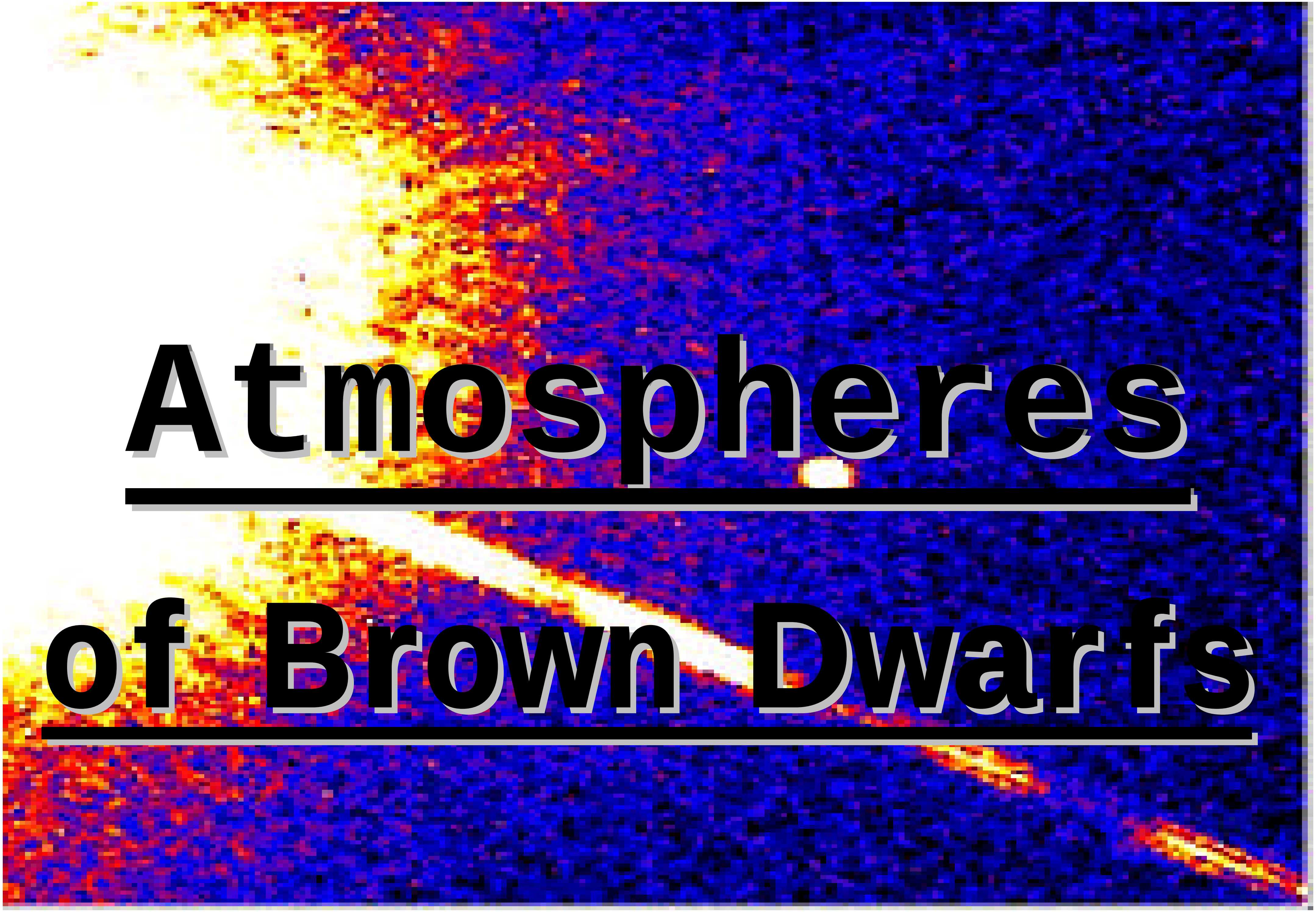
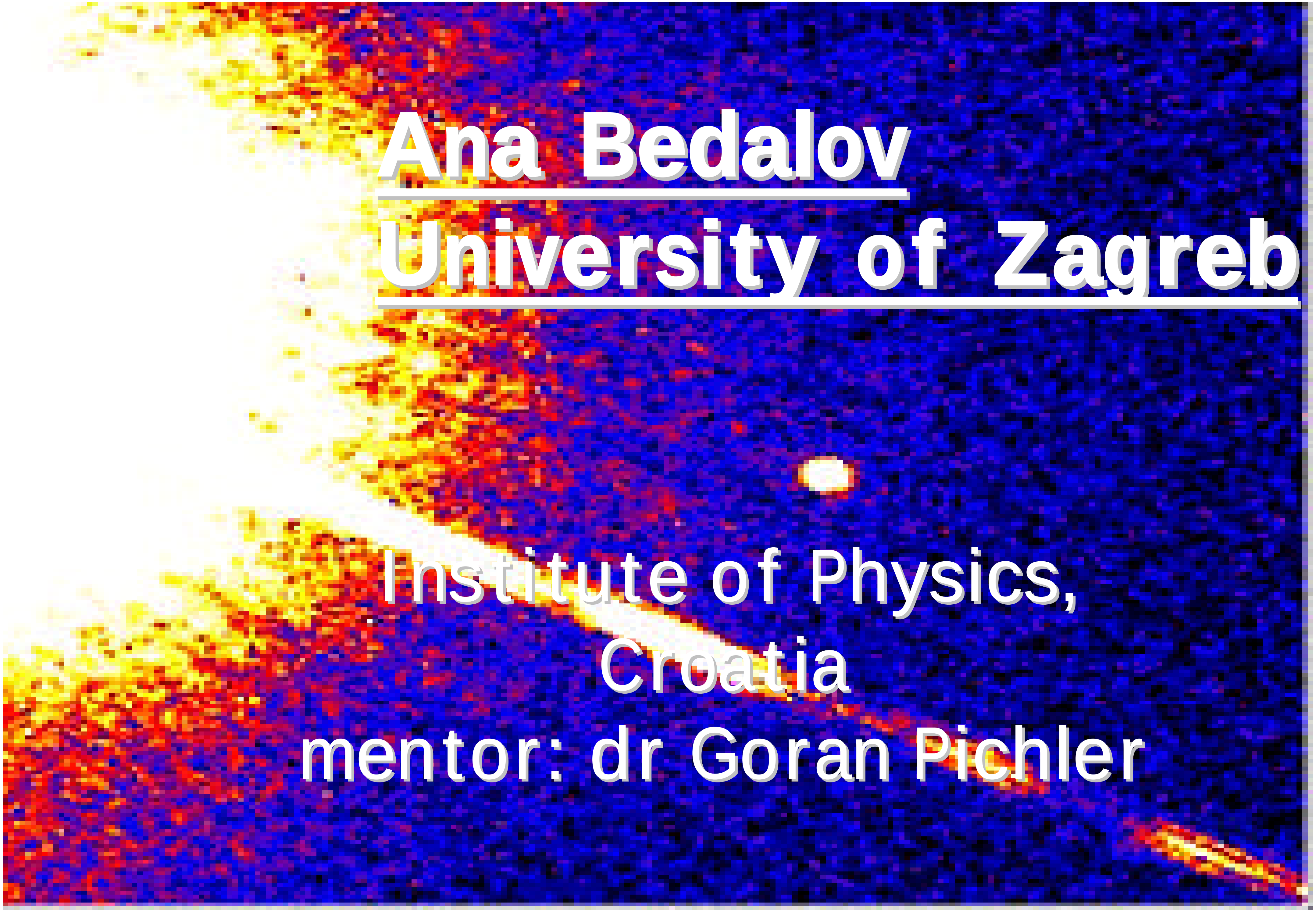
Atmospheres of Brown Dwarfs

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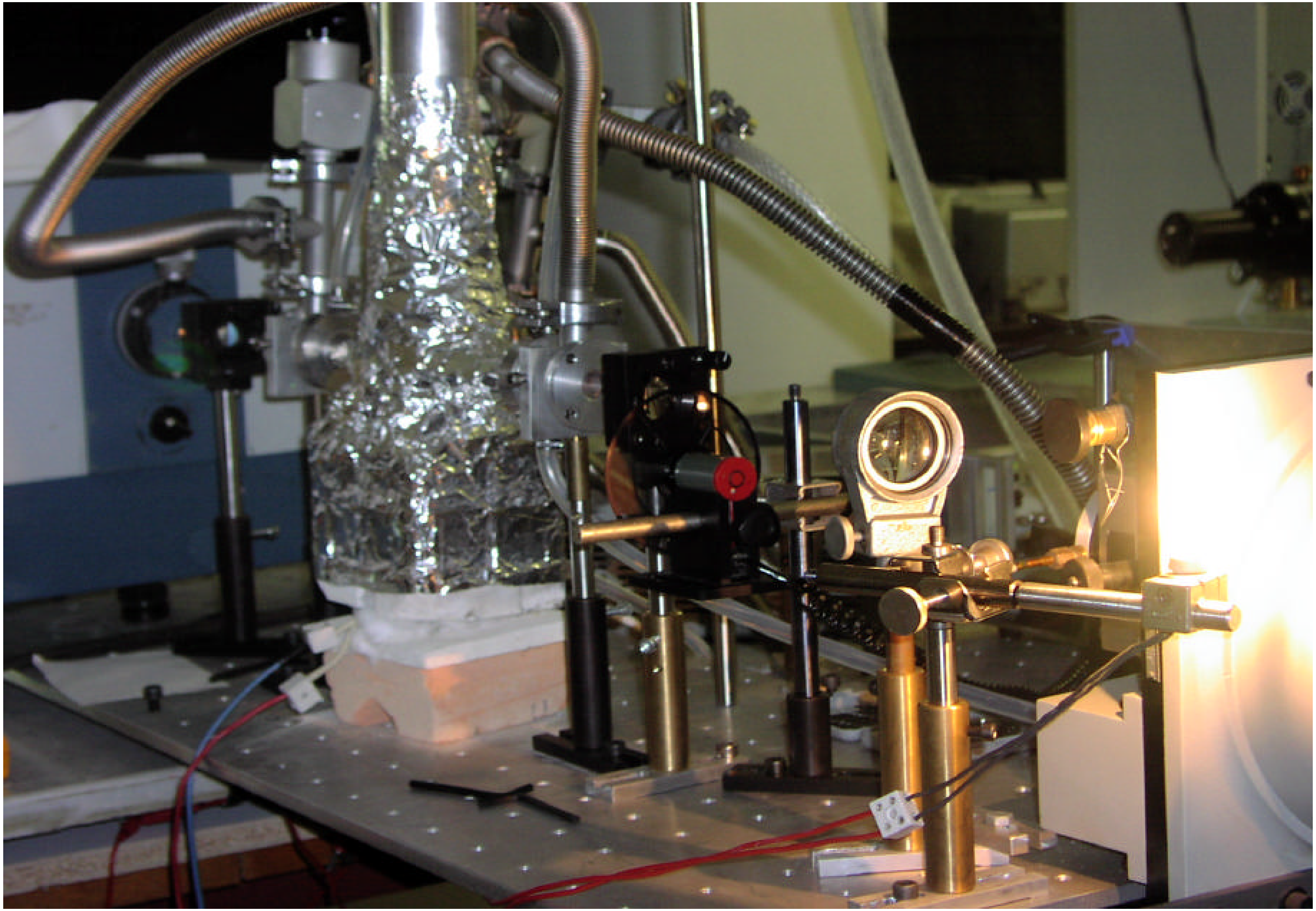
Abstract

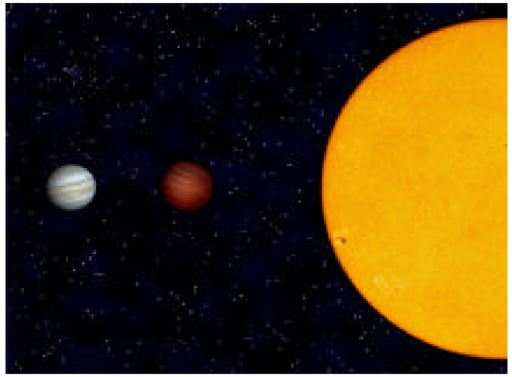
- Broadening of Sodium (Na) lines by H2 and He gases: atmospheres of Brown Dwarfs.Simulation of the atmosphere of Brown Dwarfs on linear gravitational Heat Pipe Oven (HPO), and record the ascorbic spectra of sample and then compare it with real specters of Brown Dwarfs. The result are some interesting and new conclusions about Brown Dwarfs atmospheres.

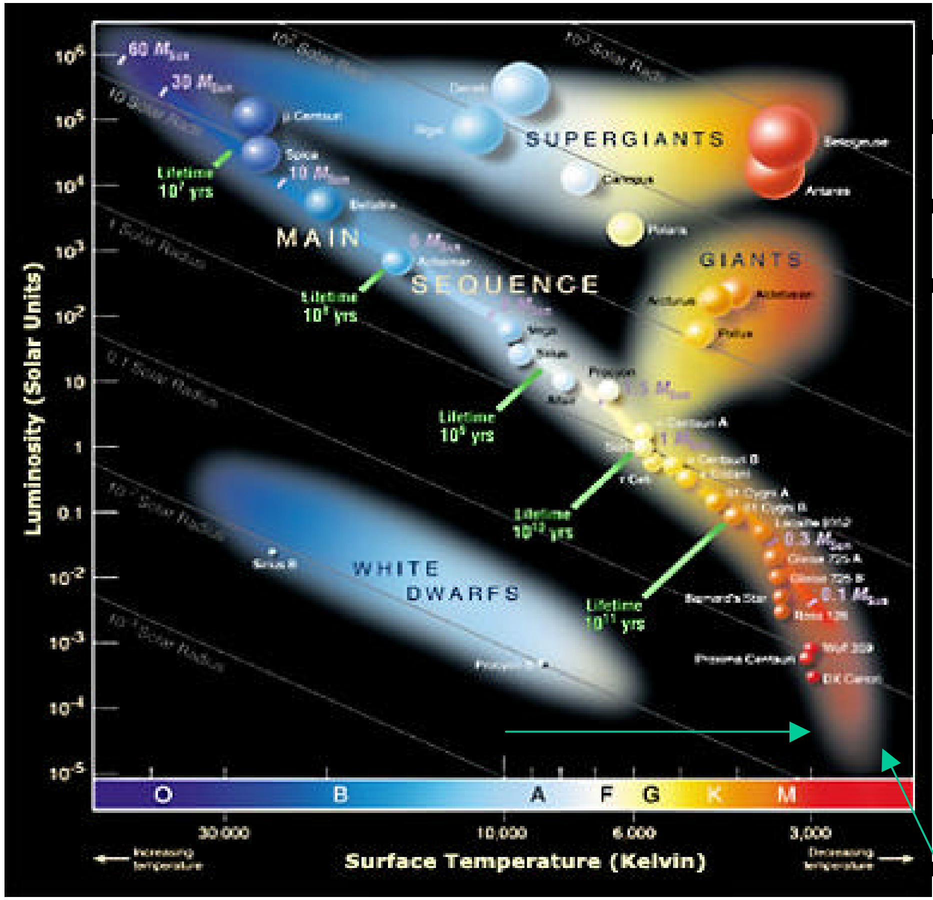

Brown dwarfs



Experimental setup for simulations of Brown Dwarfs atmosphere

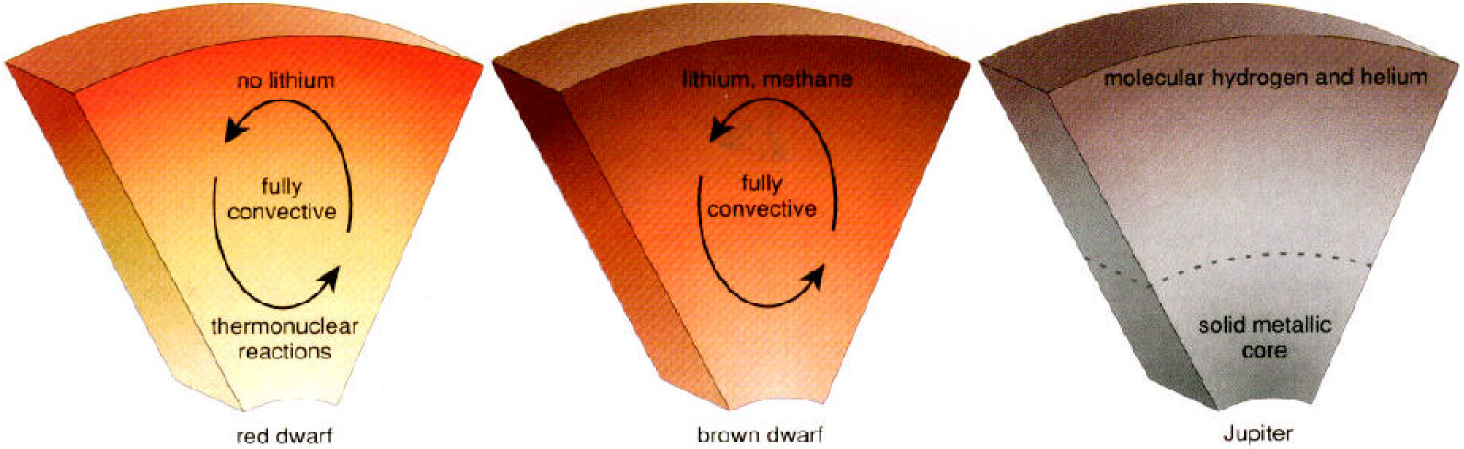
About Brown Dwarfs





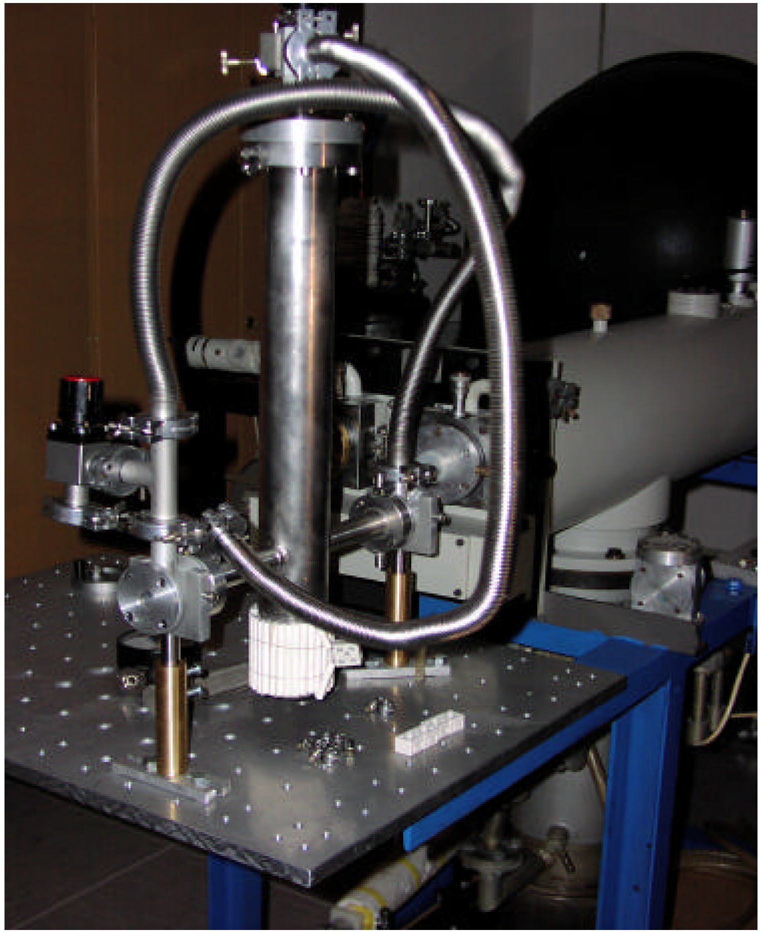
Brown dwarfs lack sufficient mass (about 80 Jupiters) to ignite the fusion of hydrogen in their cores, and thus never become true stars. The smallest true stars (red dwarfs) may have cool atmospheric temperatures (less than 4,0 00 degrees Kelvin (K)), making it difficult for astronomers to distinguish them from brown dwarfs. Giant planets (such as Jupiter) may be much less massive than brown dwarfs, but are about the same diameter and may contain many of the same molecules in th eir atmospheres. The challenge for astronomers searching for brown dwarfs is to distinguish between these objects at interstellar distances.

Atmospheres/structure



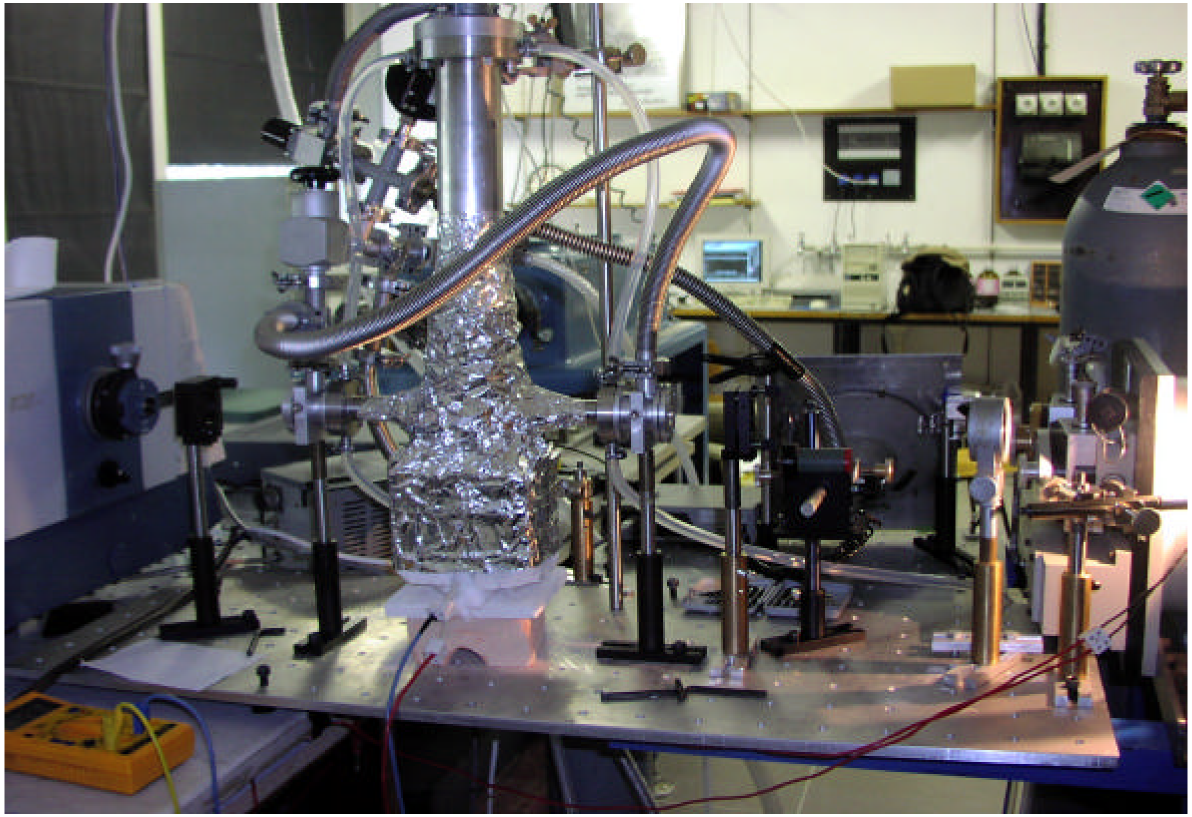
Internal structures of red dwarfs, brown dwarfs and giant planets may provide the ultimate test to distinguish between these celestial objects. Both red dwarfs and brown dwarfs mix the contents of their cores and their surfaces through convective heating and cooling, but the absence of thermonuclear reactions in the brown dwarf permits the presence of fragile molecules such as lithium. I general they are not chemically differentiated throughout their depths. In contrast to planets are formed in the agglomeration of smaller solid bodies they should be chemically differentiated at different depths, including a solid "metallic" core and gaseous upper layers.

experiment



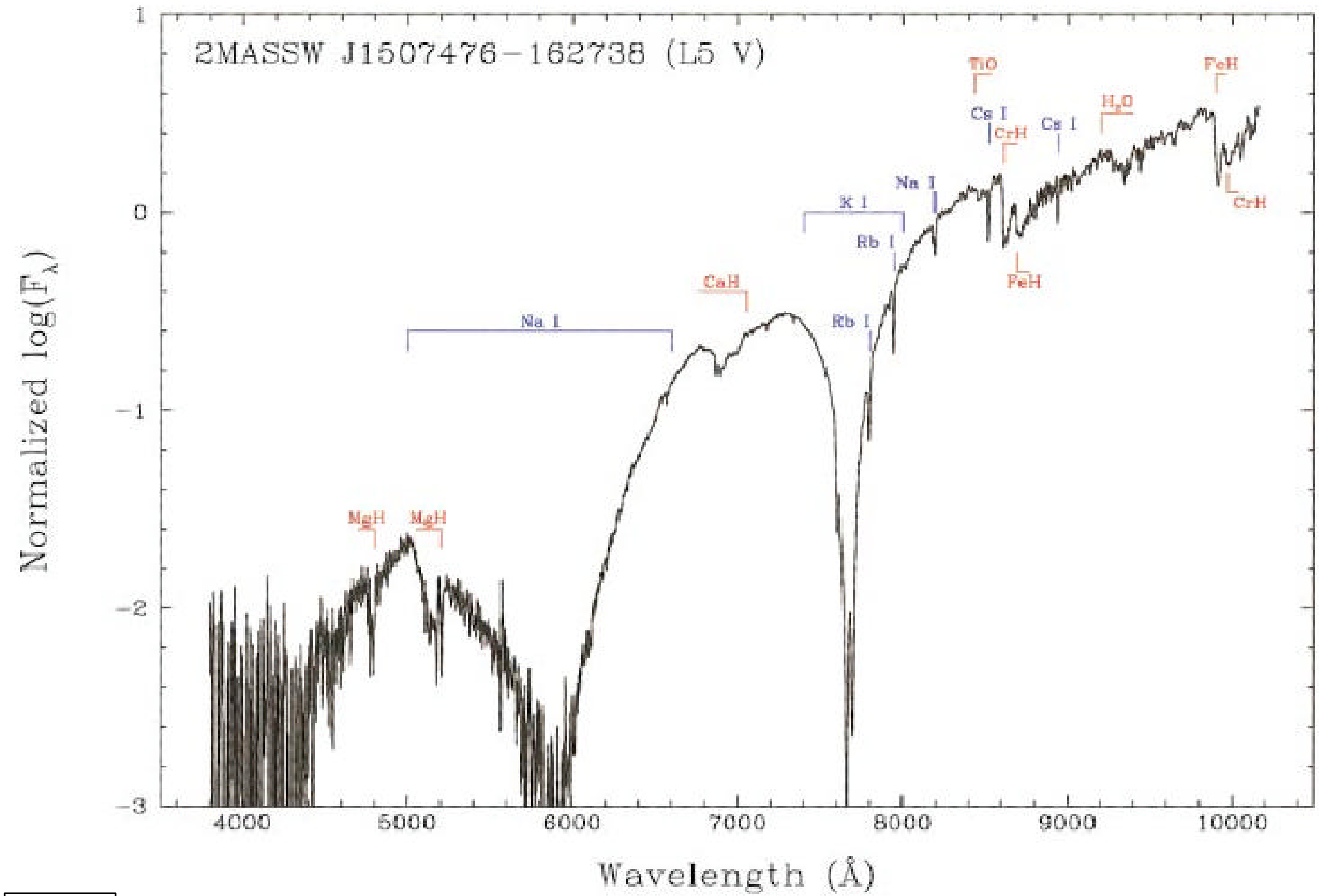
The look of HPO without isolations, cooling and vacuum sistem

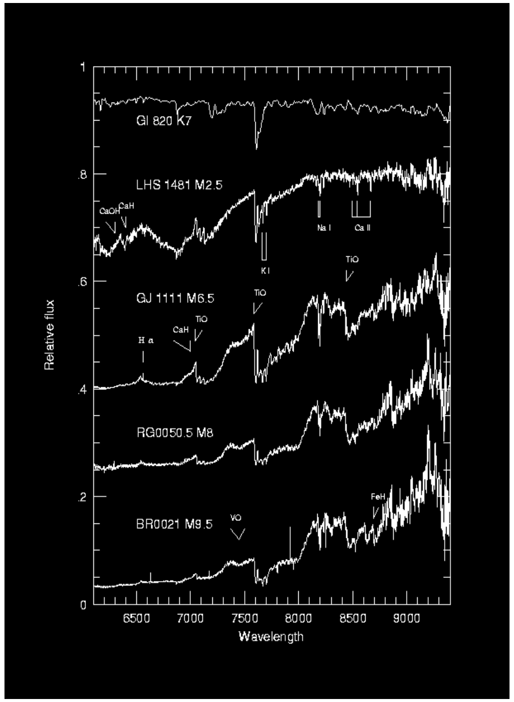
- Final look of experimental setup with halogen light source on right and monochromator on left. Heat pipe oven in the middle

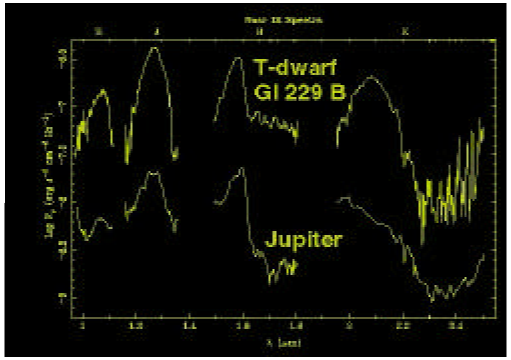


-first published results we expect very soon :)

Spectra of Brown Dwarfs







Picture

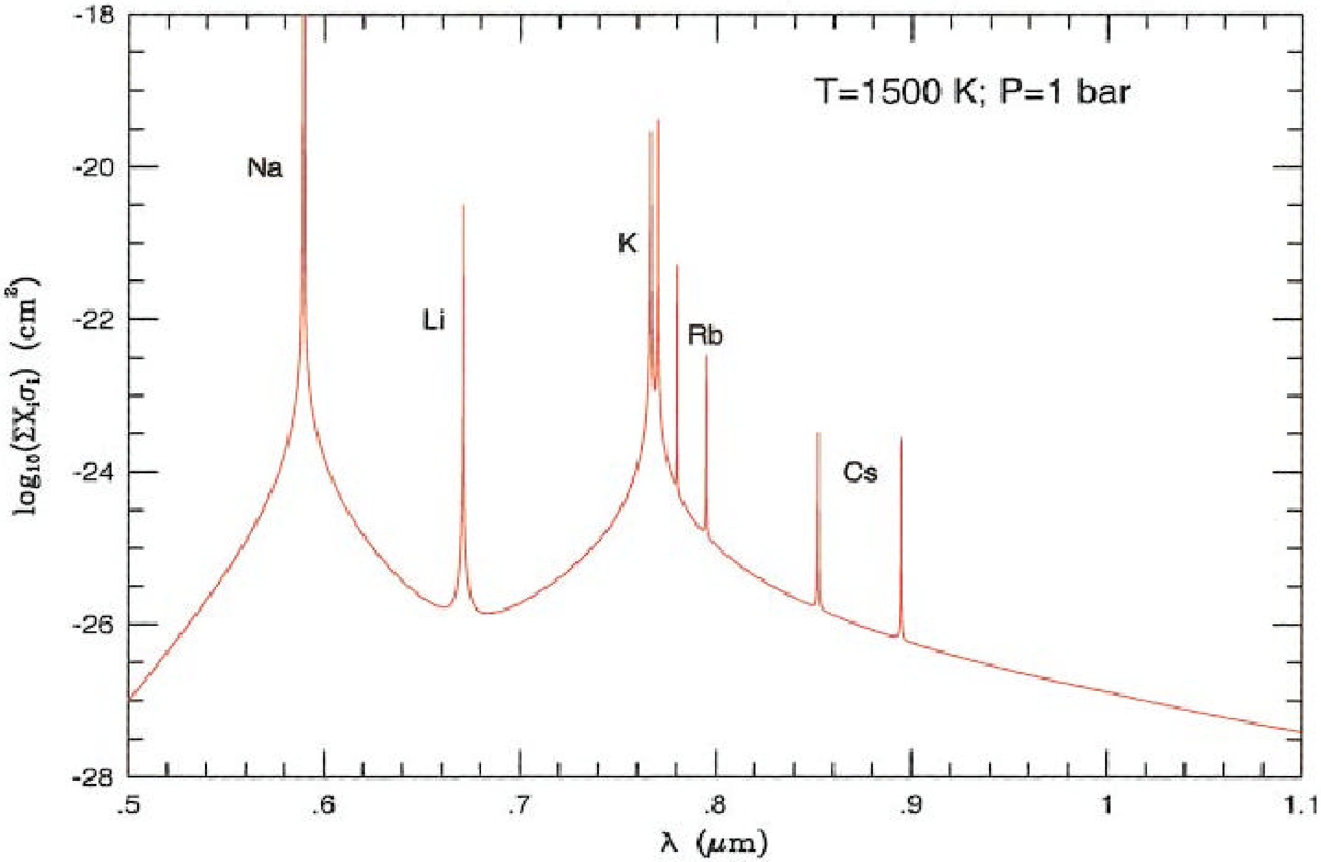
The Keck II spectrum of the L5 dwarf, 2MASSW J1507, from ~4000 to ~10 000 Å, taken from Reid *et al.* (2000a). Clearly seen are the K I absorption feature(s) at ~7700 Å, the strong absorption feature in the Na D line(s), the Cs and Rb lines, and various FeH and CrH bands, all indicated on the figure (kindly provided by J. D. Kirkpatrick). An optical color program reveals that this L dwarf is magenta. See Secs. VI.B and VII for discussions [Color].

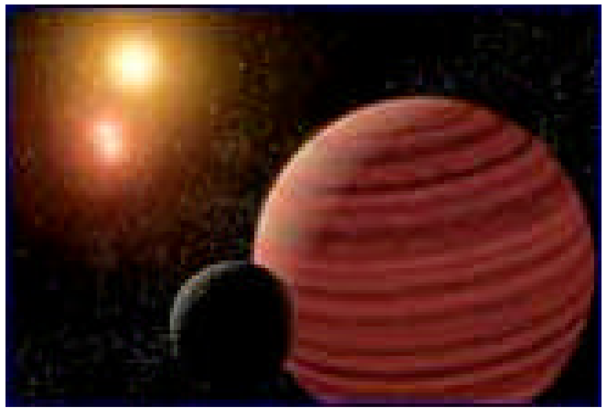
The Theory of Brown Dwarfs

(and extrasolar giant planets)

FIG. 16. The abundance-weighted cross-section spectrum for the neutral alkali metals Na, K, Cs, Rb, and Li at 1500 K and 1 bar pressure, using the theory of Burrows, Marley, and Sharp (2000). The most important spectral lines for each species are clearly in evidence [Color].

Burrows *et al.*: Theory of brown dwarfs





Relative sizes and effective surface temperatures of two recently discovered brown dwarfs -- Teide 1 and Gliese 229B -- compared to a yellow-dwarf star (our sun), a red dwarf (Gliese 229A) and the planet Jupiter reveal the transitional qualities of these objects

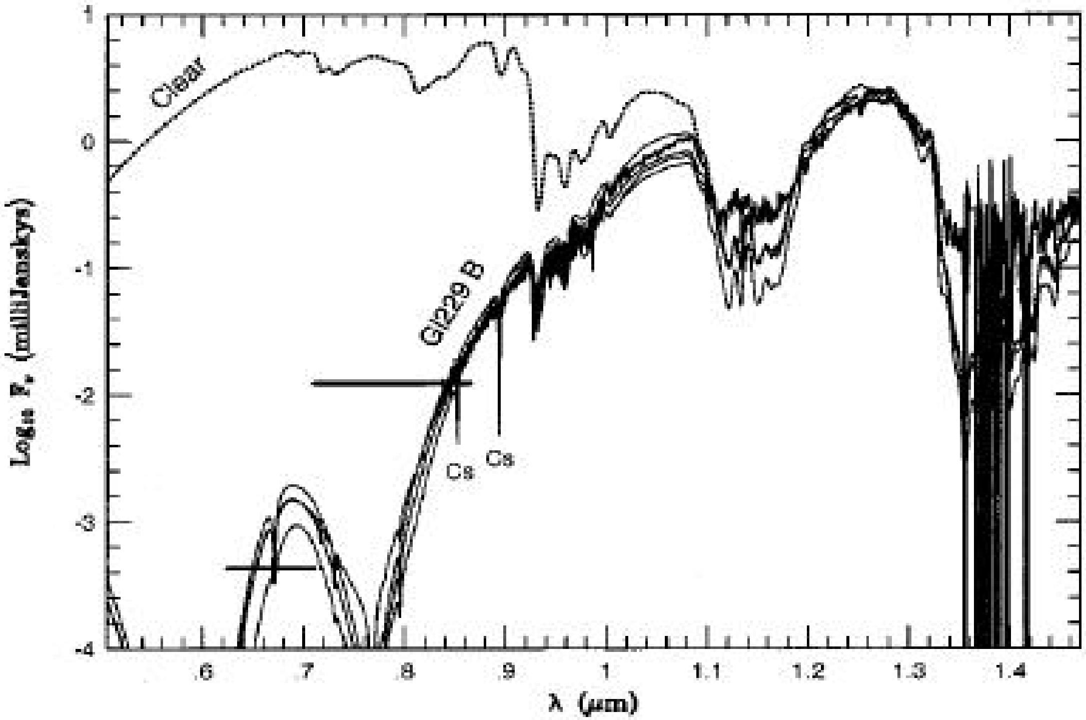
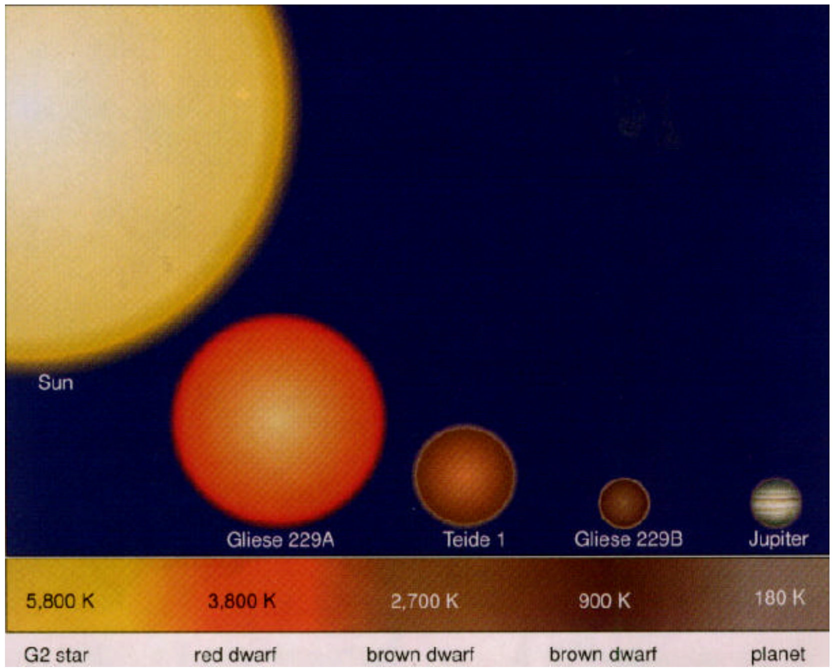
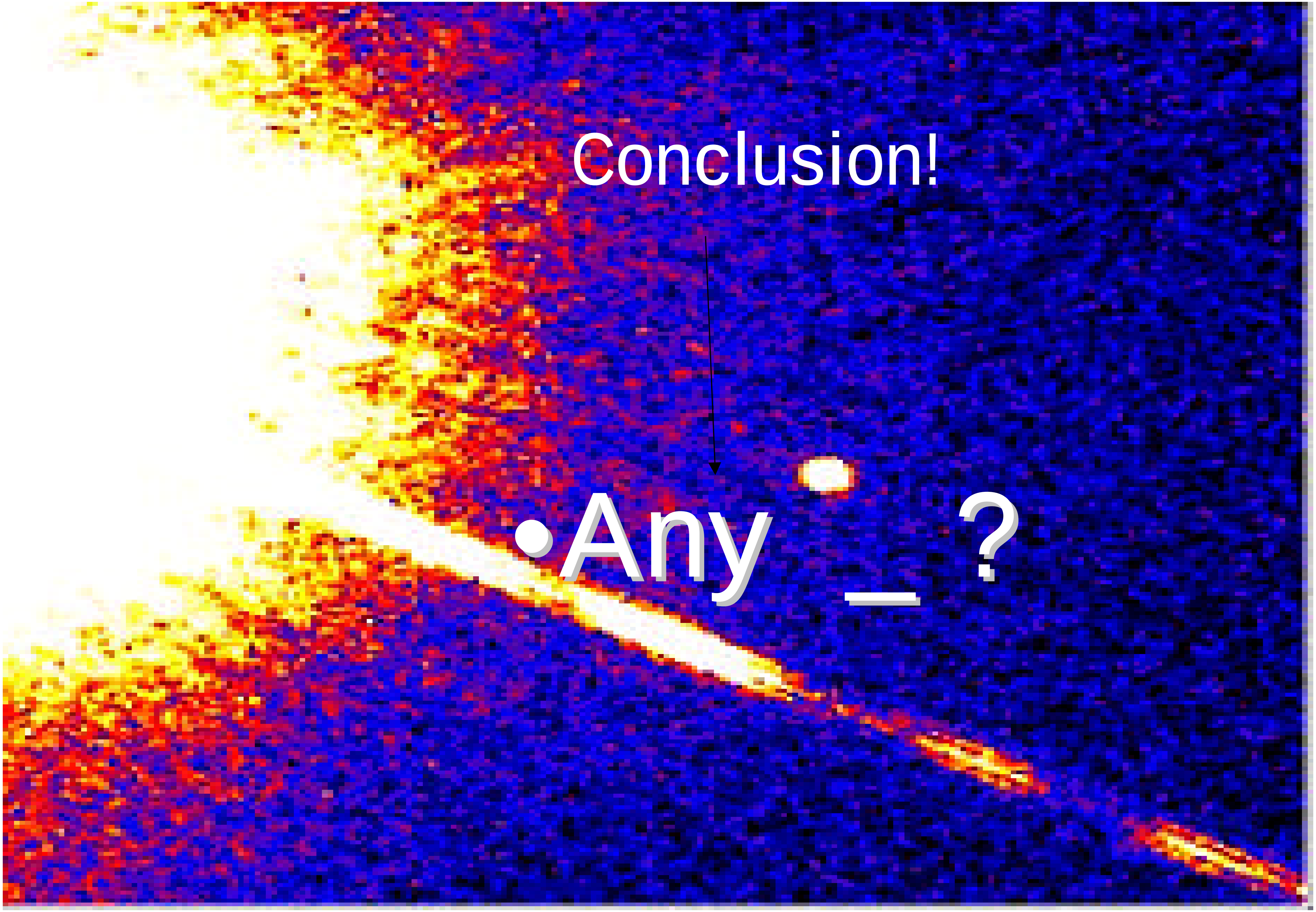


FIG. 27. The log of the absolute flux (F_ν) in milliJanskys vs wavelength (λ) in microns from 0.5 to 1.45 μm for Gliese 229B: heavy solid line, according to Leggett *et al.* (1999); light solid lines, four theoretical models described in Burrows, Marley, and Sharp, 2000. Also included is a model, denoted "Clear" (dotted), without alkali metals and without any *ad hoc* absorber due to grains or haze. The horizontal bars near 0.7 and 0.8 μm denote the WFPC2 *R* and *I* band measurements of Golimowski *et al.* (1998). From Burrows, Marley, and Sharp, 2000.




Conclusion!
•Any _ ?