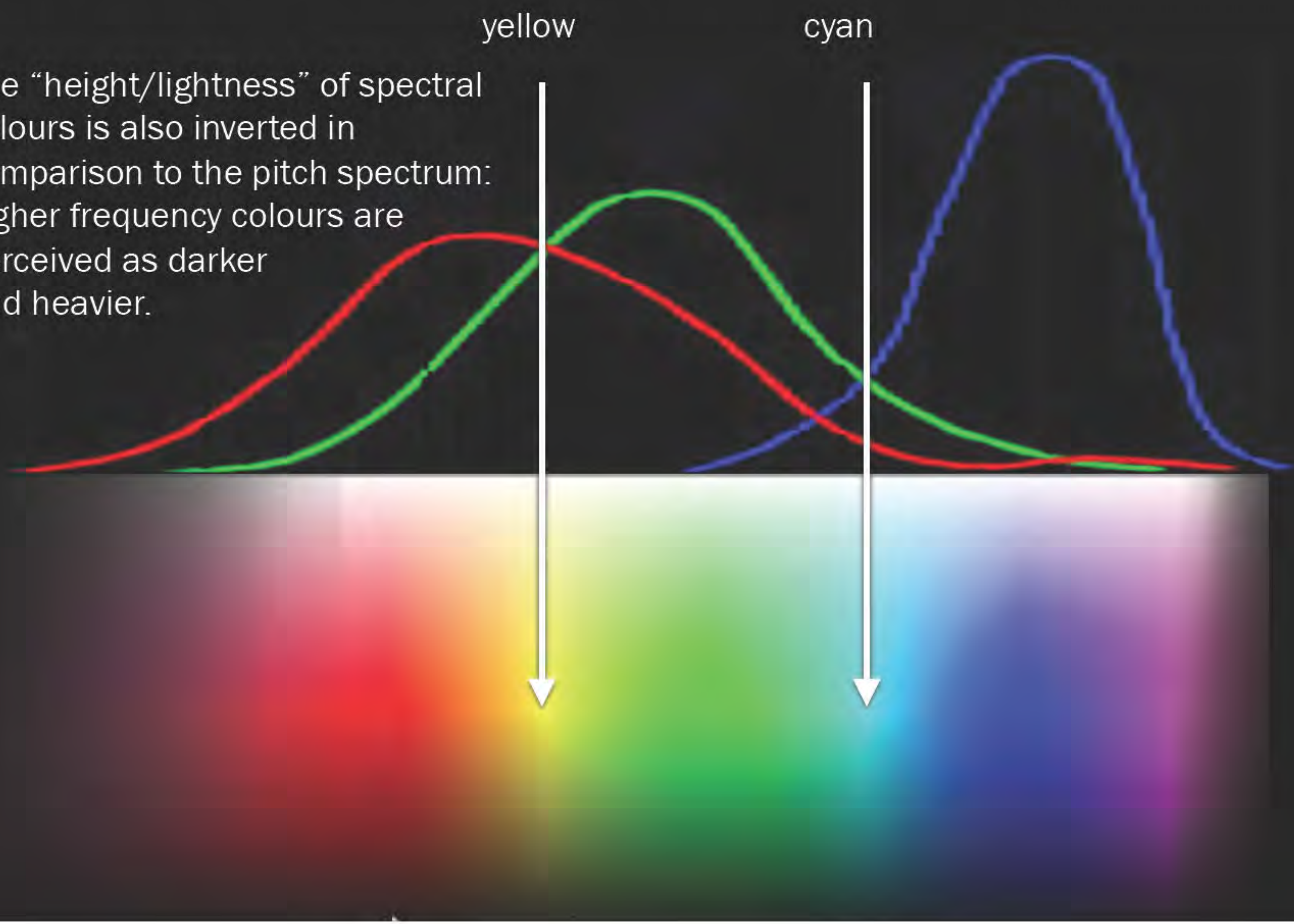
The modelling of perceptual brightness of colours is a complex and disputed area of research. One possible model is CIELAB colour space, however the issue is difficult to define because of the idiosyncrasies of human vision.

A notional colour spectrum based on human visual perception from white to black (based on CIELAB colour space[1] and Bruce MacEvoy's Artist's Value Wheel[2].

1. Hoffman, G. (2003). CIELab Color Space. http://docs-hoffmann.de/cielab03022003.pdf
2. MacEvoy, B. (2005) Artist's Value Wheel. http://www.handprint.com/HP/WCL/vwheel.pdf

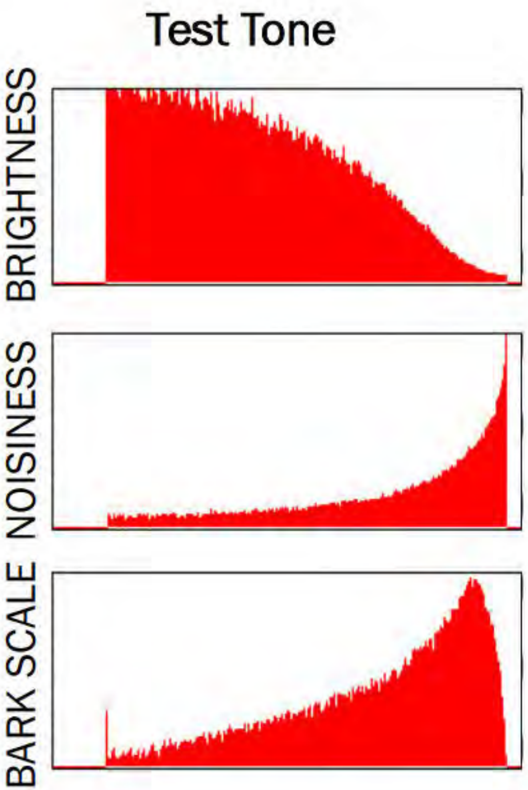
The eye contains only three kinds of colour detecting cone cells.
Colours that fall between them appear perceptually brighter.

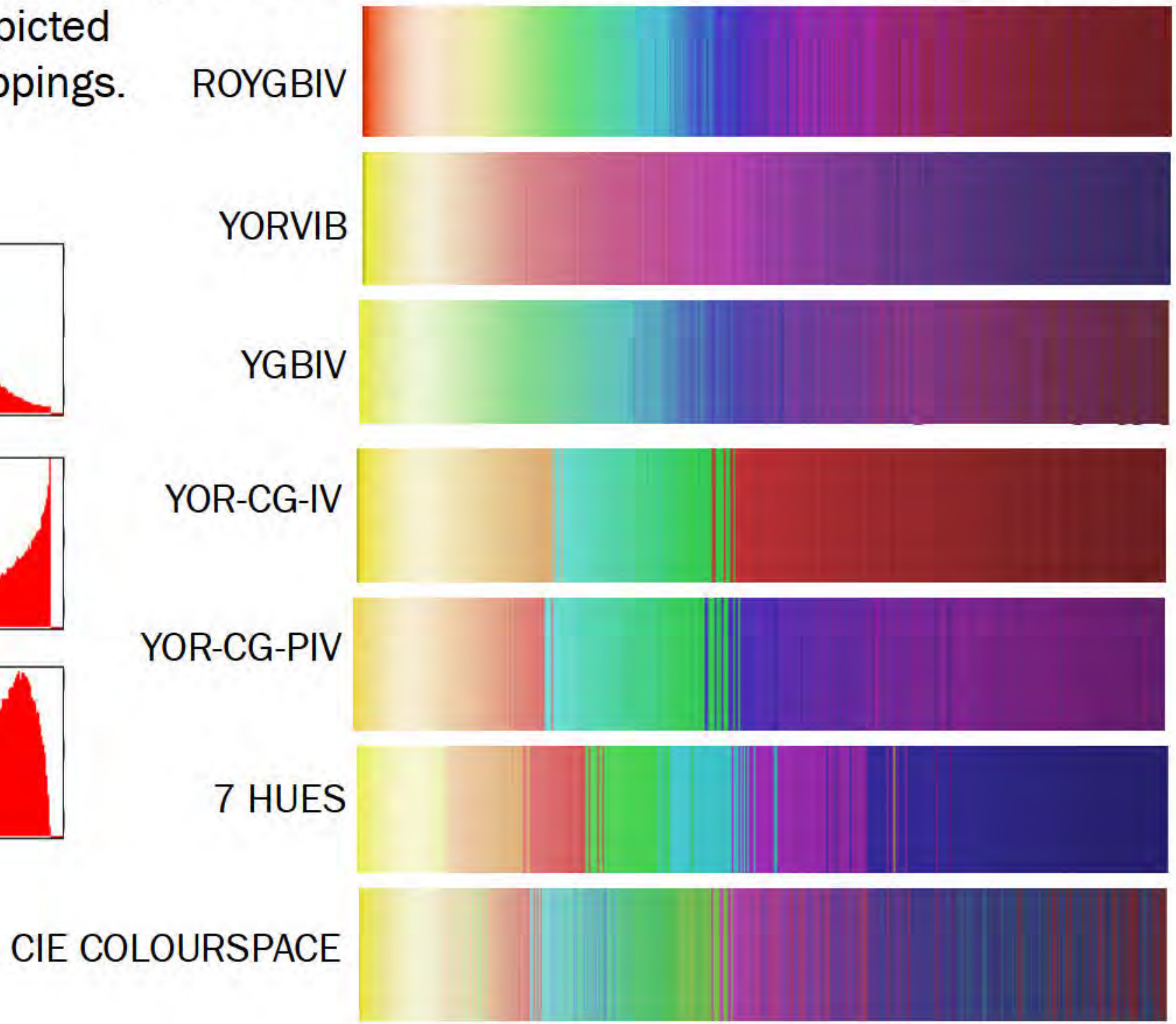
The "height/lightness" of spectral colours is also inverted in comparison to the pitch spectrum: higher frequency colours are perceived as darker and heavier.



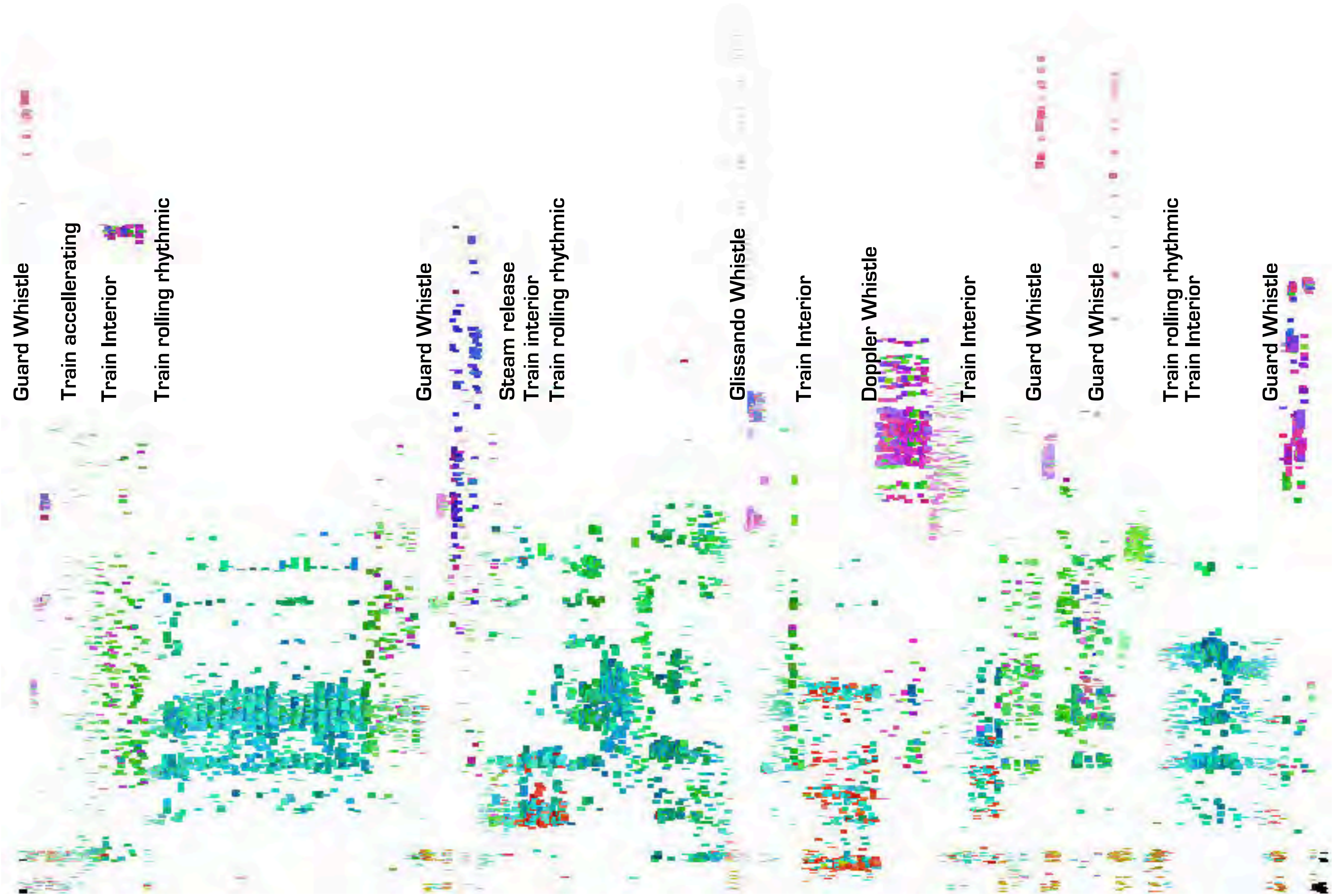
Colour Schema

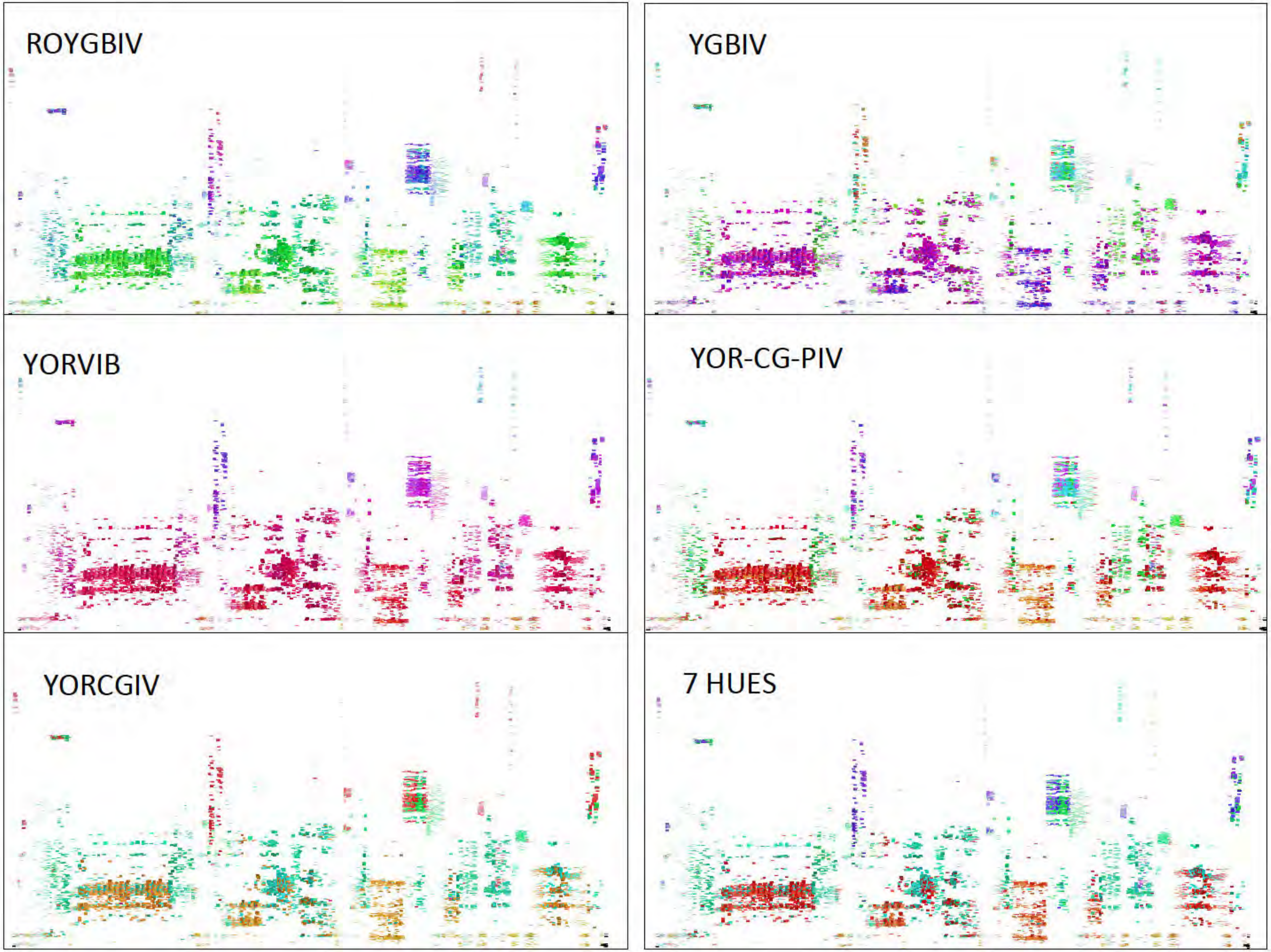
Lyrebird at present allows for the following mappings of timbral brightness to hue. The spectra below depict a test tone of increasing brightness, noisiness and bark scale depicted by a variety of mappings.





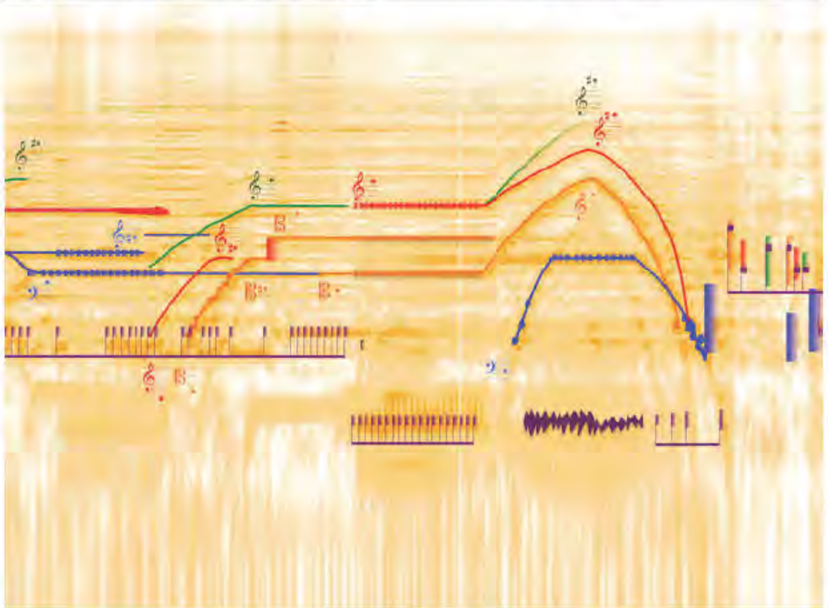
PIERRE SCHAEFFER **ETUDE AU CHEMIN DE FER** CIE COLOURSPACE



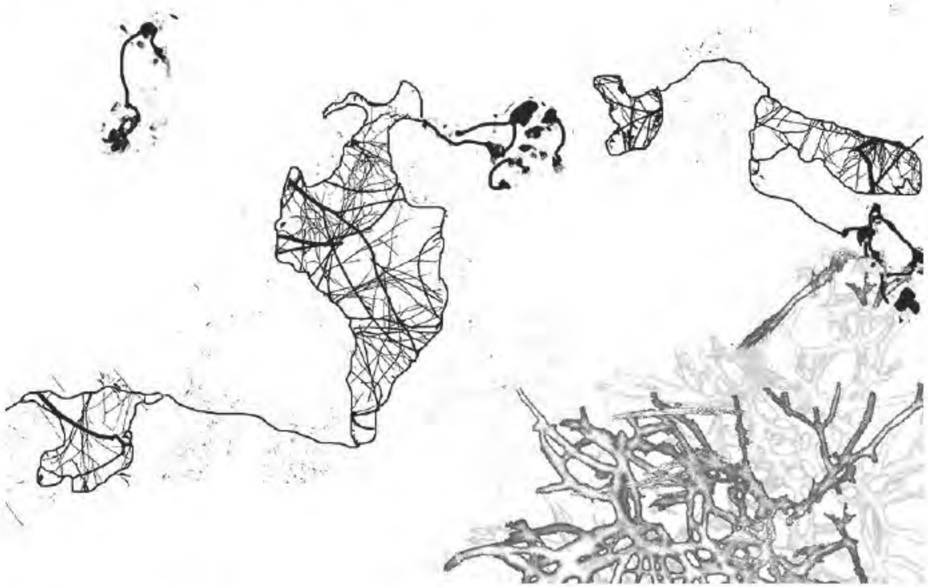

ROYGBIV
YGBIV
YORVIB
YOR-CG-PIV
YORCGIV
7 HUES

FURTHER WORK

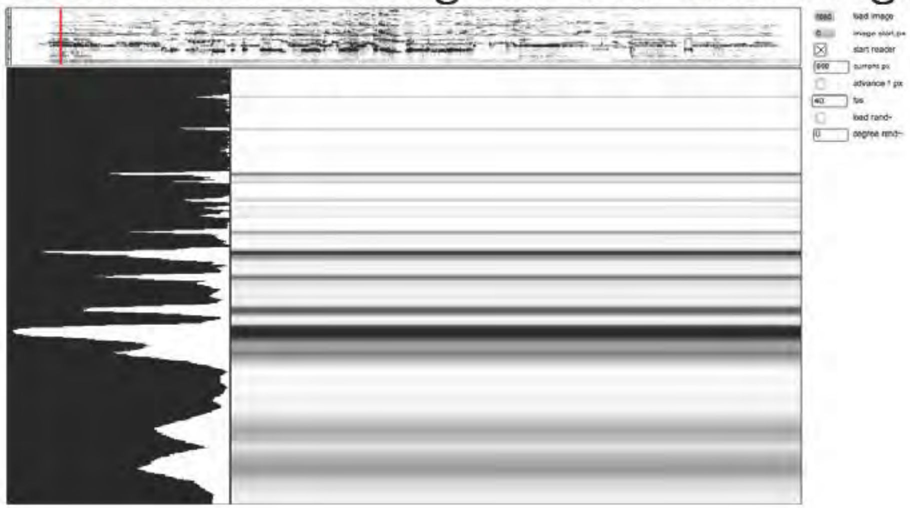
Annotated sonogram as a score



natural forms as score

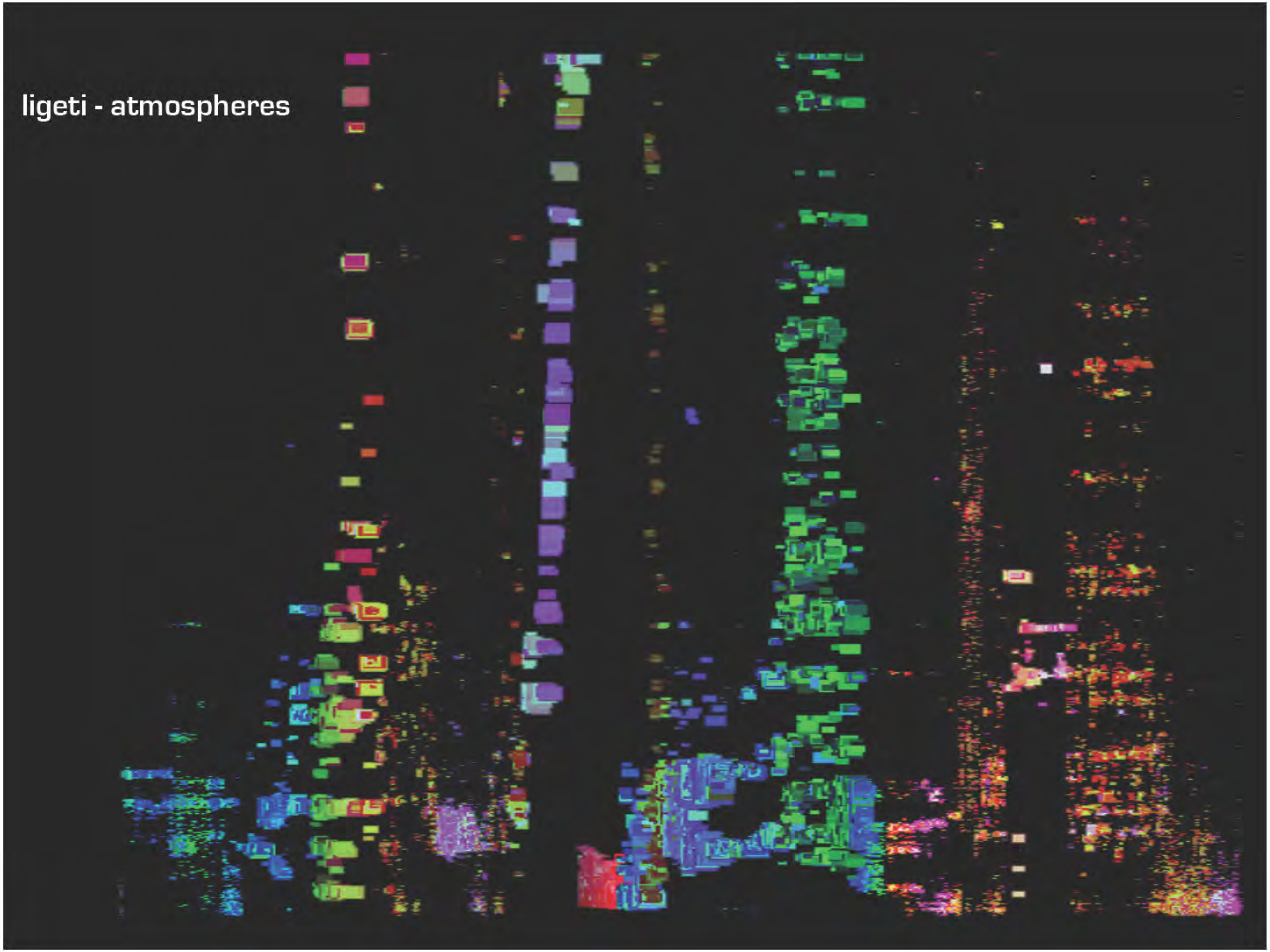


resonification of sonograms and other things



visualisation of speech accents as a percussion score

www.lindsayvickery.com


ligeti - atmospheres