Yakiv Pavlenko - a life dedicated to spectroscopy

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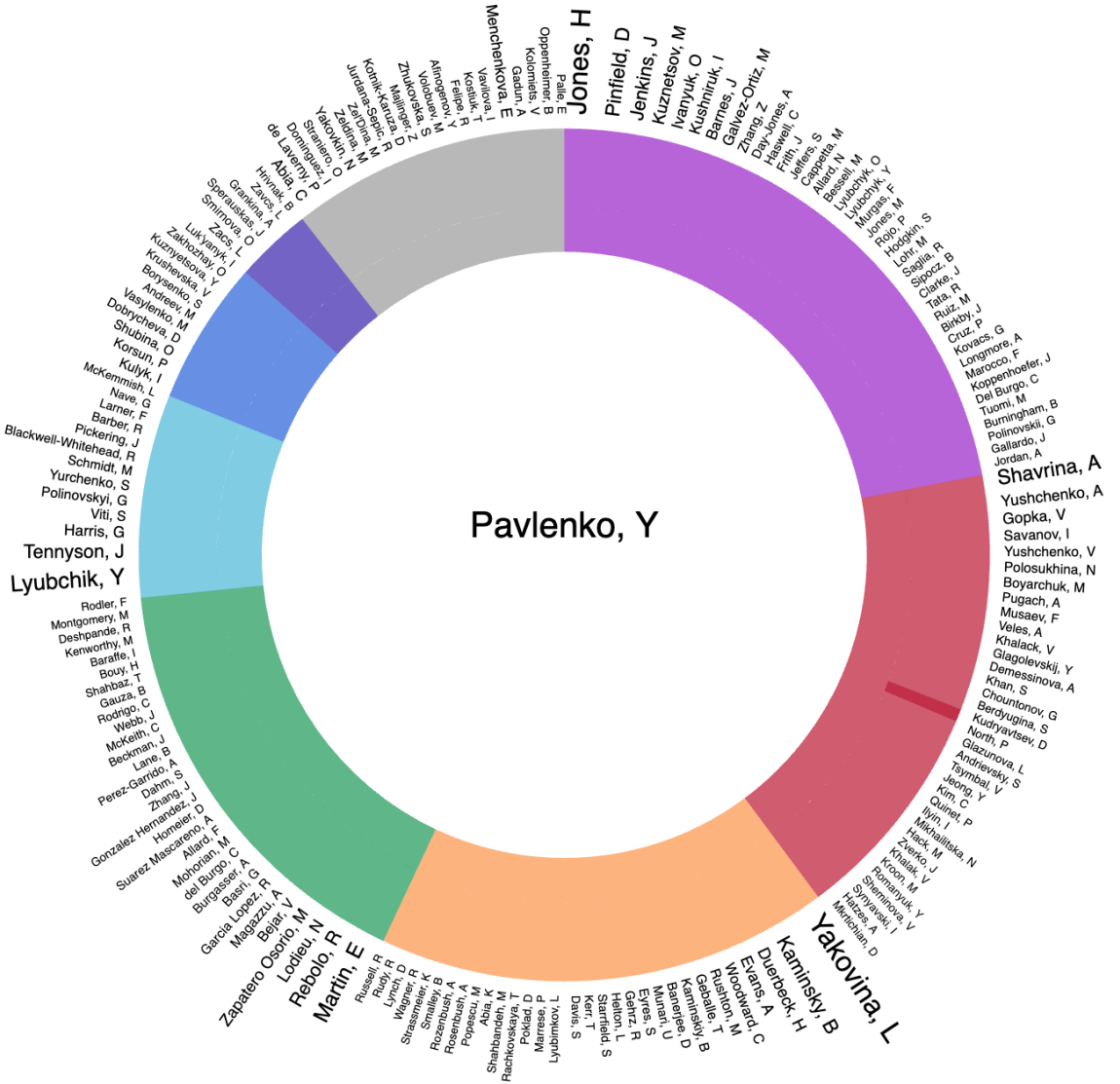
- Chief Research Fellow of the Main Astronomical Observatory of Ukraine
- Severo Ochoa Research Fellow at Instituto de Astrofísica de Canarias
- Visiting Research Fellow, University of Hertfordshire, United Kingdom

- State prize of Ukraine in Science & Technology and many other prizes

Various international grants – including Severo Ochoa, Jesus Serra, and Leverhulme fellowships, Rocky Planets Around Cool Stars (Marie Curie Initial Training Network), POSTAGBinGALAXIES—Evolved stars: clues to the chemical evolution of galaxies (Marie Curie Actions—International Research Staff Exchange Scheme), Bridges, MCS4Ukraine, Royal Society

ADS author network

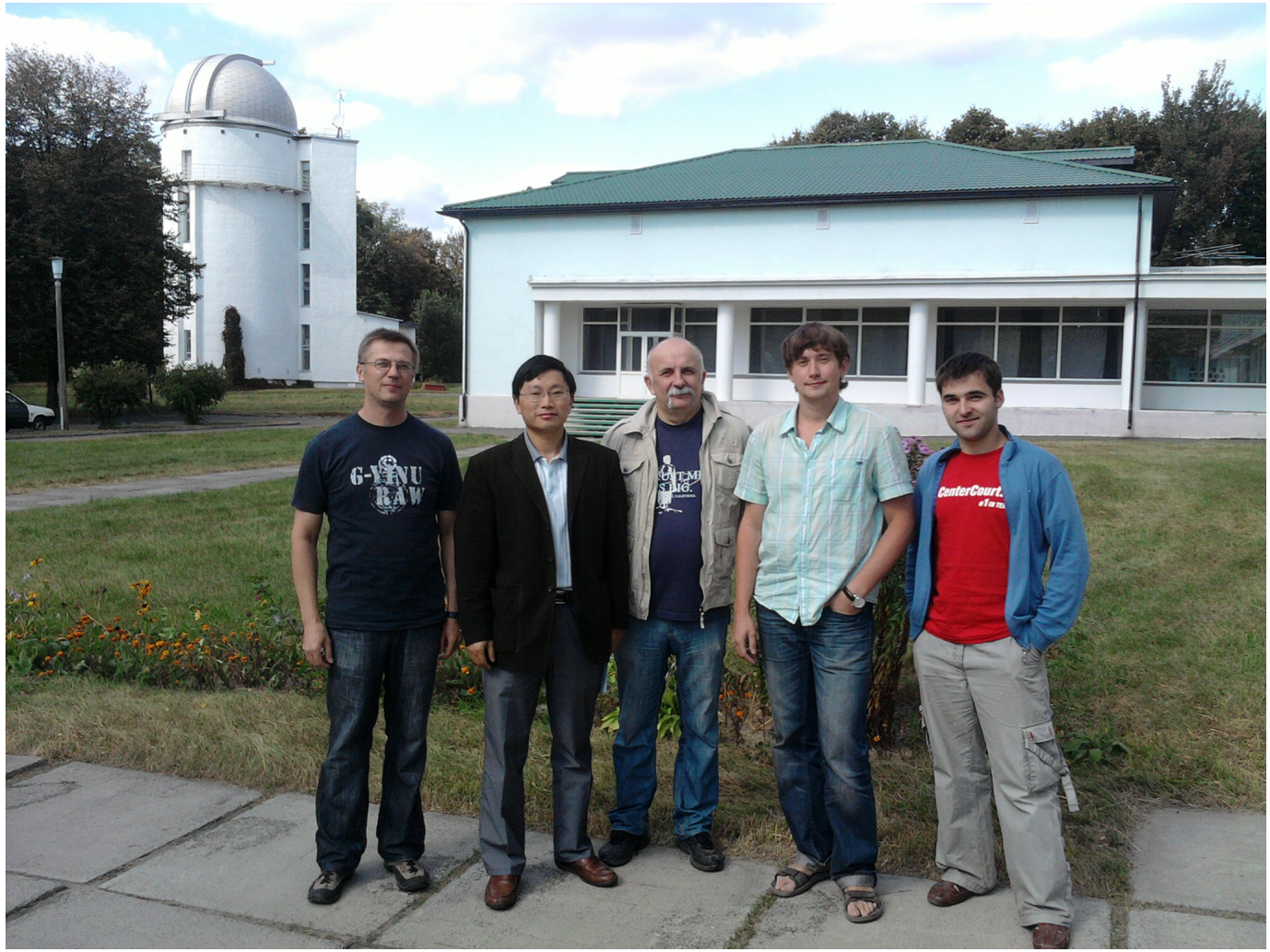
.. co-author, colleague, friend to many



Broad legacy

- Rigorous modelling of complex stellar phenomena
- Unusual for theorist to have such keen interest in real data
- Key skill was ability not to make modelling too complex
- Interdisciplinary collaboration
- Family man .. also very busy nurturing colleagues and students
- A deep commitment to advancing Ukrainian astronomy

2005
Students, colleagues, and visitors always at the centre of things



Broad friendship (supervision of me) based on riches of atomic and molecular process .. and place, food

- IAC group was Yakiv's longest collaboration, Yakiv's papers with Antonio Magazzu (Catania, Italy), Rafael Relobo, Eduardo Martin (since 1992) helped me to find him
- Many others I know found similar bond with him particularly including Tom Geballe (Gemini Telescope), Nye Evans (University of Keele), Jonathan Tennyson (University College London), Adam Burgasser (UC San Diego), James Jenkins (University of Diego Portales) .. so a big honour to be asked to speak
- My good fortune to have girlfriend working in Ukraine so looking for place to work on PhD whilst 'on holiday' .. and found Yakiv

Found Observatory and Yakiv via visit to Planetarium

Inside the Stars, IAU Colloquium 137
ASP Conference Series, Vol. 40, 1993
Werner W. Weiss and Annie Baglin (eds.)

OBSERVATIONAL PATTERNS OF LITHIUM DEPLETION IN PRE-MAIN SEQUENCE STARS*

EDUARDO L. MARTIN, RAFAEL REBOLO and RAMON J. GARCIA LOPEZ
Instituto de Astrofísica de Canarias, E-38200, La Laguna, Spain

ANTONIO MAGAZZU
Osservatorio Astrofisico di Catania, I-95125 Catania, Italy

YAKOV V. PAVLENKO
The Principal Observatory of Ukraine, Kiev, Ukraine

ABSTRACT We present results based on the analysis of lithium abundances in a sample of ~ 50 pre-main sequence stars covering a wide range of masses (from 2 to 0.3 $M_\odot$) and luminosities (corresponding to ages of 1-100 Myr). Stars with masses estimated to be $\gtrsim 1$ $M_\odot$ show lithium abundances close to cosmic with little scatter (± 0.3 dex). Stars with masses less than Solar present a wide range of lithium abundances, with a clear trend to lower abundances for lower luminosities (greater age). The observed Li abundances constrain theoretical predictions of lithium depletion in rotating pre-main sequence stars.

Lots of early interesting work

Yakiv continued to write for hard to access Ukrainian journals throughout his career

The analysis of promethium abundance in the atmospheres of magnetic-peculiarity stars HD 25354

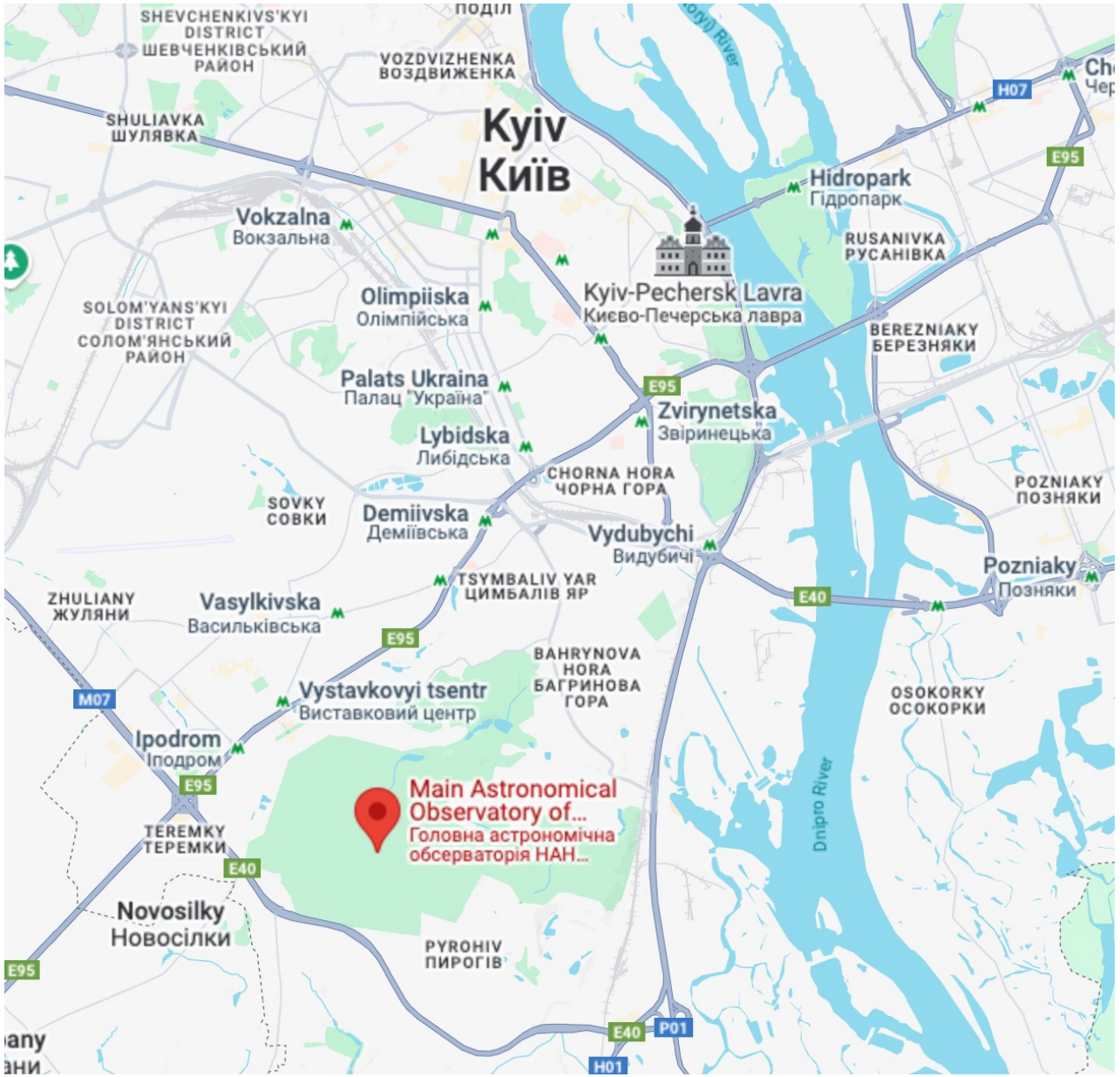
Heading: Physics of Stars and Interstellar Medium

[1]Yushchenko, VA, [1]Gopka, VF, [2]Yushchenko, AV, [3]Pavlenko, YV, [3]Shavrina, AV, [4]Musaev, F, [5]Demessinova, A
[1]Scientific Research Institute "Astronomical Observatory" of I.I.Mechnikov Odessa National University, Odesa, Ukraine
[2]Astrocamp Contents Research Institute, Goyang, Republic of Korea
[3]Main Astronomical Observatory of the National Academy of Sciences of Ukraine, Kyiv, Ukraine
[4]Shamakhy Astrophysical Observatory named after N. Tusi of the Azerbaijan National Academy of Sciences, Settlement Y. Mammadaliyev, Shamakhy district, Republic of Azerbaijan, AZ5628
[5]Faculty of Physics and Technology of the Kazakh National University named after Al Farabi, Alma-Ata, 050040, Kazakhstan

Kinemat. fiz. nebesnyh tel (Online) 2025, 41(1):45-58
https://doi.org/10.15407/kfnt2025.01.045

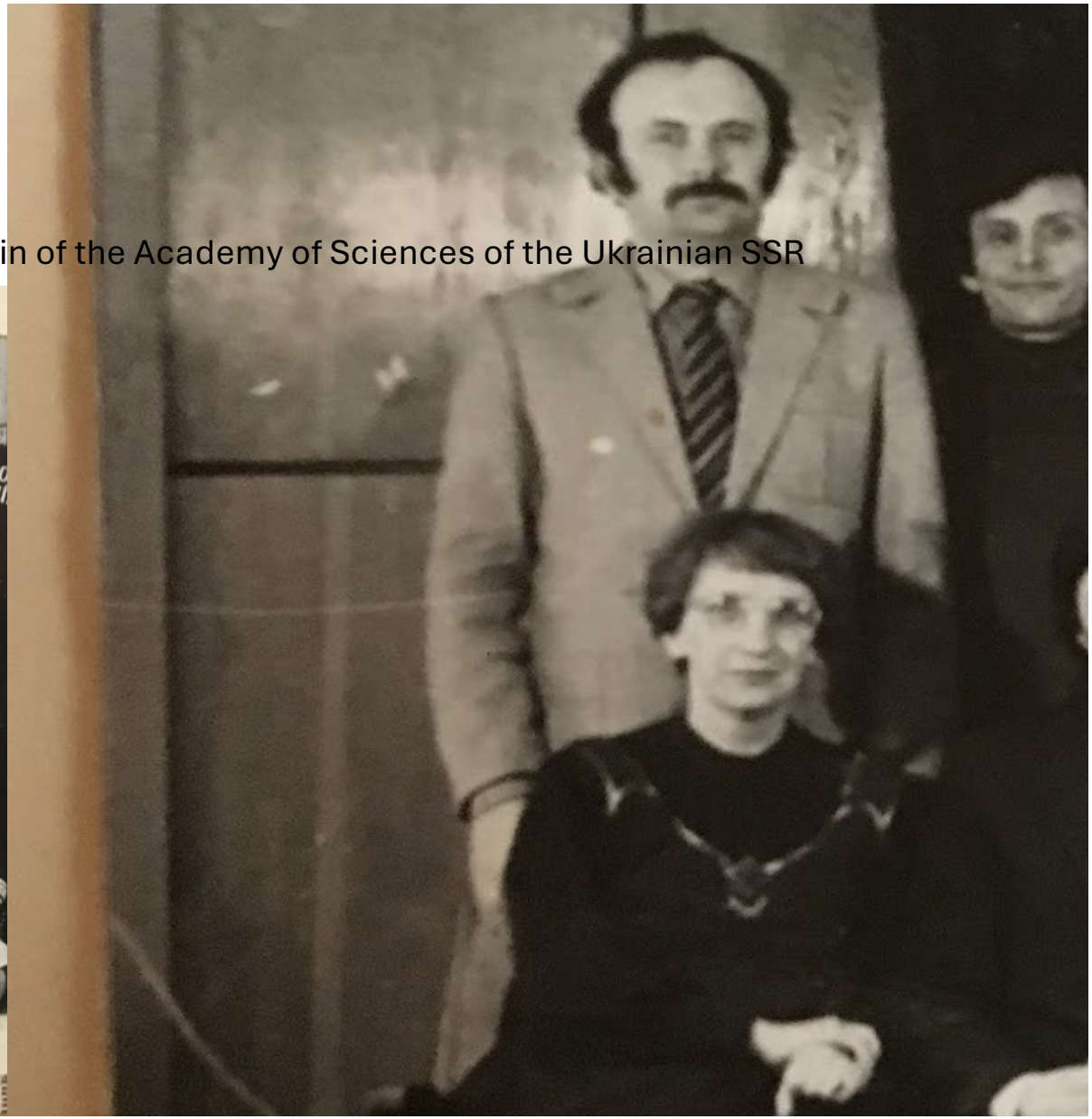
32	1988Afz....28..163P	1988	cited: 1	Solution of the NLTE Problem for MGI in Atmosphere of M Giants with Chromosphere - Part One - Menzel Coefficients Pavlenko, Y. V.
33	1987stat.conf...41P	1987		Location of the temperature minimum in the atmosphere of an M-giant depending on the chromosphere and theoretical profiles of strong Mg I lines. Pavlenko, Ya. V.
34	1987stat.conf...23P	1987		Ionization equilibrium and accuracy of determining the chemical abundance of the atmospheres of K-giants. Pavlenko, Ya. V.; Shavrina, A. V.
35	1987pras.conf...22P	1987		Theoretical profiles of strong Mg I lines in the spectrum of a red giant with chromosphere. Pavlenko, Ya. V.
36	1987pras.conf...15P	1987		Ionization state of metals in the atmosphere of an M giant with chromosphere. Pavlenko, Ya. V.
37	1984elam.book.....P	1984	cited: 6	Effects of LTE-deviation in atmospheres of M giants. Pavlenko, Ya. V.
38	1984TarOT..70....1P	1984		Departures from LTE in the atmospheres of M giants. Pavlenko, Ya. V.
39	1984PTarO..50...68P	1984		Radiative balance in transitions of magnesium in the atmosphere of anM2 giant. Pavlenko, Ya. V.
40	1984PTarO..50...54P	1984		The solution of the NLTE problem for magnesium in the atmosphere of an M2 giant. Pavlenko, Ya. V.

2025 map .. but in the 1990s the Observatory was not included on maps



Mid 1980s

Main Astronomical Observatory of the order of Lenin of the Academy of Sciences of the Ukrainian SSR



Early adopter of www

mao.kiev.ua/staff/yp/

CV New Papers New Results Bookmarks E-mail FYI Web Pub FAQ

Map of Ukraine

Ukraine on wikipedia.com

History of Ukraine from Brama.com

Astronomy in Ukraine

Colors of flag of Ukraine Etude. *by Yushchenko V., Jr.*

Our Observatory -- MAO

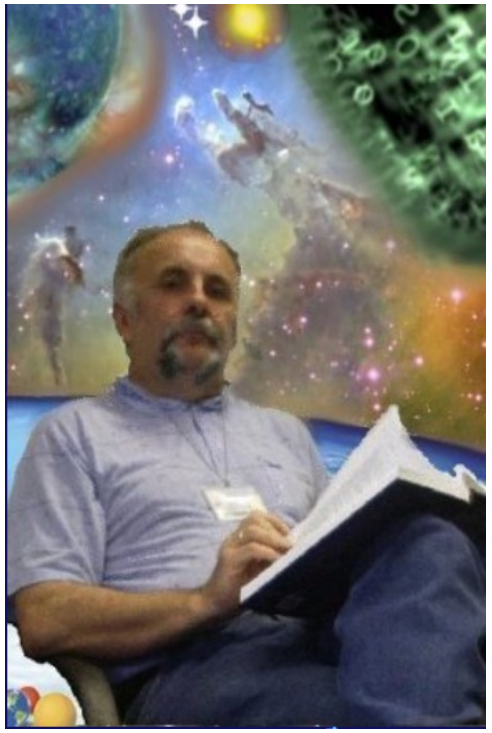
BRAMA of common interest

BBC view on Ukraine

Some info about us from Yankees :)

Isotop's abundances	recommended by IAUPAC
Isotop's abunds.	Lodders et al. (2009). Bibcode: 2009LanB...4B..712L; DOI: 10.1007/978-3-540-88055-4_34
Isotops	Masses & Abundances
Isotops	of Titanium and others...
Exomol	from UCL and EXOMOL Papers
Gurvits et al.	Thermodynamic properties of individual substances
P.F.Bernath's	Electronic Spectroscopy of Diatomic Molecules
NIST Webbok	of Huber and Herzberg et al. molecular data
NIST ASD	NIST Atomic Spectral Database. Table of spectral lines and energy levels for all elements.
EXOMOL	line lists
Uppsala	database of VALD
HITRAN	HITRAN2008 molecules
Line ID	atomic line identification
Molecular bands	of M-stars.
J. Chem. Phys.	index
J. Molec. Spectr. (JSM).	index
Hydrogen lines	before 1 micron
Hydrogen lines	beyond 1 micron
Absorption lines	of all elements in the spectrum of the Sun.
Carbon izotopic	ratio coefficients: 12C/13C 3, ..., 100.
Model atmospheres and theoretical spectra...Go to TOP	
PHOENIX	Peter Haushildt site
MARCS	Models and spectra
CoolStar	Model Repository
Useful computer stuff. Go to TOP	
US	sites of IRAF. + UK or US sites of IRAF's documentation.
Free Online OCR	Convert JPEG, PNG, GIF, BMP, TIFF, PDF, DjVu to Text
fortran 77	f77 as is...
NAG	home page

Website colour scheme based on his favourite midnight commander



Hard for me to get to Observatory so often met in central Kyiv

~1999

Maiden Nezalezhnosti

[2002] Spectral analysis of water vapour in cool stars .. Steve Miller (UCL) pre-EXOMOL

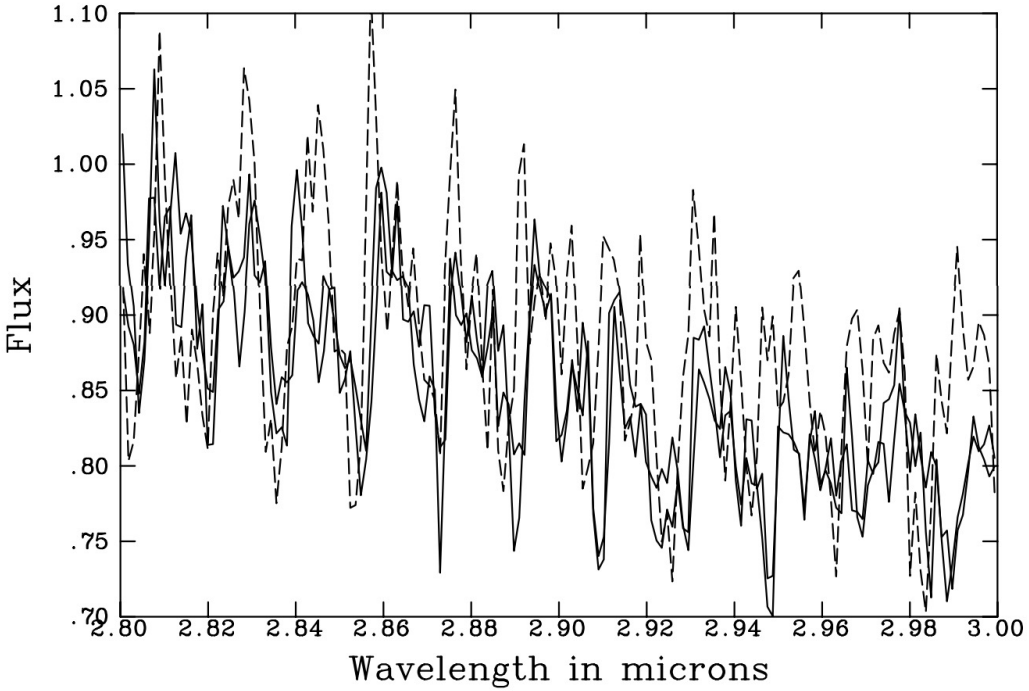


Figure 6. GJ 406 compared with 3000-K synthetic spectra using the MT and PS line lists. The observed spectra and PS model are shown as solid thick and thin lines respectively, and the MT model is shown as a dotted

2003

Carbon abundances and $^{12}C/^{13}C$ from globular cluster giants ..

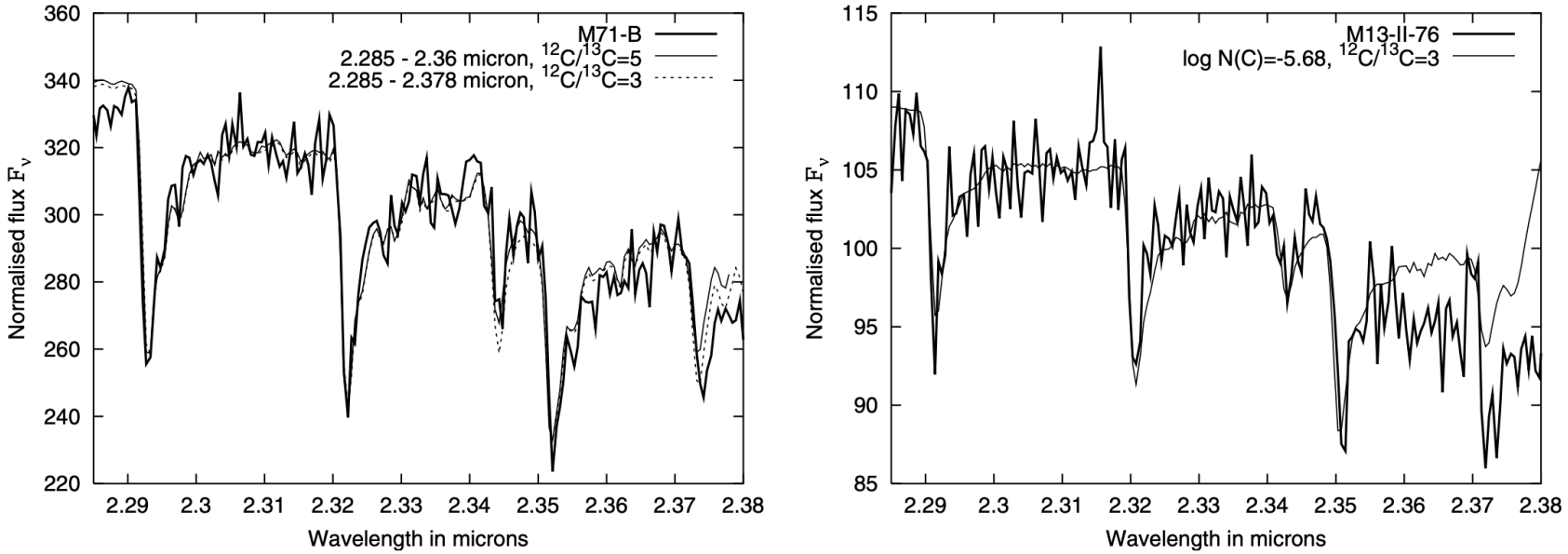


Figure 8. Fits to observed spectra for the full spectral region for M71-B (left) and M13-II-76 (right).

2005

.. Greg Harris (UCL) pre-EXOMOL line list

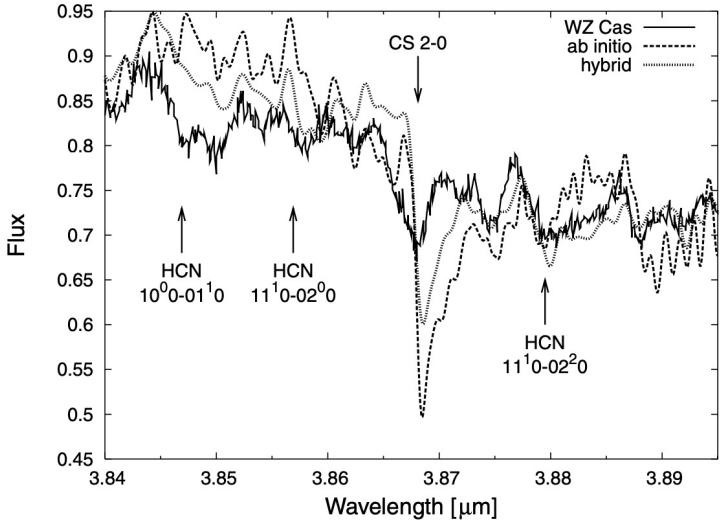


Figure 8. Synthetic and observed spectra of WZ Cas. The synthetic spectra have been convolved with by a Gaussian with half width at half maximum of 0.003 μm.

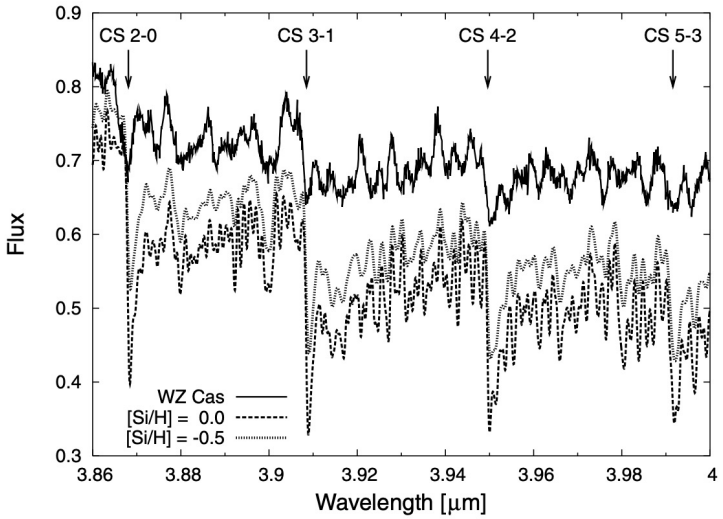


Figure 9. Synthetic and observed spectra of WZ Cas. The synthetic spectra have been calculated with different Si abundances and are convolved with by a Gaussian with half width at half maximum of 0.003 μm. The synthetic spectra have constants of 0.075 and 0.1 subtracted from the flux.

2004
orange
revolution


РАЗОМ


HUMAN RIGHTS
BEYOUND
EVERYTHING
АІ 4277 СО

2008

Bands of CrD and MgD and the ‘deuterium test’

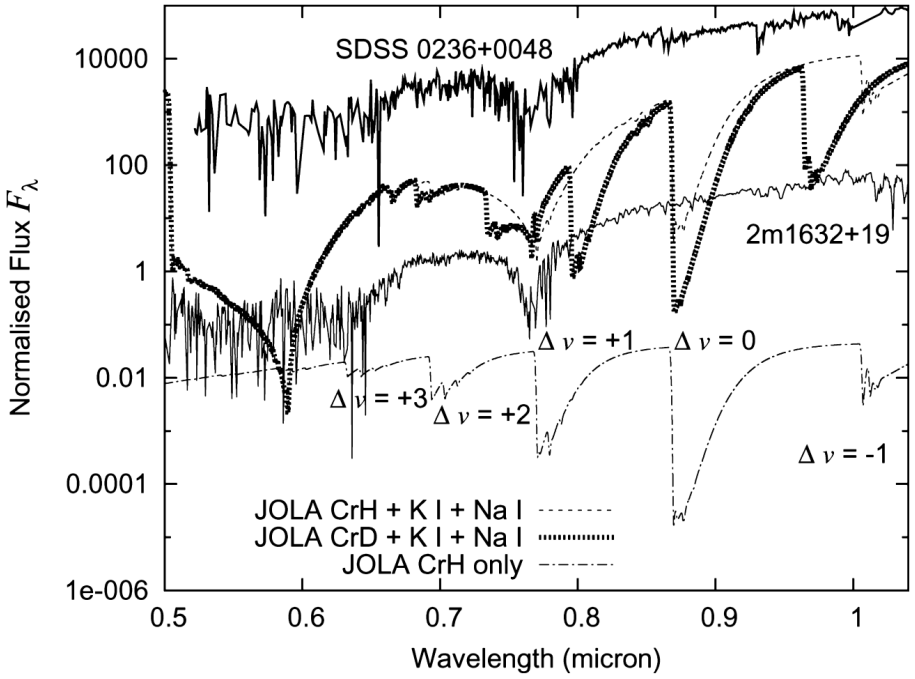


Figure 4. Molecular bands of the $A^6\Sigma^+$–$X^6\Sigma^+$ system of CrH and CrD and a theoretical spectrum computed for a 1800/5.0/0 COND model atmosphere. Spectra are shown for D/H = 1. The lower line on the plot shows the pure spectrum of CrH computed in the framework of JOLA approximation. For comparison the observed spectra of two L dwarfs 2MASS1632+19 (Martín et al. 1999) and SDSS 0236+0048 (Leggett et al. 2001) are shown as solid lines.

2009

RoPACS: Rocky Planets Around Cool Star

A Marie Curie Initial Training Network

View in full resolution

2013 .. office lemon tree

Dec 2014

2013/4 EuroMaidan .. Revolution of dignity

2014

With office colleagues at tea time, it is cold

Peter Bertsyk in foreground

A problem for abundance analysis

Pavlenko et al. A&A 606, A49 (2017)

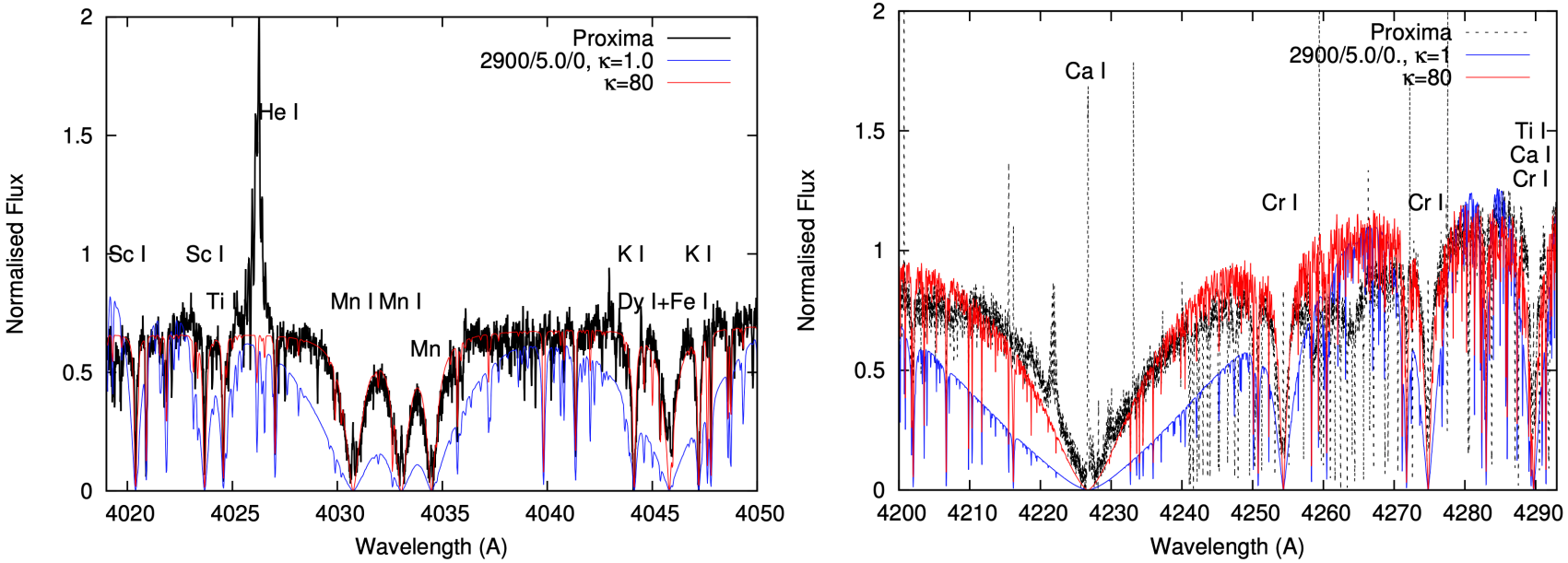


Fig. 6. Spectrum of Proxima computed for the model with enhanced continuum opacity across the blue spectral region.

2017

Proxima Cen many unidentified stellar lines might have been atomic turn out to be AlH though only identified with upgraded line list (also for NaH, SiH)

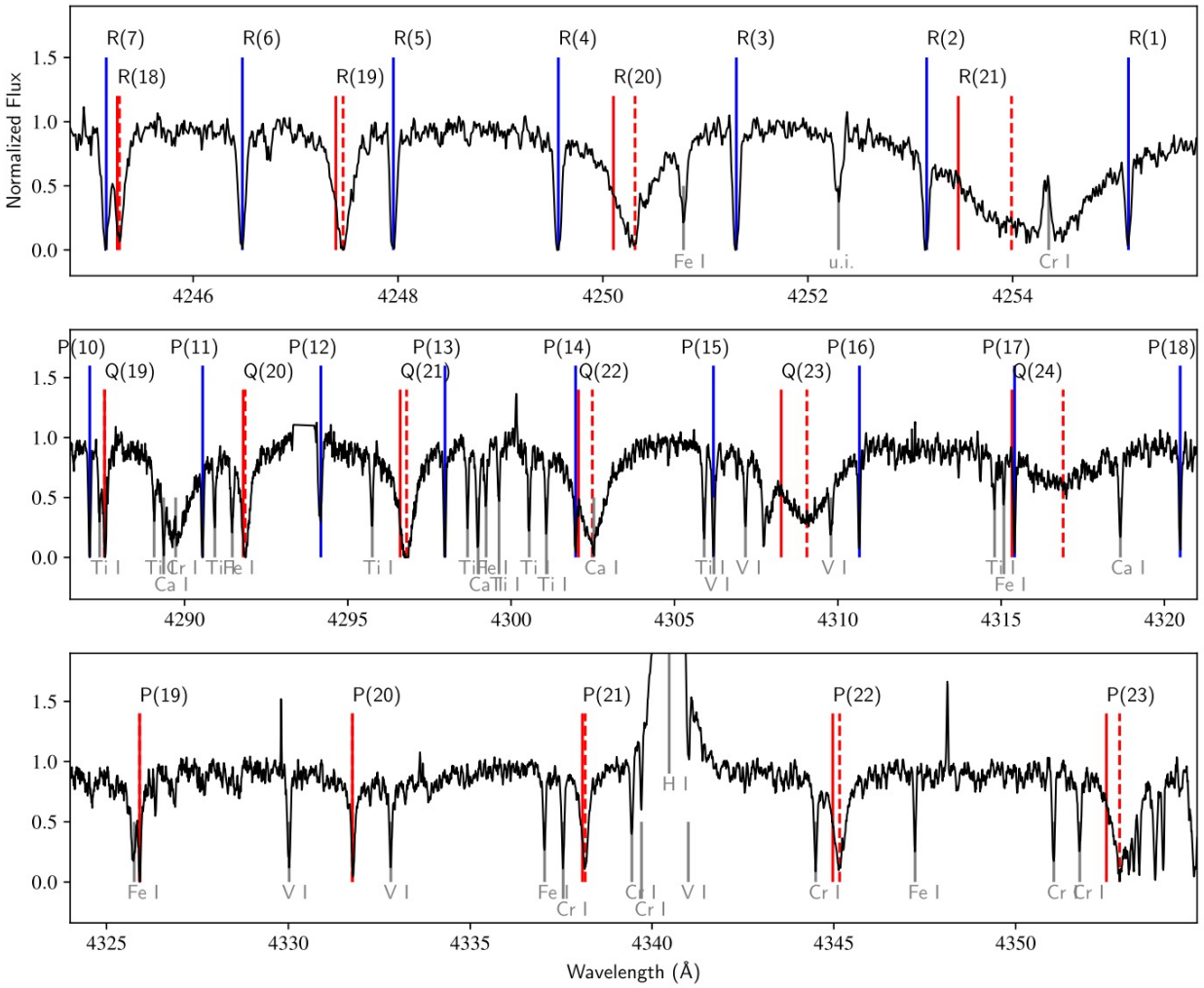
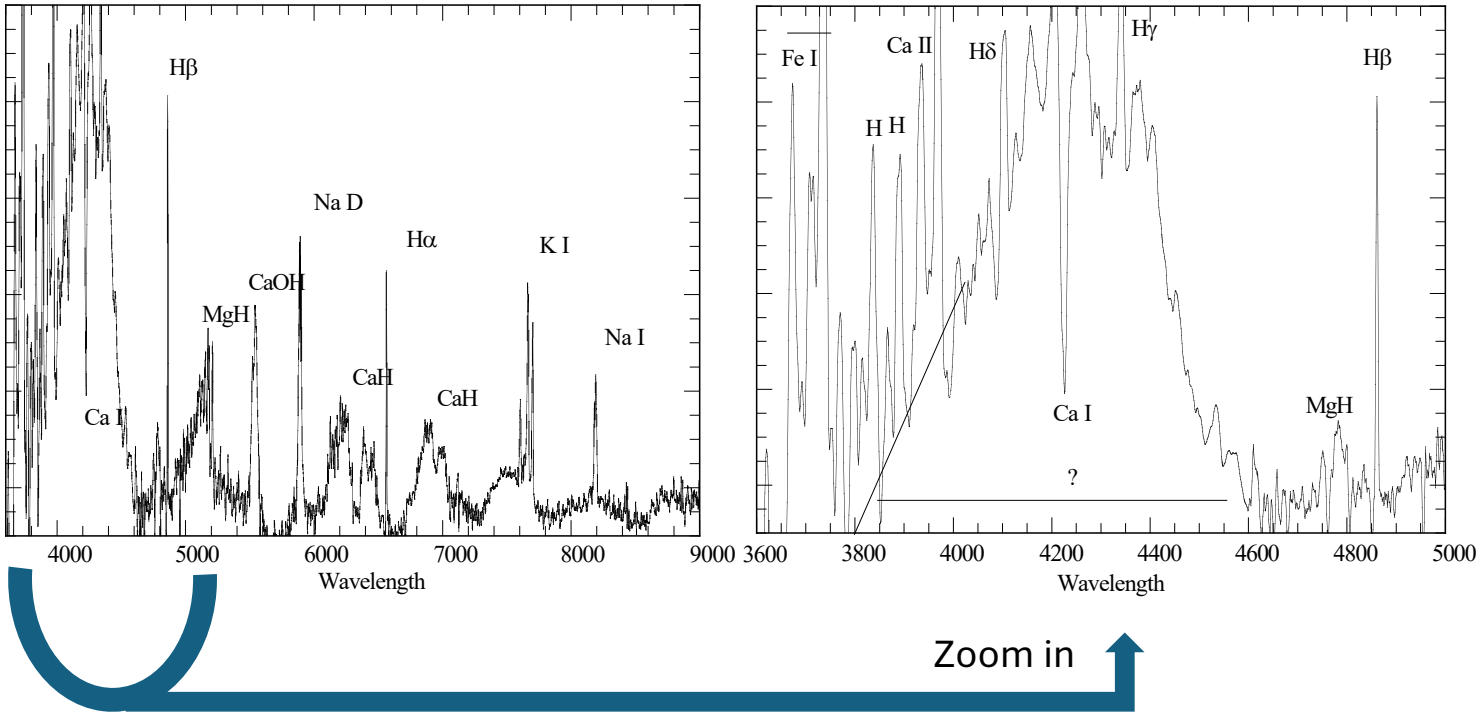


Figure 4. Spectrum of Proxima Cen in the spectral range covering selected intervals of the ^{27}AlH $A\,^1\Pi - X\,^1\Sigma^+$ 0-0 band. The lines of diffuse nature are marked in red. The vertical lines mark calculated positions of lines, while the dashed ones mark the observed positions; the R(21) in the top panel is heavily blended by the CrI resonance line and not marked. Atomic lines are marked in grey.

2018

Divide the spectra - gravity sensitive features appear (at M5)



These plots are the result of dividing the spectrum of a 6 Myr old TWA M5 star by older M star Proxima Centauri. The LHS shows the complete blue and red spectrum, highlight the well known MgH, CaH and CaOH bands and Na I and K I lines that are weaker in the lower gravity dwarf. The outstanding difference is the broad blue feature that is significantly stronger in the old disk dwarf. This is shown at larger scale on the right-hand side.

Beautiful spectra for radial velocity but models are horrible - remarkable line weakening in the blue

The metal lines of the blue depression are more than 300x weaker in the star (black) than the model (red).
If the depression is due to veiling from molecular lines, they must be evenly distributed throughout the wavelength region of interest (Bessell 2011).

But alpha Cen A and B are [M/H]=0.24+/-0.02 (e.g., Porto de Mello et al. 2008)
no evidence that alpha Cen C (Proxima Cen) is metal poor

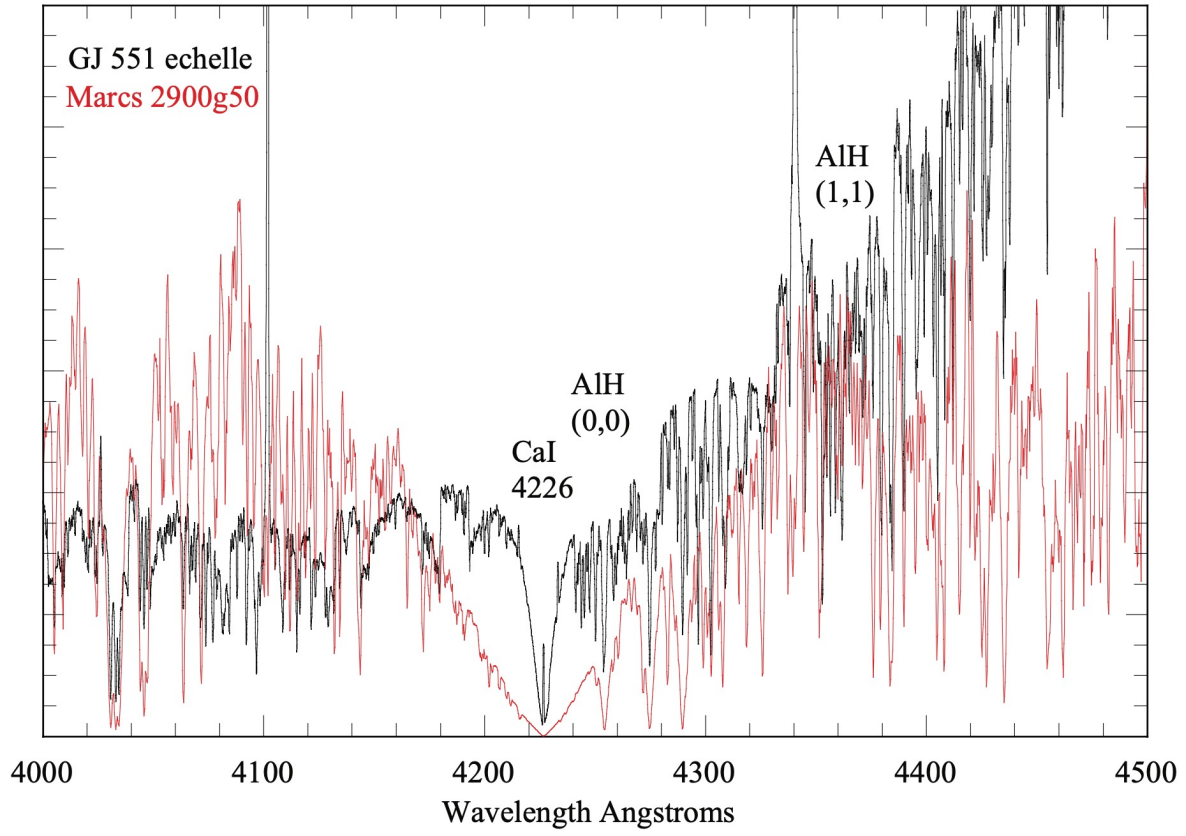


Figure 2. The observed and model blue spectrum of Proxima Cen (M5.5V). Note the huge difference in the strength of CaI 4226 and all the other lines of neutral metals and the difference in the shape of the underlying continua.

Blue depression turns out to be an old issue

Forgotten subdwarf diagnostic, circa 1980

1980ApJ...240..859A

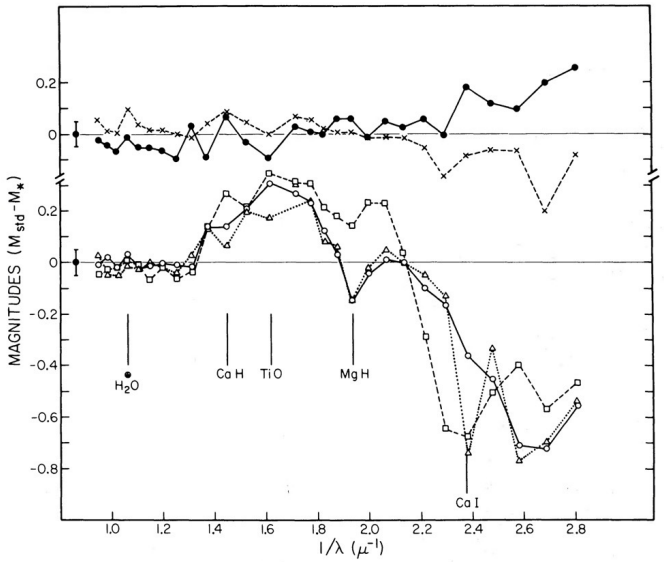


FIG. 4.—MCSP data for stars of various metallicity, plotted differentially with respect to G243-52, a normal old-disk star of type M1.5. *Filled circles:* G73-35; X: G171-47; *open circles:* G165-47; *open triangles:* LHS 3382; *open squares:* G7-17. The typical MCSP accuracy (±0.05 mag) is shown.

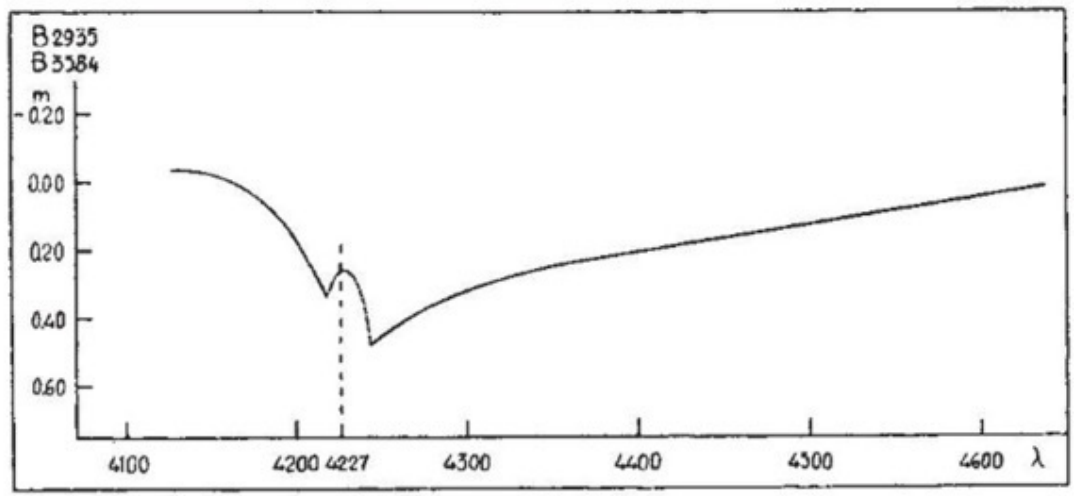


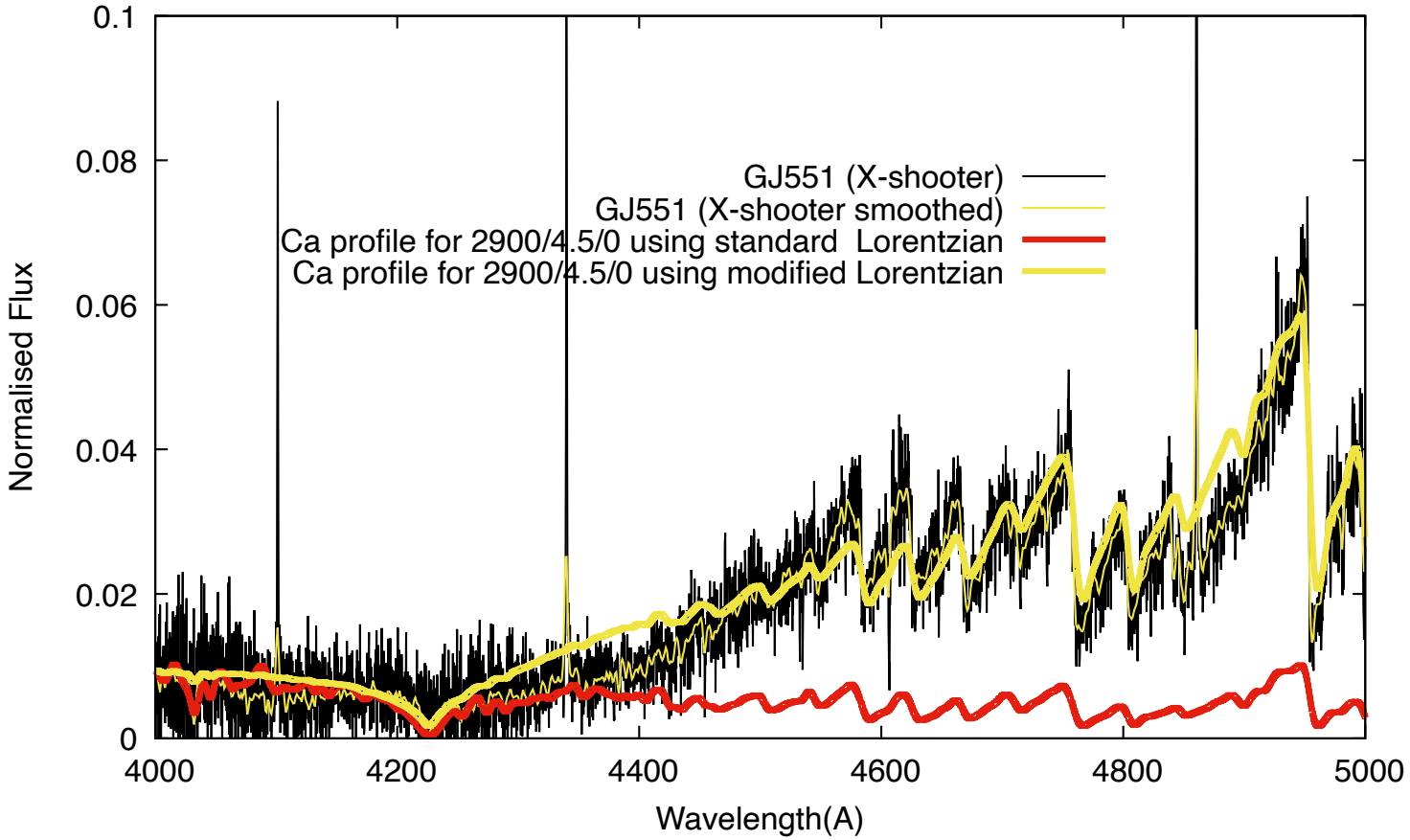
FIG. 1.

A clue to an understanding of the phenomenon is probably the continuous spectrum around the resonance line of Ca, λ 4227, which has been observed by H. Hamada[1] to extend between λ 3980 and λ 5100,

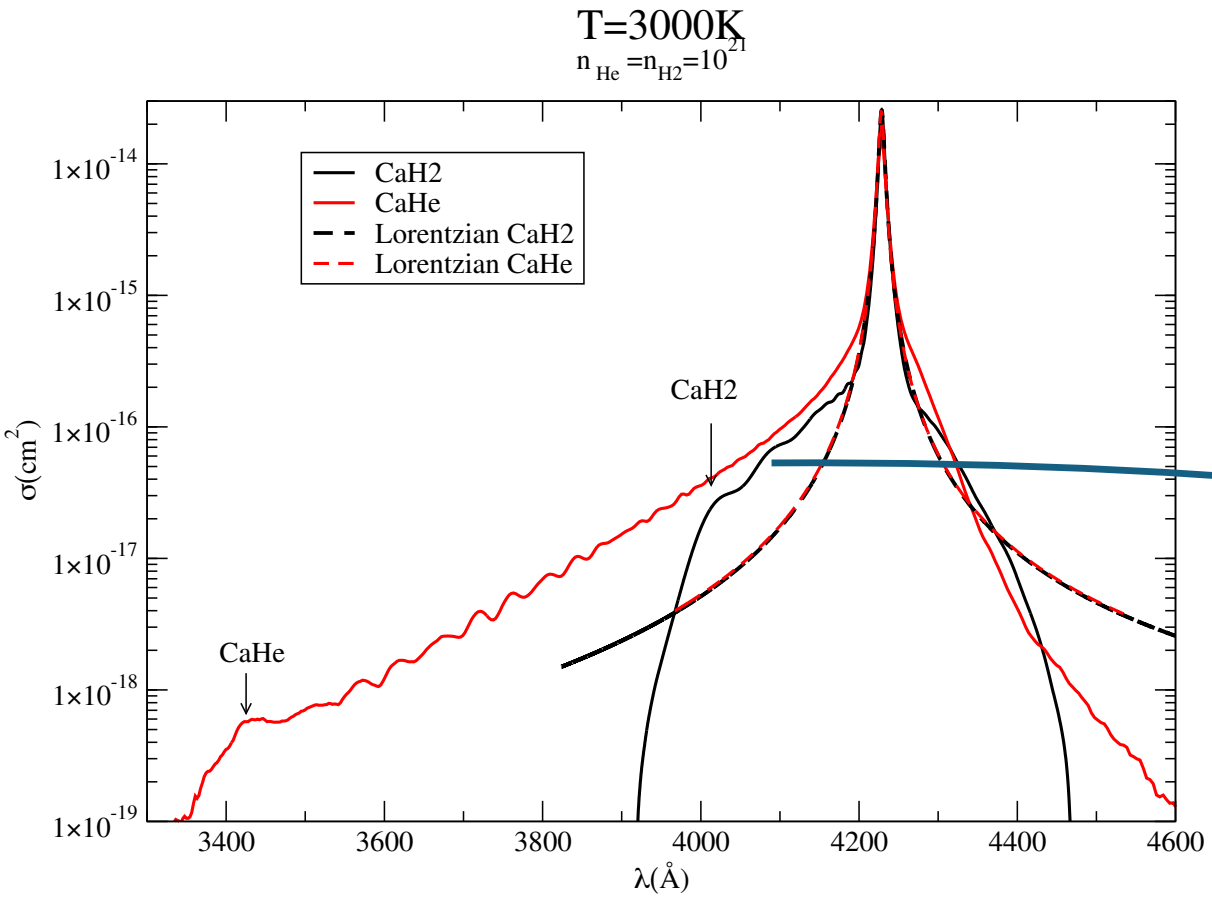
Lindblad 1935

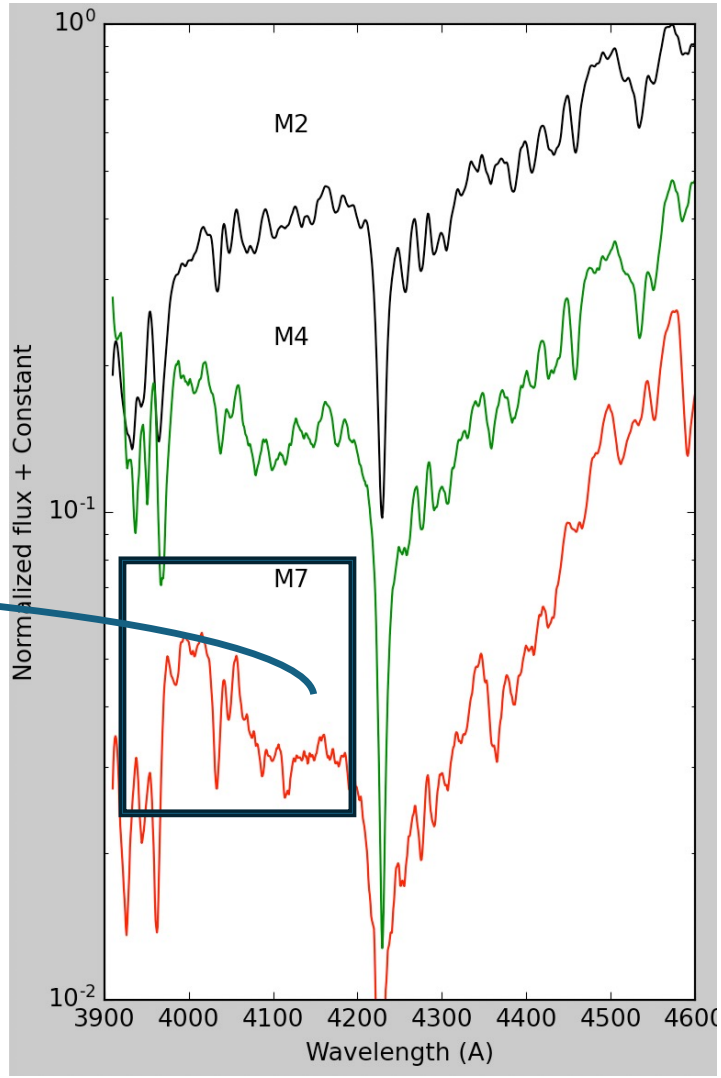
e.g., variety of suggested solutions including CaH (Varda & Bohm 1965), dust, activity, unidentified molecules (Bessell 2011), NLTE (Pavlenko et al. 2017)

New molecules don’t solve blue depression .. most promising is to change line broadening



Blue wing .. a switch from Ca-He to Ca-H_2 towards lower temperatures?





A life dedicated to spectroscopy …

Dedicated, driven .. never forgot to follow-up or get to emails, no concept of holiday, also never stressed, always another idea to try .. smiling

Life as a scientist in Kyiv is/was hard, frequently not paid, 1.5hr commute to work .. then you arrive with no heating, lighting, ancient computers, but great pleasure from long walks through the woods with students, colleagues, visitors

Close family, but tough love for PhD students

Ever self-deprecating always with many papers on the go with gentle urgency - many unfinished. He already has seven 2025 papers!

Tens of thousands of emails, a few earlier ones ..

Date: Mon, 27 Apr 1998 20:12:26 +0100 (WET DST)
From: Yakiv Pavlenko <pavlenko@ll.iac.es>
To: hraj@staru1.livjm.ac.uk
Dear Hugh,
Until now I tried two regions 6708 and 7699 and found them excellent...
Please, note my home phone 277-63-47. always you are wellcame in Kiev.
Regards, YP

Home phone number .. no mobiles

Date: Fri, 4 Aug 2000 11:16:27 +0300 (EET DST)
Subject: problems with transparancies...
Dear Hugh,
I see my talk in the frame of your ultra cool meeting.
May I ask you if there wil be a possssibility to make 5 - 6v transparancies?
I prepared figures in Kyiv, but I habve not taken my transparancies ...
Now I'm inKeele.
Next MOnday I wiil be in Manchester...
Lookind forward to seeng you soon,
YP

Transparencies .. no pptx etc

> > We have 2 men's day: one in on December (a day of Ukrainian Army)
> > and Fbruary (a day of sovjet Army)... I do not celebrate any...
> > I do not like any army... and police...
> I surprised that you still have a day for the soviet army though
> maybe this is similar to our rememberance day, to remember those
> who died in war .. which can be interpreted as a day for the army.
>
Yes, you are right --- the day in February is the Day of my father-
he's old army men, spent on the front 6 years (against Germany
and then JApan)...
Be sure, the main day for us is a day of 8 March...
Regards,
YP

International womens day

Most emails come with a ps.

My computer is overcrowded by computed spectra. I hope we can find not black cat in not dark room... :)

We have a nice winter. A lot of snow, -10 C. It's the real ukrainian winter. Very pity that you cannot see it!

Unfortunately, there is very thin boundary between the real feeling/culture and kitch... Pls look as axample:

Pls, read comments there ... Almost complete darkness of the western view on Ukraine ... but the author of the movie knows the difference between USSR, Ukraine and Russia.

.. always fond of various quotes

V.Trimble & R.A, Bell: “ …Given the web of interconnected uncertainties and errors presented here, one is initially tempted to give up on stellar atmospheres completely and turn to something simple like cosmology.”

Yakiv’s typical approach starting from scratch considering impact of ..

Opacities - missing continuum/line from atomic, molecular, and broadening

isotopes,

chemical abundance disequilibrium,

3-D convection,

sphericity effects,

dust,

stellar winds

Many of Yakiv's contributions still to appear in literature, e.g., in 2025

1 ☐ 2025MNRAS.541.3331G 2025/08

Infrared spectroscopy of V838 Monocerotis in 2015 and 2022

Geballe, T. R.; Kaminskiy, B. M.; Banerjee, D. P. K. *and 5 more*

2 ☐ 2025A&A...698A.141Z 2025/06 cited: 1

Optical constraints on the coldest metal-poor population

Zhang, J. -Y.; Lodieu, N.; Martín, E. L. *and 10 more*

3 ☐ 2025ApJ...984L..35Z 2025/05 cited: 1

Detection of Methane in the Closest Extreme Metal-poor T Dwarf WISEA J181006.18-101000.5

Zhang, Jerry J. -Y.; Lodieu, Nicolas; Martín, Eduardo L. *and 7 more*

4 ☐ 2025A&A...695A..26R 2025/03 cited: 3

A closer look at LTT 9779b:The ESPRESSO endeavour to pierce the atmospheric veil

Ramírez Reyes, R.; Jenkins, J. S.; Sedaghati, E. *and 9 more*

5 ☐ 2025KPCB...41...26Y 2025/02

Evaluating Promethium Abundance in the Atmospheres of Magnetically Peculiar Star HD 25 354

Yushchenko, V. A.; Gopka, V. F.; Yushchenko, A. V. *and 4 more*

6 ☐ 2025KFNT...41a..45Y 2025/01

The analysis of promethium abundance in the atmospheres of magnetic-peculiarity stars HD 25354

Yushchenko, V. A.; Gopka, V. F.; Yushchenko, A. V. *and 4 more*

7 ☐ 2025AAS...24535325G 2025/01

Recent Infrared Spectroscopy of V838 Monocerotis

Geballe, Thomas; Banerjee, D. P. K.; Evans, A. *and 5 more*

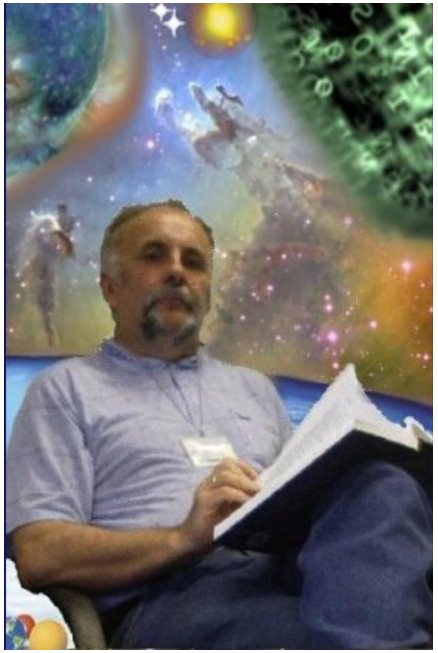
Yakiv loved celebrations

some will remember his xmas cards

Many diagnostic phenomena available with high resolution spectrographs, e.g., obvious ones

- Isotopic ratios
- Abundance patterns and formation
- Light element abundances
- Atomic broadening diagnostics
- Molecular broadening diagnostics
- NLTE can give detailed insight into 3D atmospheric structure
- Magnetic broadening

.. but many many more, Yakiv encourages you to explore




КОРИЧНЕВІ КАРЛИКИ У БЕЗПЕЦІ
ВІН ПРАЦЮЄ...