

YIANNIS TSAMIS, PH.D.

MET. OFFICE
LONDON ROAD, BRACKNELL
RG12 2SZ, U. K.

E-MAIL: ygt@star.ucl.ac.uk
TEL: +44 770 318 6006

how old?

CURRENT POSITION

SEPTEMBER 2002 - : **Research Scientist, U.K. Meteorological Office**

RESEARCH INTERESTS

- Study of galactic/extragalactic H II regions and Planetary Nebulae (PN) via multi-wavelength spectroscopy, imaging and numerical modelling.
- Elucidating the nature and origin of the recently identified 'cold plasma' within ionized nebulae emitting heavy-element optical recombination lines (ORLs).
- Investigating connections between the heavy-element recombination-line emission from PN and H II regions, and the degree of mixing, homogeneity and variation of composition in the ISM of the Milky Way and of Local Group galaxies.

RESEARCH EXPERIENCE

JANUARY 2002
AUGUST 2002

Research Assistant, Dept. of Physics & Astronomy, Univ. College London

Worked on issues arising from my thesis research in PN and H II regions.

- I showed that the O II recombination-line emission from several of our sample PN originates from cold plasma ($<10^3$ K). The temperature difference between this medium and the one emitting the stronger, UV and optical collisionally-excited line (CEL) emission is correlated with the discrepancy between ionic abundances, relative to H, obtained from ORLs and CELs.
- Authored a MNRAS paper on the heavy element abundances of five H II regions derived from analyses of both CELs and ORLs. Its main findings were: substantial ORL/CEL abundance discrepancies *are* found in H II regions. The possibility that temperature fluctuations or high-density *ionized* knots might explain the discrepancy is ruled out. The potential of ORLs in measuring accurate C/O and N/O ratios in extragalactic nebulae is demonstrated for the first time. The presence of a previously unsuspected metal-rich, diffuse and cold, ionised medium is inferred, which permeates the nebulae (over scales of tens of parsecs in the case of 30 Doradus as shown from long-slit mapping of the nebula).

- Authored a MNRAS paper presenting results from a deep spectroscopic survey of heavy-element emission lines from PN. A companion paper on which I am leading author, is soon to be submitted.

OCTOBER 1997
DECEMBER 2001

PhD Student, Dept. of Physics & Astronomy, Univ. College London

Conducted active research in the field of Planetary Nebulae and H II regions employing multi-wavelength UV (*IUE*), IR (*IRAS*, *ISO*) and optical (*ESO 1.52m*, *NTT*, *AAT*) spectroscopy as well as empirical modelling. I investigated the longstanding problem of discrepant ORL/CEL elemental abundances. I significantly advanced the state of the art in the field by reaching the following conclusions:

- ORL/CEL ionic abundance discrepancies occur widely in PN and H II regions, but in varying degrees from one nebula to the other (PN factors of ~ 2 up to >20 ; H II region factors of ~ 2 to 5). The ORL/CEL ratios for doubly ionized C, N and O are: i) positively correlated with the difference between the Balmer discontinuity and [O III] forbidden line temperatures, ii) negatively correlated with the PN surface brightness, and iii) positively correlated with PN absolute radii, i.e. young, bright nebulae display smaller ORL/CEL abundance ratios than older more extended ones. These findings strongly indicate an association of the phenomenon with the evolution of PN.
- The lack of correlation between the ORL/CEL ratios and the excitation energies of UV, IR or optical CELs rules out fluctuations in temperature as the cause of the discrepancies both in the cases of PN and H II regions. The existing density variations are shown to be inadequate in producing the discrepancy. The presence of high-density *ionized* inclusions that might cause the discrepancy is ruled out from an examination of suitable H I and O II recombination-line diagnostics which show that these ORLs are emitted from a low density medium.
- The high-excitation optical C II lines that populate the upper level of the C II $\lambda 4267$ transition were detected from a number of PN and were positively identified in the spectrum of the Orion Nebula. Their relative intensities were found to be in agreement with the predictions of current recombination theory, thereby disproving lasting claims that the $\lambda 4267$ line is augmented via means other than recombination; on the contrary the C II $\lambda 4267$ line was shown to be a reliable abundance indicator.
- These results suggest an alternative to the scenario that our elemental abundance estimates for photoionized nebulae are severely flawed and may point instead towards the presence of a hitherto neglected, cold, ionized phase within both PN and H II regions which emits the bulk of heavy-element ORLs.

SEPTEMBER 1996
SEPTEMBER 1997

MSc Student, Dept. of Space & Climate Physics, Univ. College London

Researched a thesis on the modelling of the IR (2.1, 4- μ m) vibrational emission of the H_3^+ molecular ion observed in the ionosphere of Jupiter. I wrote a computer code that calculated emission profiles and the latitudinal variation of the ion's emission thus producing global IDL maps of the planet showing both the auroral and planetary body H_3^+ emissions. Made use of H_3^+ emission rates calculated from first principles, as well as of theoretical H_3^+ and H_2 number densities.

SKILLS

- Knowledge of UNIX, LINUX and WINDOWS environments.
- Excellent astronomical image and data reduction & analysis skills with MIDAS, IRAF, DIPSO and PV-WAVE.
- Fluent in FORTRAN and PV-WAVE programming languages, as well as in MIDAS scripting.
- Experience of handling/running code on CRAY T3E machines.
- Graphical, statistical packages (e.g. ORIGIN, EXCEL).
- Other applications (LaTeX, Word, Emacs, HTML, PowerPoint).
- Languages (Greek, English).

**TEACHING
EXPERIENCE**

Astronomy/Physics/Math Tutor

Worked as an assistant at the *Univ. of London Observatory* teaching undergraduates in practical courses involving astronomical data reduction and analysis. Tutored students at the *Dept of Physics & Astronomy* in problem solving Physics/Math classes.

EDUCATION

Ph.D. in Astronomy <i>University College London, U.K.</i>	March 2002
M.Sc. in Space Science <i>University College London, U.K.</i>	Sept 1997
Diploma Degree in Physics <i>Aristotle University, Thessaloniki, Greece</i>	Sept 1996

COURSES

Astronomy/Space Science/Physics

Dynamical Astronomy, Celestial Mechanics, High Energy Astrophysics, Solar Physics, Radioastronomy, Planetary Atmospheres, Spacecraft Instrumentation, Space Operations & Project Organization, Newtonian/Statistical/Quantum mechanics, Thermodynamics, Nuclear physics/Elementary particles, Geophysics, Atmospheric physics, Electronics, Solid state physics, Science of metals, Environmental physics/Natural resources and

Chemistry; Numerical Modelling & Formulation of Models (European Centre for Medium-Range Weather Forecasting – May 2003)

THESES

Heavy Element Abundances in Ionized Nebulae, *Ph.D.*, March '02

AWARD

✓ Perren Graduate Studentship, *Univ. College London*

Modelling of H_3^+ in the Ionosphere of Jupiter, *M.Sc.*, Sept '97

MEETINGS

- Faraday Discussion 109: Chemistry & Physics of Molecules & Grains in Space (*Nottingham Univ*, April '98)
- Summer School: Dynamical MHD Phenomena in Solar & Astrophysical Plasmas (*Univ. of Crete, Heraklion*, July '98)
- ESO Workshop: Chemical Evolution from Zero to High Redshift (*Garching*, October '98)

OBSERVING

ESO 1.52-m, "*High excitation C II lines from Planetary Nebulae*" July '99

PUBLICATIONS

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- Y. G. Tsamis, M. J. Barlow, et al., '*Heavy elements in Galactic and Magellanic Cloud H II regions: recombination-line versus forbidden-line abundances*', 2003, *MNRAS*, 338, 687
- Y. G. Tsamis, M. J. Barlow, et al., '*A deep survey of heavy element lines in planetary nebulae - I*', 2003, *MNRAS*, astro-ph/0305469
- Y. G. Tsamis, M. J. Barlow, et al., '*A deep survey of heavy element lines in planetary nebulae - II*', 2003, *MNRAS*, to be submitted
- Y. G. Tsamis & D. Pequignot, '*The planetary nebula NGC 5882: empirical and photoionization modelling*', 2003, in preparation
- Y. G. Tsamis, M. J. Barlow, et al., '*A survey of recombination-line abundances in planetary nebulae and H II regions*', 2003, *IAU Symp.* No. 209, ASP, in press
- M. J. Barlow, ..., Y. G. Tsamis, C. Morisset, '*Recombination-line abundances for the third-row element magnesium*', 2003, *IAU Symp.* No. 209, ASP, in press

REFEREES

1. Prof. Mike Barlow, Dept. of Physics & Astronomy, Univ. College London (mjb@star.ucl.ac.uk).
2. Prof. Jonathan Tennyson, Dept. of Physics & Astronomy, Univ. College London (tennyson@star.ucl.ac.uk).
3. Dr. Daniel Péquignot, Observatoire de Paris-Meudon (Daniel.Pequignot@obspm.fr)
4. Prof. Pete Storey, Dept. of Physics & Astronomy, Univ. College London (pjs@star.ucl.ac.uk).