

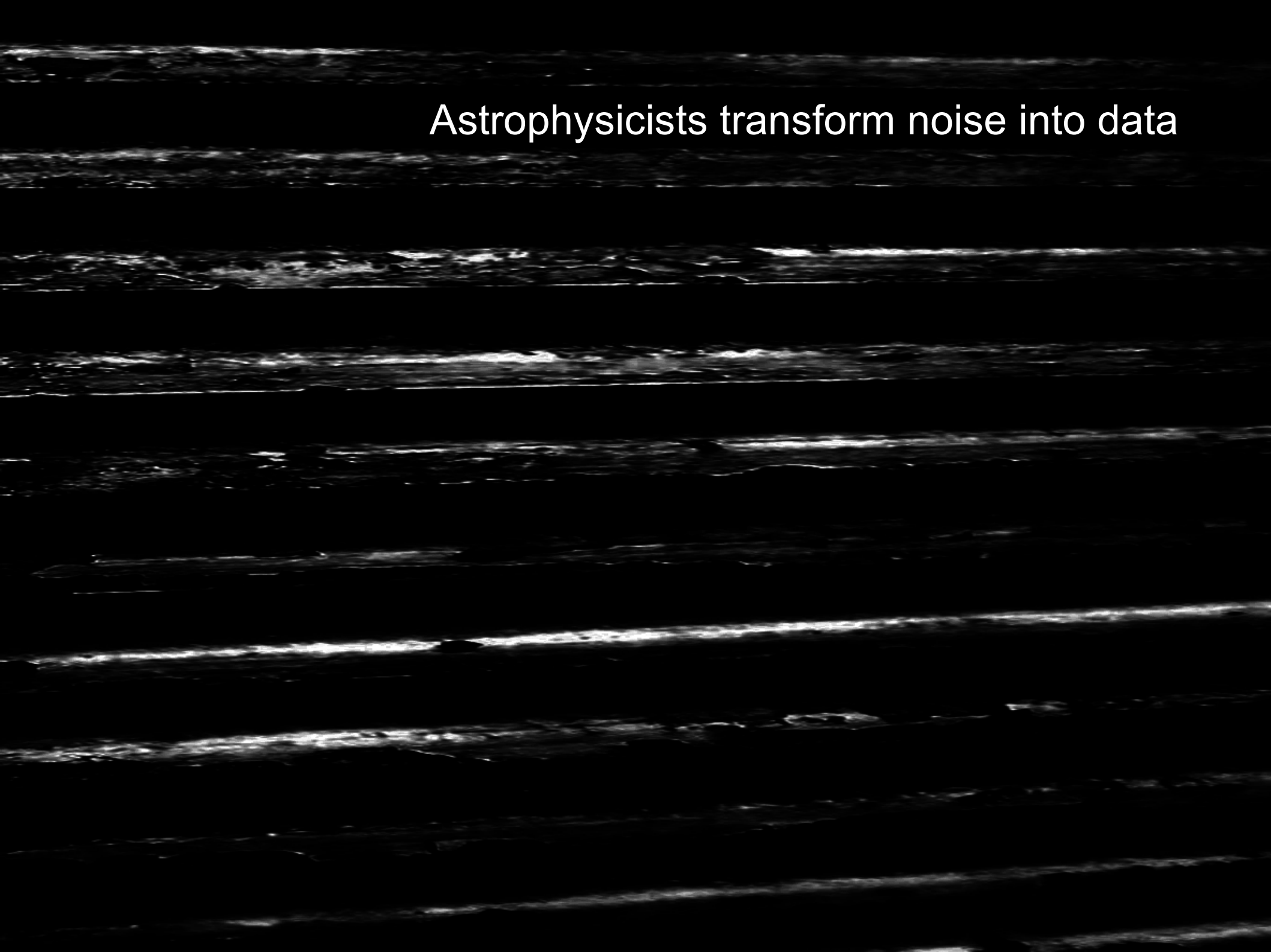


On Music and Astrophysics

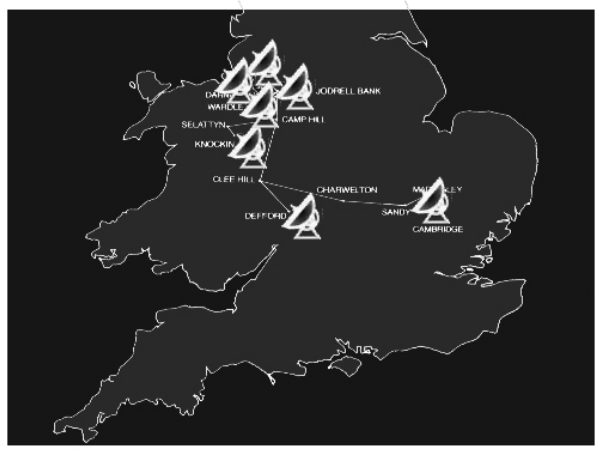
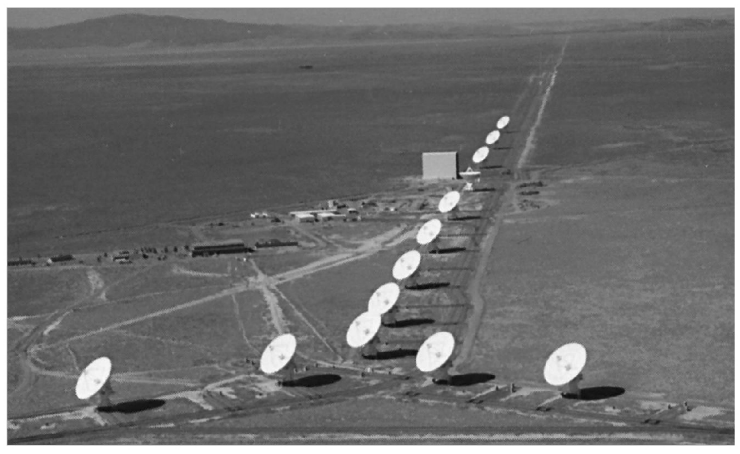
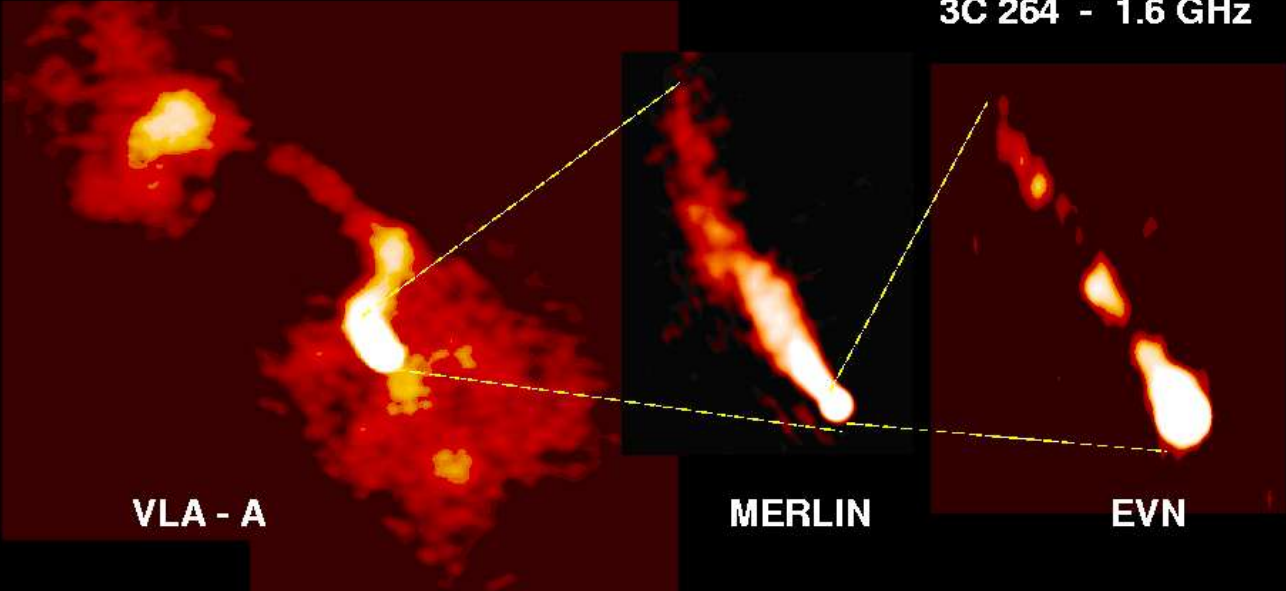


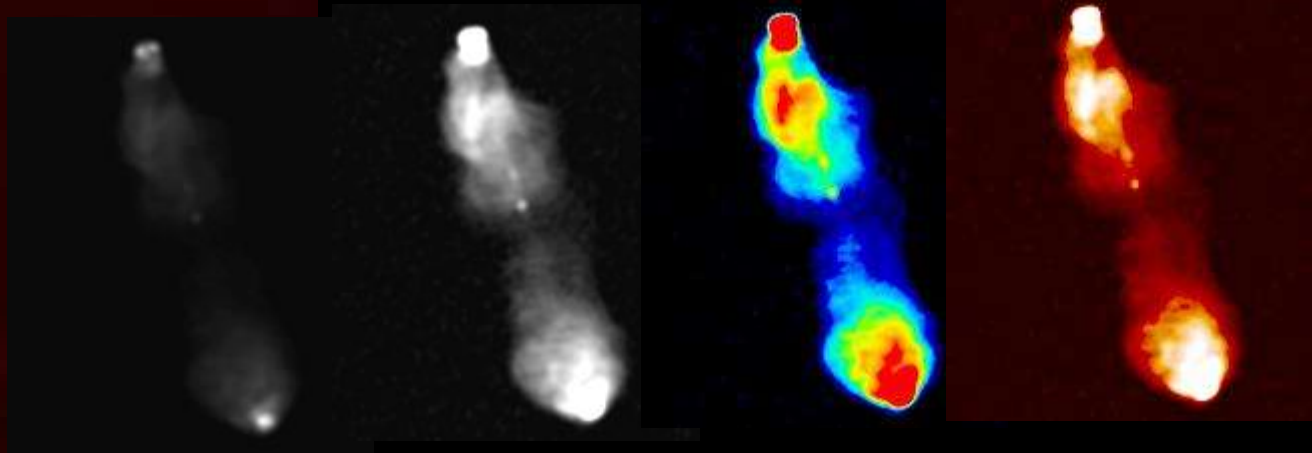
Jodrell Bank, UK

Astrophysicists transform noise into data

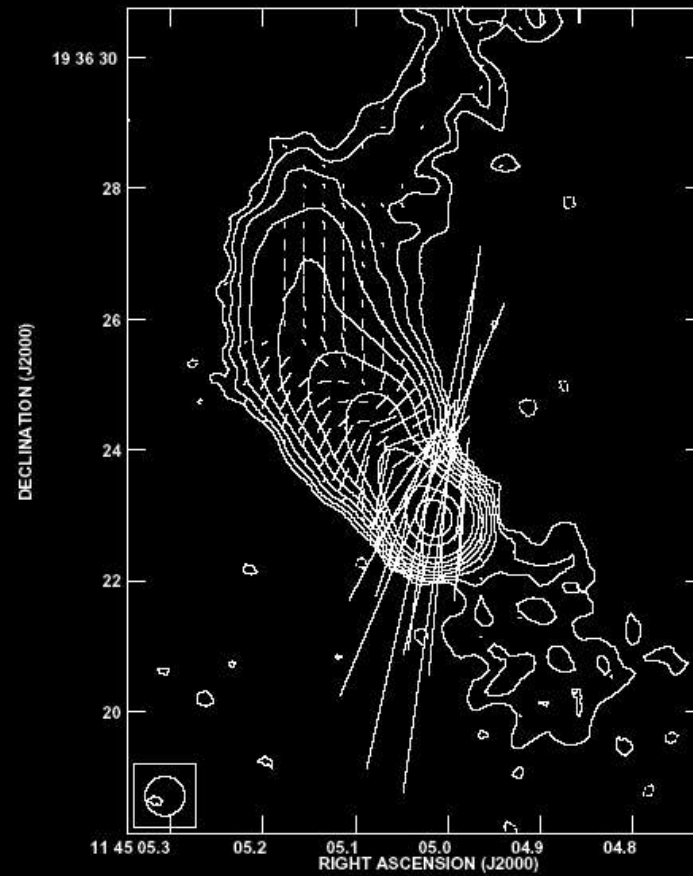


3C 264 - 1.6 GHz





and data into knowledge



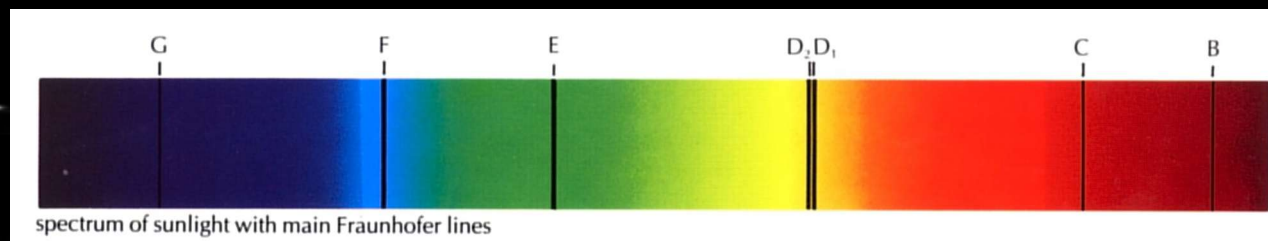
noise - data - knowledge

Revealing
geometry,
chemistry,
physical dynamics,
evolution

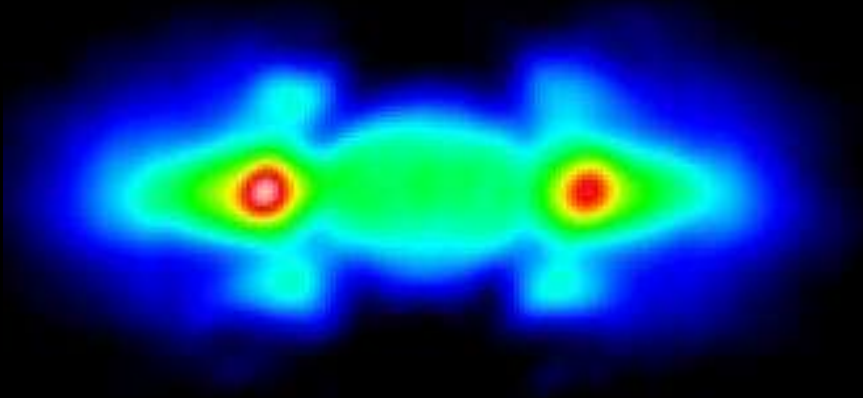
natural data

Electromagnetic radiation ('light')

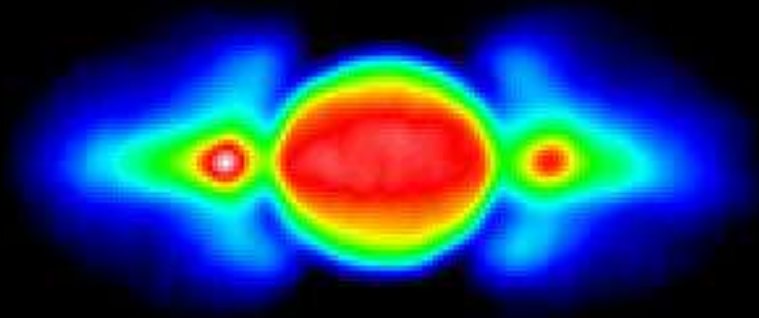
Physical pressure waves ('sound')



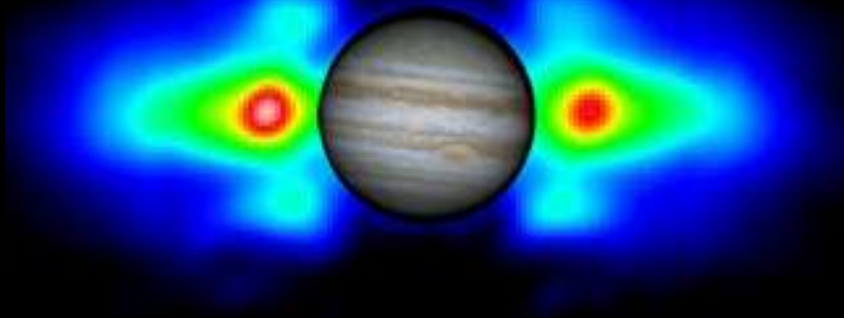
22cm wavelength
observation of Jupiter



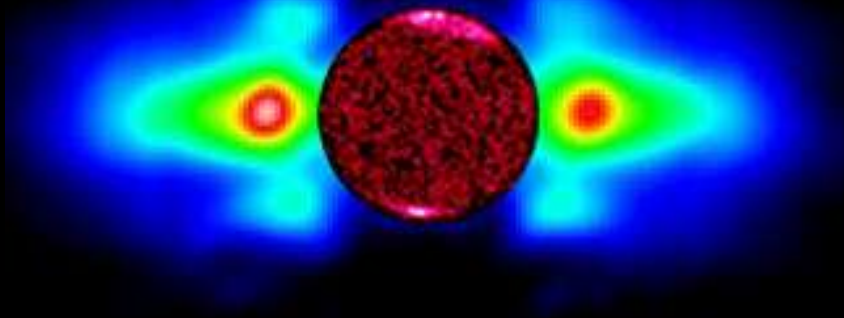
13cm wavelength
observation of Jupiter



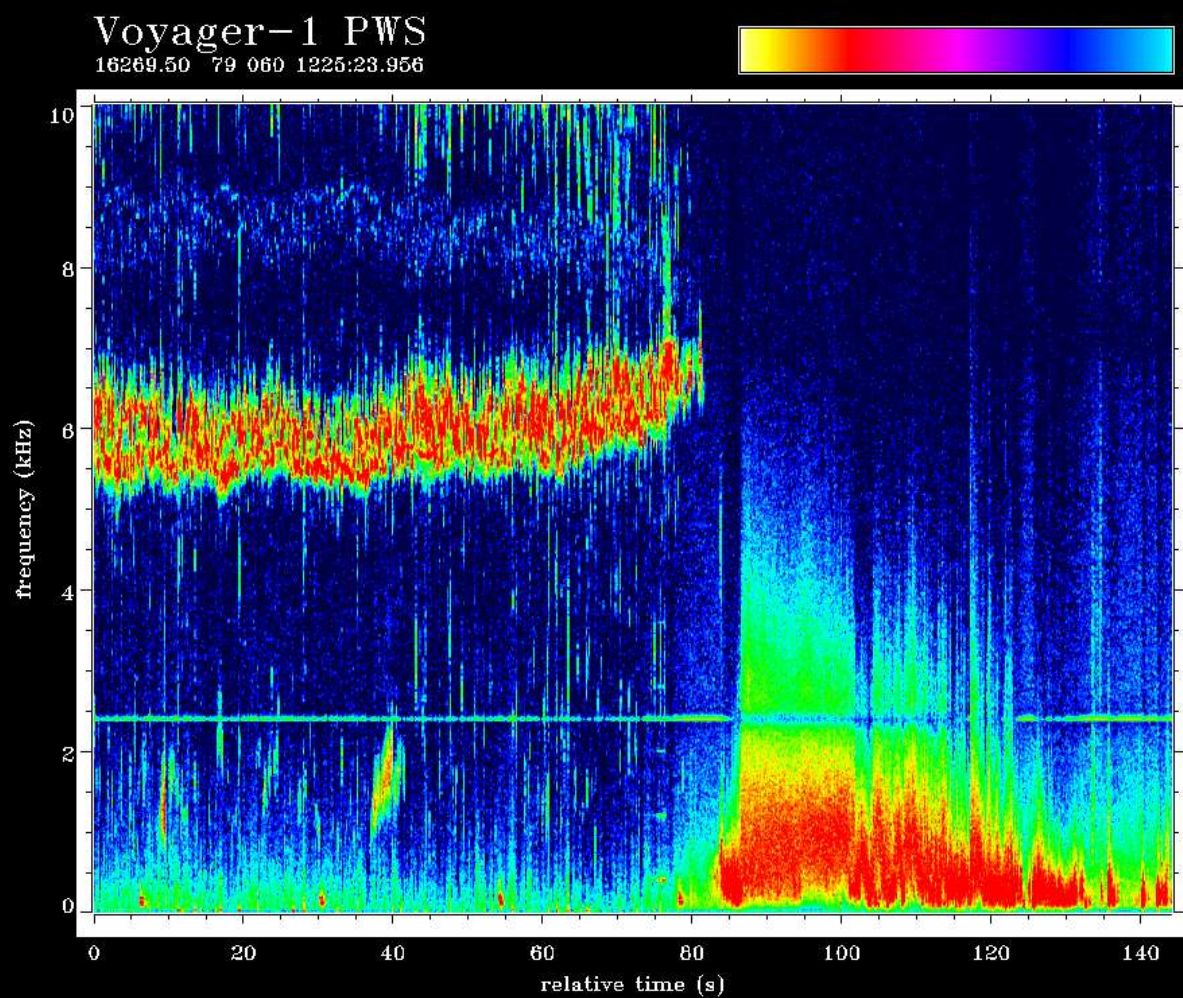
Optical overlay on 22cm



X-ray overlay on 22cm



Voyager entering the solar wind shockwave around Jupiter



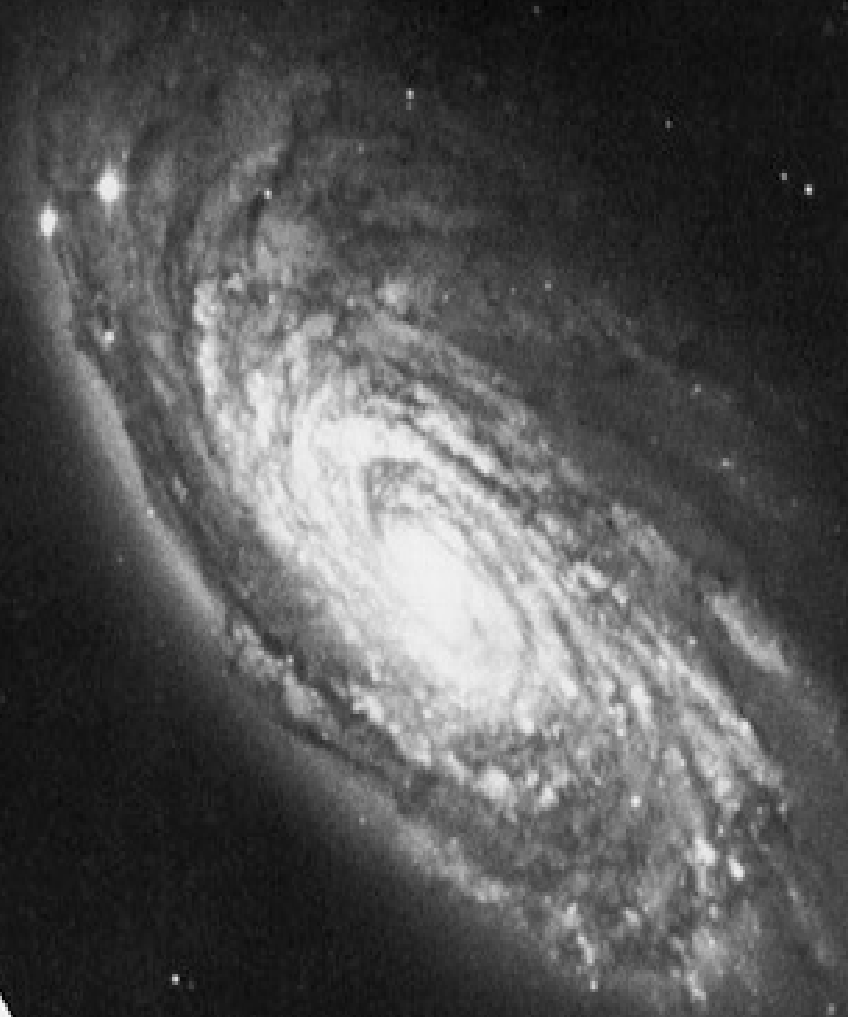
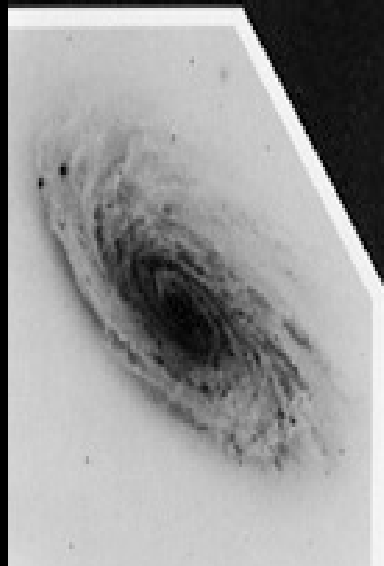
recipes for transformation

Ingredients:

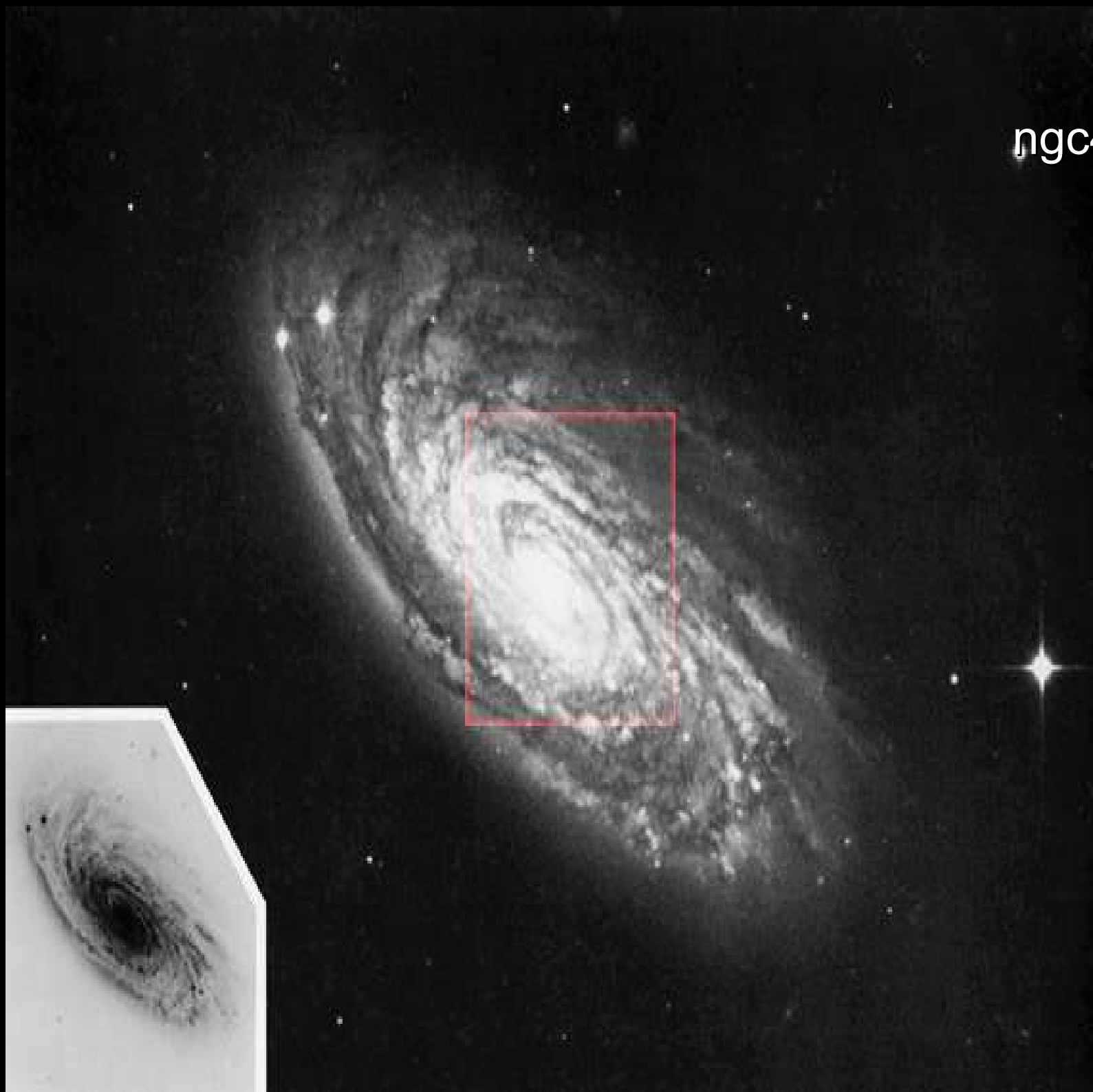
1 radio data-cube

A radio data-cube is usually thought of with X-Y as "space" and Z as "velocity". However, Z is actually frequency, of course. So, a single X/Y "pixel" actually contains a power spectrum. *So*, if we assume some form for the phases (random?) then each X/Y "pixel" can be used to produce a tone (aka "note" :-). So, a piece can be played by selecting notes by moving over the image of the galaxy in some way.

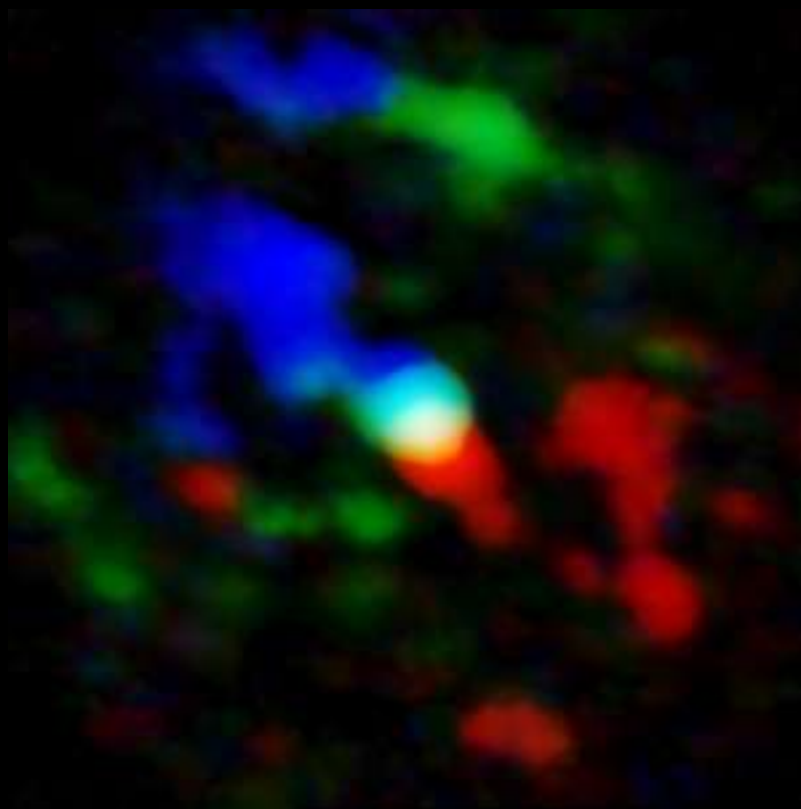
ngc4501



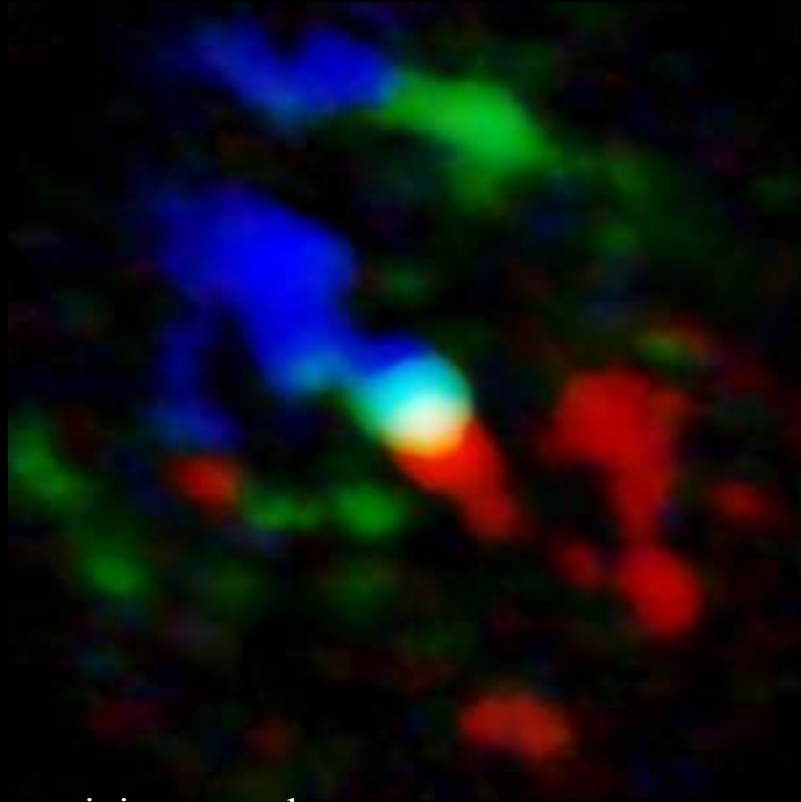
ngc4501



ngc4501



ngc4501



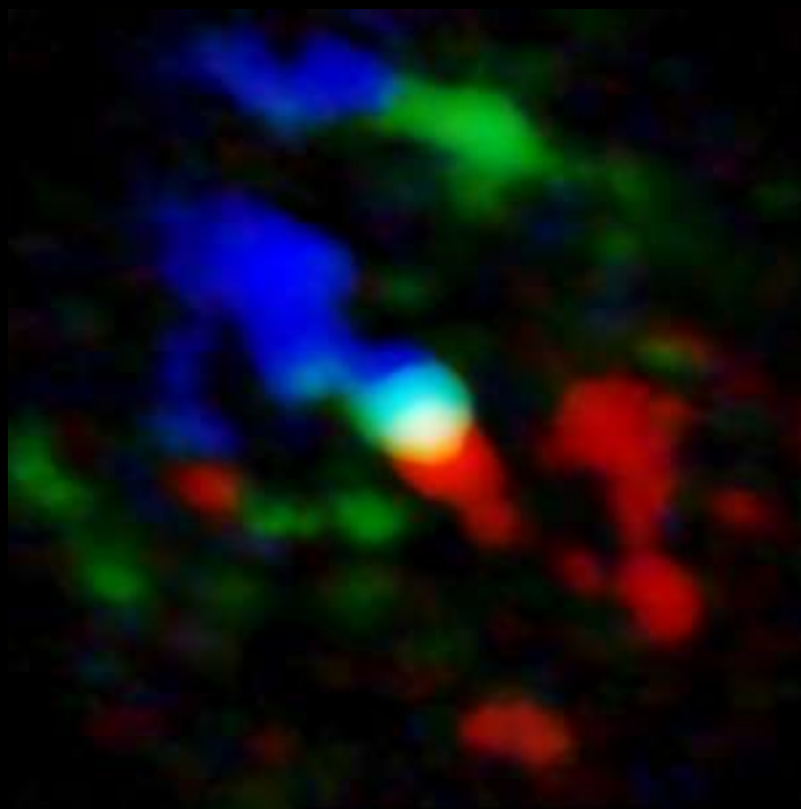
Take a Radio Spectral Cube and turn it into sound.

The cube is like an image, but instead of each pixel being a single "colour", it is actually a spectrum. Selecting a pixel with the mouse takes that spectrum and transforms the radio frequencies into an audible range, then it creates a sound with that spectrum.

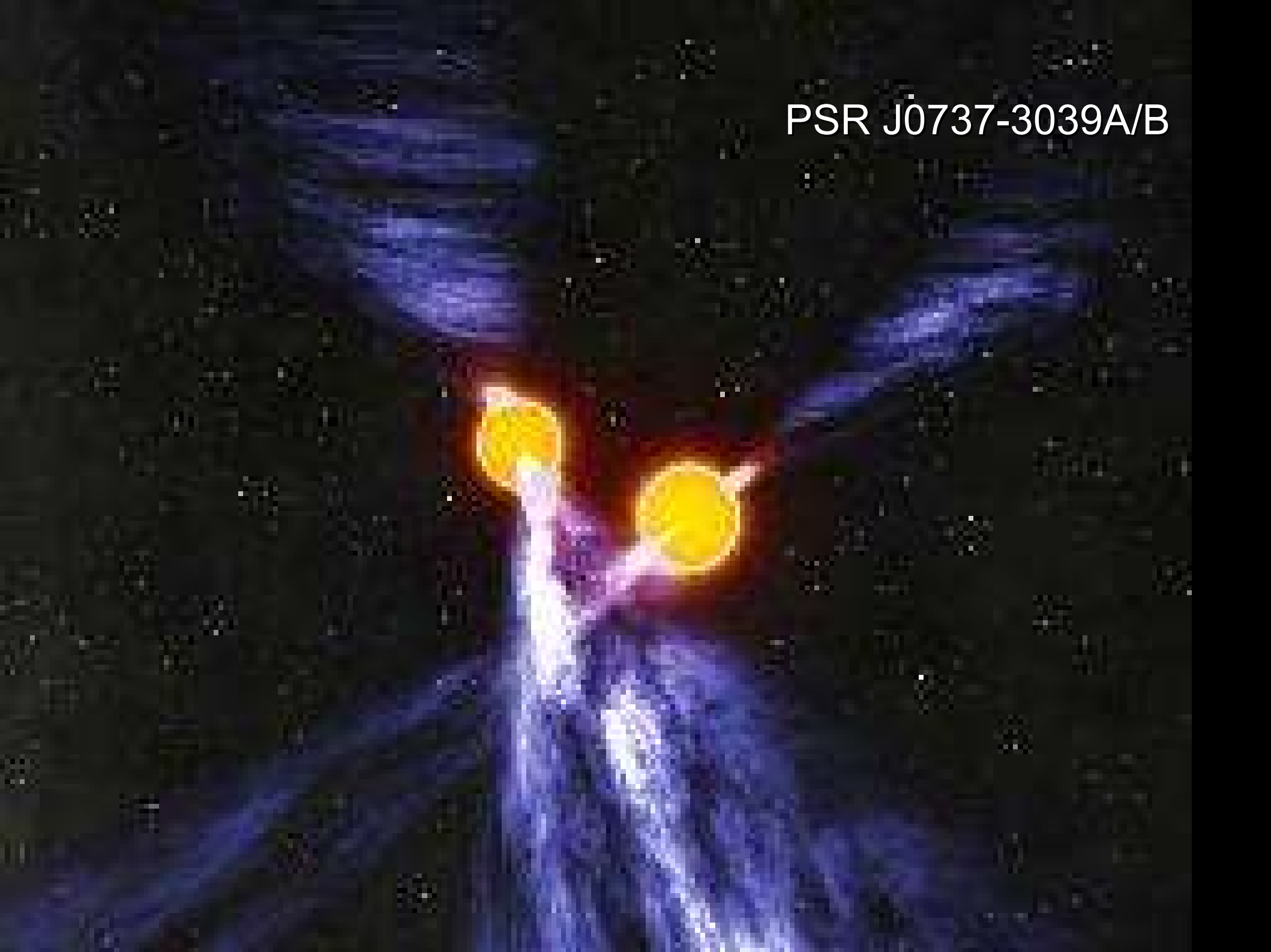
Similarly, the radio frequencies have been transformed into visible colours so you can see them, blue for "higher frequency" and red for "lower frequency".

You can see and hear the structure of the spiral arms, even the discord in the middle where both are super-imposed.

ngc4501

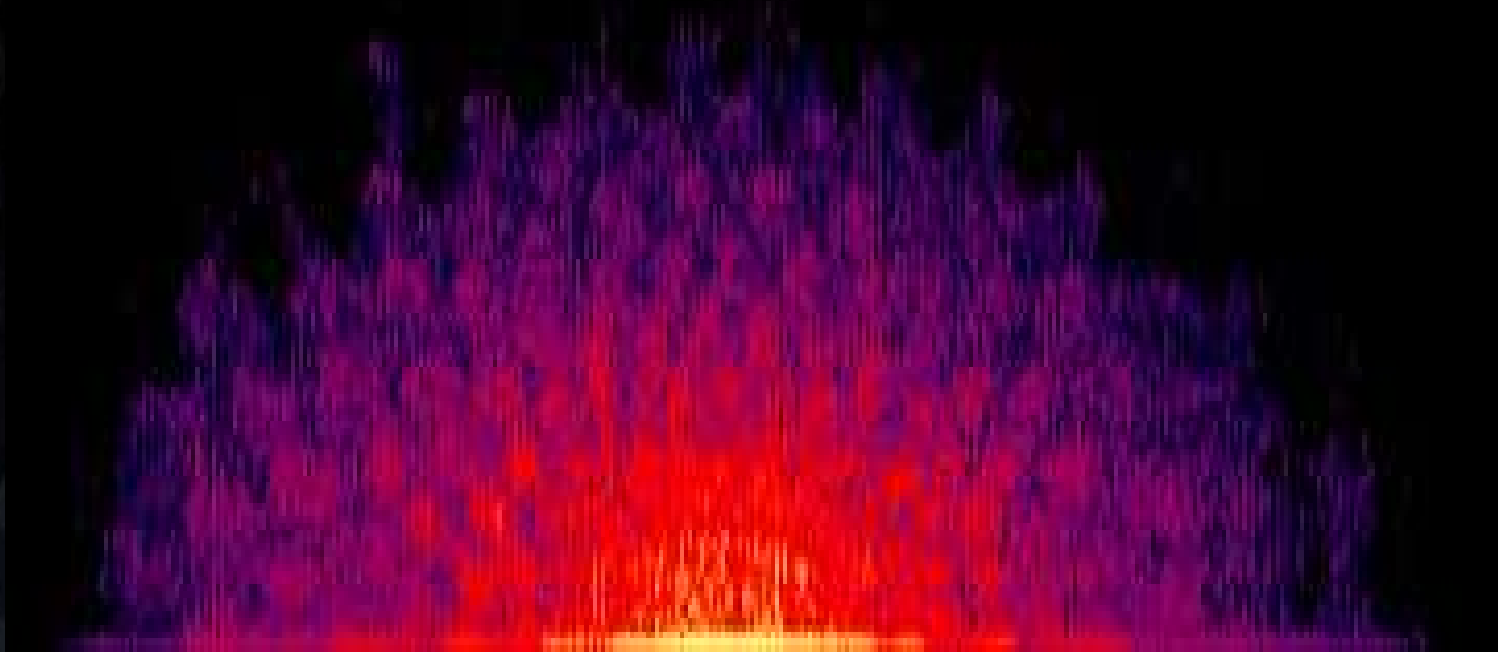


PSR J0737-3039A/B





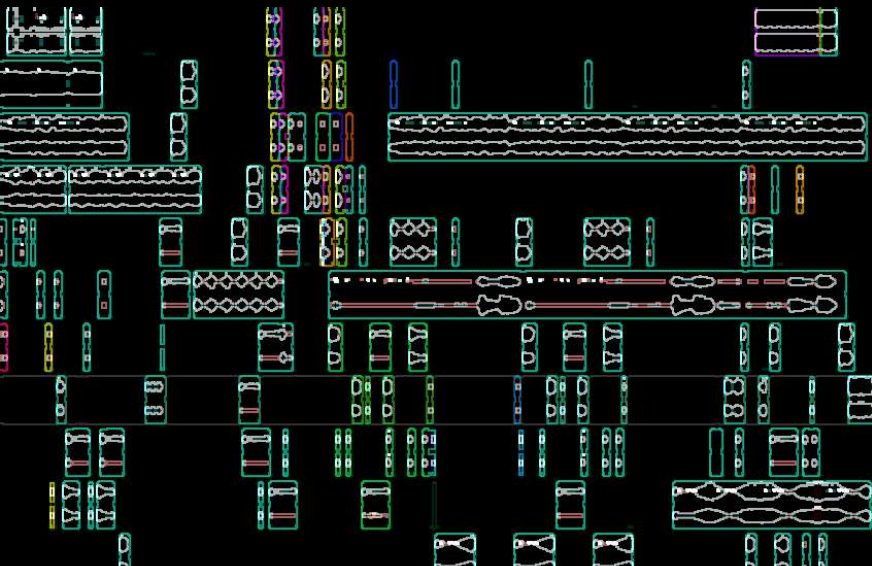
Jaakko Mattila, "One"



rules of engagement

$$ds^2 = (cdt)^2 - R^2(t) \left[d\chi^2 + S_k^2(\chi) (d\theta^2 + \sin^2 \theta d\phi^2) \right]$$

note to self: “avoid shallow art and shallow science and not engaging with anyone”

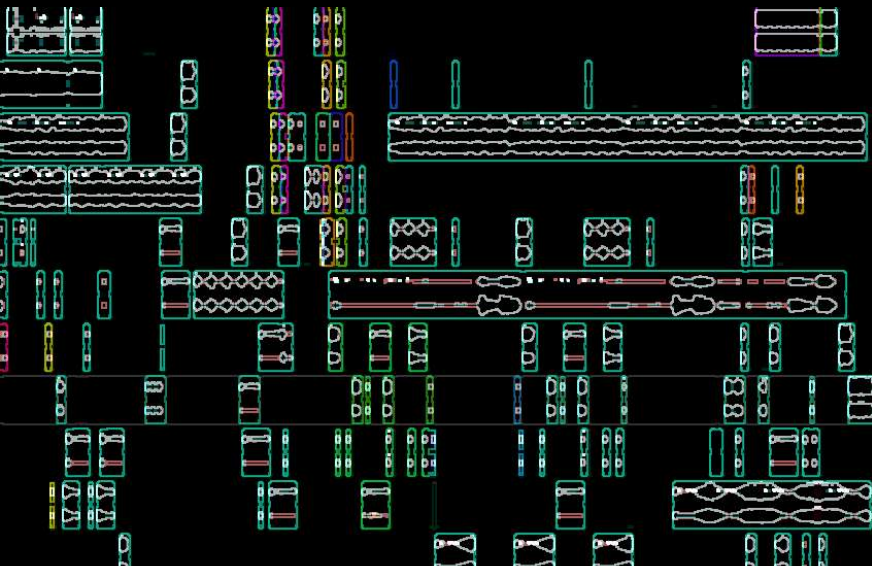


$$g_{\alpha\beta} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -R(t)^2 & 0 & 0 \\ 0 & 0 & -s^2 R(t)^2 & 0 \\ 0 & 0 & 0 & -\sin^2(\theta) s^2 R(t)^2 \end{pmatrix}.$$

rules of engagement

$$ds^2 = (cdt)^2 - R^2(t) \left[d\chi^2 + S_k^2(\chi) (d\theta^2 + \sin^2 \theta d\phi^2) \right]$$

Build coherent bridges with audiences – if 'art' is used as a tool to assist the public understanding of 'science' then it's important to provide 'empirical' inspiration to support 'creative' inspiration.



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NGC 4501
IPC, B

Collaborators:

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Peter Clive (Astrophysics + Piano)

Andrew Conway (Astrophysics + Welding)

Aidan Keane (Cosmology)

Ulya Gumeniuk (Oil Painter)

Jaakko Mattila (Oil Painter)

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