

THE STANDARD STAR NEWSLETTER

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From the editor

There is something for nearly everyone in this issue of the Standard Star newsletter. The contributions range from spectral classification of ultra cool dwarfs through infrared classification of A-M type stars, to using the data anticipated from the GAIA spacecraft to determine the basic physical parameters of stars. In our new Website section, I have included a number of websites with information on the photometric systems now under consideration by the GAIA team. Since this spacecraft will obtain photometric measurements of nearly a billion stars down to magnitude $V = 20$, this is a matter that will directly and profoundly affect all of us. With many thanks to our contributors,
R.O.Gray, Editor

A Note From the Chair

International Astronomical Union
Working Group on Standard Stars (WGSS)

There is a Kluwer book in the pipeline. Terry Oswalt is the courageous editor, and its working title is "The Future of Small Telescopes." The idea of the book is to outline what great astronomy is suitable for, and should be done with small (i.e., less than 4-m) telescopes in the next ten years or so. Rather than containing polemic over the closure of small telescopes, the book concentrates on the link between the work of smaller telescopes and the giant telescopes of this decade.

It is a no-brainer that something which best suits small telescopes is the maintenance and extension of data on standard stars. Such work is unglamorous (a word that comes to mind since I write on the

eve of the Miss America pageant), but vital if the observations from any telescope, large and small, are going to mean anything astrophysically.

This point is obvious to all the readers of SSN. I make it so that, when you hold this book in your hands (hopefully before our spring 2002 SSN is out) or indeed look at any worthwhile astronomical work, you may sense a satisfaction that your regard for good standards makes such science possible.

With my best wishes for your endeavors,

Chris Corbally
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Abstracts

The Spectra of T Dwarfs I: Near-Infrared Data and Spectral Classification

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We present near-infrared spectra for a sample of T dwarfs, including eleven new discoveries made using the Two Micron All Sky Survey. These objects are distinguished from warmer (L-type) brown dwarfs by the presence of methane absorption bands in the 1–2.5 μm spectral region. A first attempt at a near-infrared classification scheme for T dwarfs is made, based on the strengths of CH_4 and H_2O bands and the shapes of the 1.25, 1.6, and 2.1 μm flux peaks. Subtypes T1 V through T8 V are defined, and spectral indices useful for classification are presented. The subclasses appear to follow a decreasing T_{eff} scale, based on the evolution of CH_4 and H_2O bands and the properties of L and T dwarfs with known distances. However, we speculate that this scale is not linear with spectral type for cool dwarfs, due to the settling of dust layers below the photosphere and subsequent rapid evolution of spectral morphology around $T_{\text{eff}} \sim 1300\text{--}1500$ K. Similarities in near-infrared colors and continuity of spectral features suggest that the gap between the latest L dwarfs and earliest T dwarfs has been nearly bridged. This argument is strengthened by the possible role of CH_4 as a minor absorber shaping the K-band spectra of the latest L dwarfs. Finally, we discuss one peculiar T dwarf, 2MASS 0937+2931, which has very blue near-infrared colors ($J-K_s = -0.89 \pm 0.24$) due to suppression of the 2.1 μm peak. The feature is likely caused by enhanced collision-induced H_2 absorption in a high pressure or low metallicity photosphere. See figure on the next page.

Accepted by ApJ, 563, in press

For preprints, contact A. Burgasser, diver@its.caltech.edu; also available on astro-ph 108452: <http://xxx.lanl.gov/abs/astro-ph/0108452>

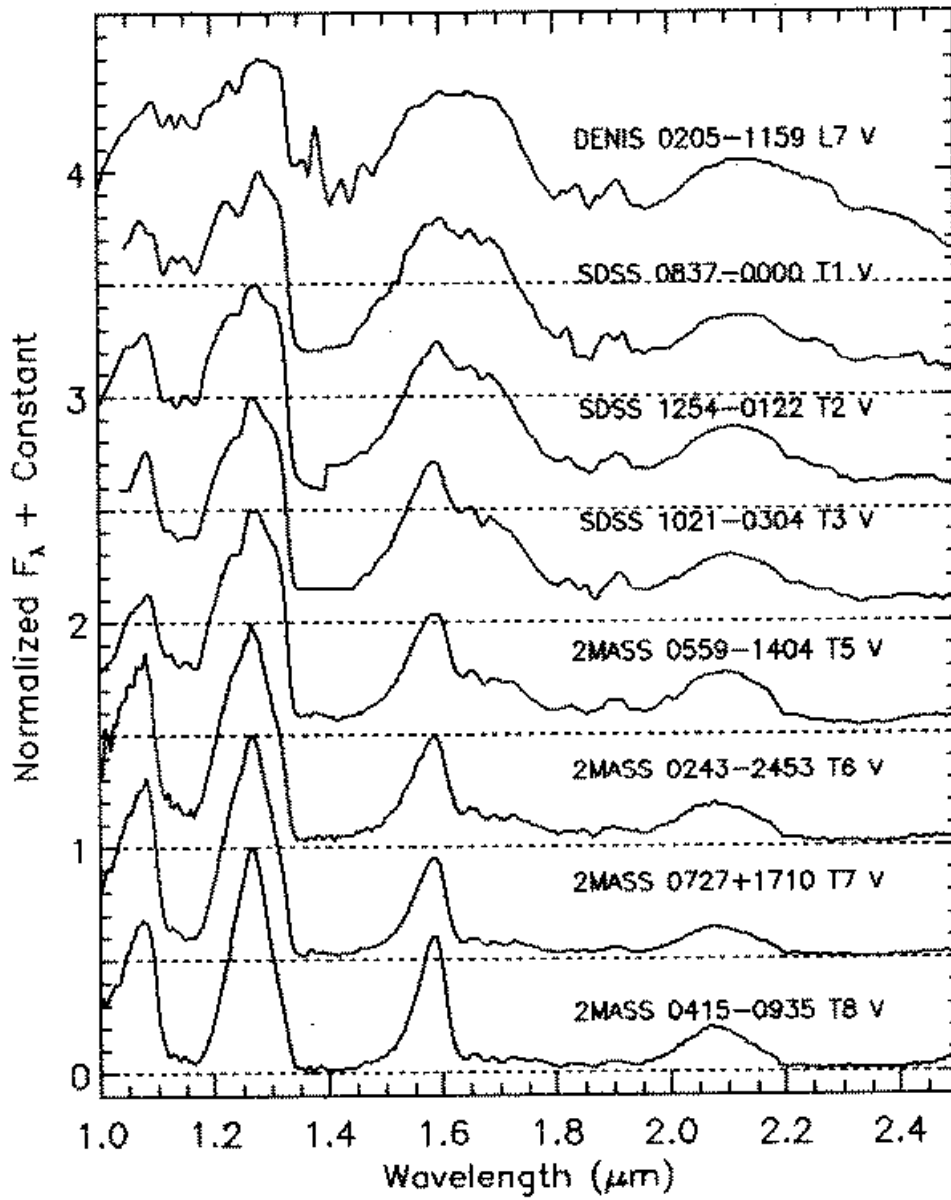


Figure 1: The Burgasser et al. spectral sequence of T dwarfs

Determination of stellar parameters with GAIA

C.A.L. Bailer-Jones

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The GAIA Galactic survey satellite will obtain photometry in 15 filters of over 10^9 stars in our Galaxy across a very wide range of stellar types. No other planned survey will provide so much photometric information on so many stars. I examine the problem of how to determine fundamental physical parameters (T_{eff} , $\log g$, $[Fe/H]$ etc.) from these data. Given the size, multidimensionality and diversity of this dataset, this is a challenging task beyond any faced so far in large-scale stellar parameterization. I describe the problems (initial object identification, interstellar extinction, multiplicity, missing data etc.) and present a framework in which they can be addressed. A probabilistic approach is advocated on the grounds that it can take advantage of additional information (e.g. priors and data uncertainties) in a consistent and useful manner, as well as give meaningful results in the presence of poor or degenerate data. Furthermore, I suggest an approach to parameterization which can use the other information GAIA will acquire, in particular the parallax, which has not previously been available for large-scale multidimensional parameterization. Several of the problems identified and ideas suggested will be relevant to other large surveys, such as SDSS, DIVA, FAME, VISTA and LSST, as well as stellar parameterization in a virtual observatory.

Accepted by Astrophysics and Space Science

For preprints, contact calj@mpia-hd.mpg.de

Automated Stellar Classification for Large Surveys: A Review of Methods and Results

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Current and future large astronomical surveys will yield multiparameter databases on millions or even billions of objects. The scientific exploitation of these will require powerful, robust, and automated classification tools tailored to the specific survey. Partly motivated by this, the past five to ten years has seen a significant increase in the amount of work focused on automated classification and its application to astronomical data. In this article, I review this work and assess the current status of automated stellar classification, with particular regard to its potential application to large astronomical surveys. I examine both the strengths and weaknesses of the various techniques and how they have been applied to different classification and parameterization problems. I finish with a brief look at the developments still required in order to apply a stellar classifier to a large survey.

Accepted by in Automated Data Analysis in Astronomy, R. Gupta, H.P. Singh, C.A.L. Bailer-Jones (eds.), Narosa Publishing House, New Delhi, India, 2001

For preprints, contact calj@mpia-hd.mpg.de

IR Spectral Classification

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With ISO(Infrared Space Observatory) SWS(Short Wavelength Spectrometer) spectra we intend to establish the classification scheme for A ~ M stars in the infrared wavelength region. ISO SWS data of about 50 stars have been reduced for this work. Although ISO SWS data cover from $2.35 \mu\text{m}$ to

45.2 μm , the classification scheme will be restricted to the shorter wavelength region because of the quick drops of the stellar brightness, the lack of molecular and atomic line lists, and the unknown circumstellar contribution in the longer wavelength region. Spectra of stars earlier than sun are mainly dominated by atomic lines and those of later stars are by molecules.

Walraven VBLUW Photometry Standard Star List

J. Lub ¹ and J. W. Pel ²

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A list containing almost 2000 stars, which has been compiled with a view towards calibrating the Walraven Photometric System as it was in use at ESO from 1979 until 1991 is made publicly available through anonymous ftp at [ftp.strw.leidenuniv.nl](ftp://ftp.strw.leidenuniv.nl) as a simple print file in </pub/lub/vbluw/calstar123.txt>

This list contains the photometric data for all standard stars and substandards of the VBLUW Photometric System as well as main sequences, highly reddened stars, stars of all luminosity classes and metal abundances. Further details on the calibration, transformations to the UBV system as well as theoretical colors will also be made available on this site.

For more information, contact lub@strw.leidenuniv.nl, pel@astro.rug.nl

Websites of Interest

The instrumentation on the GAIA spacecraft (European Space Agency), which promises to revolutionize astronomy, is currently in the process of being designed. The GAIA spacecraft is primarily an astrometric spacecraft which will be able to determine precise positions and parallaxes of stars as faint as $V = 20$, and will thus go well beyond the capabilities of Hipparcos. GAIA will also observe these stars in a multi-band photometric system and will determine radial velocities. Recently, in July, an important workshop was held in Vilnius to make progress toward the design and selection of a photometric system for the GAIA spacecraft. Currently, three photometric systems, called 1F, 2A and 3G are being considered for GAIA. Papers on these systems (and on other topics) presented at the Vilnius meeting may be downloaded at <http://www.astro.lt/gaia/downloads.html>. Further technical details on these photometric systems can be found in a report by Erik Hoeg, at <http://www.astro.ku.dk/~erik/gaia/98>. Information about past and future meetings on the GAIA photometric system and radial velocity determinations may be found at the GAIA homepage: <http://astro.esa.int/gaia/>.

A website which has recently come to our attention containing many useful links on stellar spectroscopy is <http://www.ucm.es/info/Astrof/spectra.html> maintained by David Montes of the Astrophysics Department of the University Complutense of Madrid. This website includes links to spectral libraries, references on spectral classification, including automatic classification, solar spectra, spectral synthesis and spectral line databases.

A website of interest to our readers, but which is still very much a work in progress is the Canadian Astronomy Data Centre (CADC) Astronomical Standards page <http://cadwww.dao.nrc.ca/standards/>. Currently this site contains a list of Peter Stetson's Photometric standard fields, with links to Digital Sky Survey images of those fields. FITS image files, position files and photometry files can be downloaded for some of these fields.

Meetings

IAU Symposium 211 - "Brown Dwarfs"

Dates: May 20-24, 2002

Location: Outrigger Waikoloa Beach Hotel, Big Island of Hawaii

Topics will include: Imaging Surveys for Brown Dwarfs, Companion Detection Techniques, Measurements of Fundamental Properties of Brown Dwarfs, Classification Schemes for Ultracool Dwarfs and others

See <http://www.ifa.hawaii.edu/iau211/> for more information.

2002 Pacific Rim Conference On Stellar Astrophysics

Dates: July 11 - 17, 2002

Location: Xian, China

see <http://bohr.physics.hku.hk/~xian2002/> for more information

A Festschrift for R.F. Garrison on his 66th Birthday

Dates: June 10-11 2002

Location: Tucson, Arizona

see <http://stellar.phys.appstate.edu/garrison> for more information

Contributions to the next Newsletter, due out in March 2002, will be welcomed at any time by grayro@appstate.edu.

WHEN SUBMITTING AN ABSTRACT, PLEASE USE THE FOLLOWING TEMPLATE IF POSSIBLE:

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\begin{center}{\Large\bf{ Title
}}\{\bf{
A. Author$^1$ and B. Author$^2$
}}\{\footnotesize $^1$ Institute One and Address
\ $^2$ Institute Two and Address
}\end{center}
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