First NCAC Symposium on

Physical and chemical aspects of late stages of stellar evolution

Warsaw, Poland

29 August - 1 September, 2011

organized by

The Nicolaus Copernicus Astronomical Centre of the Polish Academy of Sciences

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Social events (included in the registration fee):

Sunday, 28 August
18:00 - Registration and welcome cocktail, NCAC

Monday, 29 August
18:00 - Grill party, NCAC

Wednesday, 31 August
19:00 - Conference dinner, NCAC

Thursday, 1 September
12:30 – Lunch & site seeing in Wilanów

Program

Sunday, 28 August

18:00 Registration and welcome cocktail party at NCAC

Monday, 29 August

9:00-10:00 Breakfast, registration and coffee
10:00 Welcome address
10:15-10:45 Introductory talk by P. Podsiadlowski

Session I: Evolved stars, pulsations and mass loss (1)

10:45-11:15 I. Soszyński: Massive search and analysis of evolved stars from the OGLE project
11:15-11:30 Break/cold drinks
11:30-11:50 S. Uttenthaler: The evolutionary state of Miras with changing pulsation period
11:50-12:10 B. Hrivnak - Pulsational light variability in Carbon-rich post-AGB stars in the Milky Way Galaxy and the Magellanic Clouds
12:10-12:25 M. Hillen: Uncovering the pulsating photospheres of AGB variables through near-IR interferometry: a case study on R Vir
12:30-13:30 Lunch

Session II: Evolved stars, pulsations and mass loss (2)

14:00-14:20 W. Vlemmings: Magnetic fields in the envelopes of Evolved Stars
14:20-14:40 L. Zacs: Dynamical phenomena in the atmospheres of proto-planetary nebulae
14:40-15:00 M. Feast: AGB variables: distance indicators; bolometric magnitudes; pulsation modes
15:00-15:20 J. Menzies: Mira variables in southern Local Group galaxies
15:20-15:40 P. Whitelock: AGB variables in NGC6822
15:45-16:15 Coffee break & poster session
16:15-16:45 I. McDonald: Mass loss from giant stars: its variance with metallicity and evolution
16:45-17:15 M. Groenewegen: The Herschel MESS program on evolved stars
17:15-17:35 S. Sacuto: A possible solution to the mass-loss problem in M-type AGB stars
17:35-17:50 L. Matthews: Constraining Stellar Mass-Loss through HI 21-cm Line Observations with the Very Large Array

18:00 Grill party at the NCAC

Tuesday, 30 August

9:00-10:00 Breakfast & wake up coffee

Session III: Interacting binaries and circumstellar discs (1)

10:00-10:30 A. Jorissen: Herschel's view of evolved binary stars
10:30-10:50 T. Verhoelst: Creating a circumbinary dust disc from a Roche Lobe-overflowing red giant: the SS Leporis system
10:50-11:10 O. Chesneau: Hunting and characterizing stratified disks around evolved stars
11:10-11:20 Break/cold drinks
11:20-11:40 N. Gorlova: High-resolution spectroscopic investigation of post-AGB binary candidates with disks
11:40-12:00 C. Gielen: Dust processing in Keplerian discs around post-AGB binaries
12:00-12:20 E. Lagadec: A mid-infrared imaging catalogue of post-AGB stars
12:30-13:30 Lunch

Session IV: Interacting binaries and circumstellar discs (2)

14:00-14:20 B. Miszalski: The influence of binaries on dust in planetary nebulae
14:20-14:40 D. Jones: Examining the influence of central star binarity on the morphologies of PNe
14:40-15:00 S. Mohamed: Mass Transfer in Mira-type binaries

15:00-15:20 J. Mikołajewska: Mass transfer in symbiotic stars
15:20-15:40 P. Podsiadlowski: The Symbiotic Channel for Type Ia Supernovae
15:40-15:55 I. Dominguez: Connecting Thermonuclear Supernovae with their Progenitors
15:55-16:45 Coffee break & poster session
Free afternoon (informal discussions, site seeing, etc.)

Wednesday, 31 August
9:00-10:00 Breakfast & wake up coffee
Session Va: Interacting binaries and circumstellar discs (2)
10:00-10:20 A. Jorissen: Importance of circumbinary discs in the evolution of low- and intermediate-mass binaries
10:20-10:40 S. Van Eck: Chemical abundances in Barium and S stars
Session Vb: Chemistry of evolved stars and their environment
10:40-11:00 K. Smolders: The Spitzer Spectroscopic Survey of S-type Stars
11:00-11:10 Break/cold drinks
11:10-11:30 I. Cherchneff: Non equilibrium chemistry in the shocked inner wind of AGB stars
11:30-11:50 C. Abia: First fluorine abundance determinations in extragalactic AGB carbon stars: Is there a new fluorine problem?
11:50-12:10 G. Stasińska: Chemical abundances in planetary nebulae and their central stars
12:10-12:30 L. Guzman-Ramirez: Carbon chemistry in Galactic Bulge Planetary Nebulae
12:30-13:30 Lunch
Session VI: Circumstellar molecules and dust (1)
14:00-14:30 A. Omont: Carbon particles in circumstellar and interstellar environments
14:30-14:50 J. Bernard-Salas: Elusive Fullerenes found in Space
14:50-15:05 C. Paladini: Unveiling the dusty envelope of C-rich AGB stars
15:05-15:25 O. Jones: The Crystalline Silicate abundance around oxygen-rich Asymptotic Giant Branch stars
15:25-15:45 J. Blommaert: Crystalline dust in the circumstellar environment of evolved stars
15:45-16:30 Coffee break & poster session
16:30-16:50 K. Menten: An unbiased view of the molecular emission from the red supergiant VY CMa over the 270-355 GHz range
16:50-17:10 G. Sloan: Dust and metallicity
17:10-17:30 M. Boyer: Dust production in AGB and RSG stars in the Magellanic Clouds
17:30-17:45 R. Tylenda: V1309 Scorpii: Death of a Binary and Birth of a New Star

18:45 Delivery of the NCAC Medal to prof. Alain Omont
19:00 Conference dinner

Thursday, 1 September
9:00-10:00 Breakfast & wake up coffee
Session VII: Circumstellar molecules and dust (2)
10:00-10:30 V. Bujarrabal: Herschel/HIFI observations of molecular lines from planetary and proto-planetary nebulae
10:30-10:50 T. Kamiński: Examining the extended CO emission in IRC+10216 with APEX
10:50-11:05 M. Schmidt: Modeling of the circumstellar ammonia lines in carbon-rich AGB stars by the Herschel/HIFI
11:15 General discussion & conference summary
End of the meeting

12:15 Departure for Wilanów

Session I: Evolved stars, pulsations and mass loss (1)

Massive search and analysis of evolved stars from the OGLE project
I. Soszyński, University of Warsaw, Astronomical Observatory, Poland

The Optical Gravitational Lensing Experiment (OGLE) is a long-term sky survey being conducted since 1992. Currently, the OGLE project monitors brightness of about 10^9 stars, which is a unique tool for detecting and studying variable stars of all kinds. The catalogs prepared on the basis of the OGLE photometric databases contain over 10^5 stars in the late stages of evolution - long-period variables, RV Tau stars, R CrB stars, etc. in the Galaxy and in the Magellanic Clouds. Such large samples of evolved stars were used to analyse their statistical features, as well as to study individual objects of particular interest.

The evolutionary state of Miras with changing pulsation period

S. Uttenthaler, University of Vienna, Department of Astronomy, Austria

We present an investigation of the evolutionary state of Mira variables with changing pulsation period. The changing periods have been speculated to be the consequence of a recent thermal pulse in these stars. In particular, we acquired optical high-resolution spectra of a sample of 12 Miras to check for the presence of technetium absorption lines, an indicator for recent thermal pulses and third dredge-up. Furthermore, we used the spectra to measure Li abundances, and we determined present-day periods and luminosities. Among the 12 stars, five were found to show absorption lines of Tc. However, there is no clear correlation between period change type and Tc presence. We identify one star that probably changed its spectral type from SC to C by 3DUP recently, one star that possibly switches its pulsation mode from Mira-like to semi-regular variability right now, one massive, hot bottom burning Mira, and one metal-poor variable that probably belongs to the thick disk.

Pulsational light variability in Carbon-rich post-AGB stars in the Milky Way Galaxy and the Magellanic Clouds

B. Hrivnak, Valparaiso University, USA

We recently published the results of a long-term photometric monitoring program of 12 carbon-rich post-AGB stars in the Milky Way Galaxy. These objects are classified as proto-planetary nebulae (PPNe), and their mid-infrared spectra show aromatic infrared bands along with the unidentified 21 micron feature. They have cool, detached dust shells and published models imply that intensive mass loss ended 400-2000 years ago. The carbon-rich PPNe in the spectral range G8 – F3 pulsate with periods of 155 to 35 days, with the cooler ones possessing the longer periods. Consistent results are found for a smaller sample in the Magellanic Clouds. The detection of periods as long as 150 days requires a revision in the published post-AGB evolution models that couple pulsation period to mass loss rate and that assume intensive mass loss ended when the pulsation period had decreased to 100 days. This revision will have the effect of extending the timescale for the early phases of post-AGB evolution.

Uncovering the pulsating photospheres of AGB variables through near-IR interferometry: a case study on R Vir

M. Hillen, Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Belgium

I propose to present the first results of our ongoing study which intends to directly probe the interaction between the pulsating photosphere and the close circumstellar environment of a diverse sample of variable AGB stars. Our method is based on that of Perrin et al. (2004): we fit an adapted version of their parametric star + molecular layer model to a large near-IR spectrally dispersed interferometric dataset (containing visibilities and spectro-photometry) from the Palomar Testbed Interferometer and AMBER/VLTI. The strength of this dataset lies in its unique temporal coverage and sampling, allowing to constrain the behavior of the stellar photosphere as well as the molecular layer throughout several pulsation cycles. In this way our results will lead to a better understanding of the origin of the enigmatic molecular layer and its role in the driving of the stellar wind.

Session II: Evolved stars, pulsations and mass loss (2)

Magnetic fields in the envelopes of Evolved Stars
W. Vlemmings, Argelander-Institut fuer Astronomie, Germany / Chalmers University

Magnetic fields are being observed at different distances throughout the envelopes of evolved stars. ALMA will provide a further enormous improvement in the capabilities of magnetic field observations. Still, the origin of the magnetic field remains poorly understood. I will discuss current and future observations of the magnetic field and its origin.

Dynamical phenomena in the atmospheres of proto-planetary nebulae

L. Zacs, University of Latvia, Latvia

The results of radial velocity monitoring and high-resolution spectroscopy are presented for three bright proto-planetary nebulae. Long-term observations are performed with the main goal to understand better the pulsation properties and dynamical phenomena in the extended atmospheres of PPN. The time series of high-resolution optical spectra are discussed for IRAS22272+5435. Significant variations are observed in the intensity of C_2 and CN lines. Variable emission in the Hα, splitting of low-excitation atomic absorption lines, appearance of CN emission lines and blue wings of strong atomic lines give evidence of shocks and mass outflow obviously induced by atmospheric pulsations.

AGB variables: distance indicators; bolometric magnitudes; pulsation modes

M. Feast, University of Cape Town and South African Astronomical Observatory, South Africa

The use of Mira variables as distance indicators is tested against other indicators in the LMC, the Galactic centre and the Fornax and LeoI dwarf spheroidal galaxies.
A problem with bolometric corrections for some carbon-rich AGB variables is discussed. It will be shown that whilst published data for the SMC intermediate age cluster NGC 419 show consistent mode and distance estimates using K-log P plots; using the published bolometric magnitudes would lead to a more complex and puzzling situation.

Mira variables in southern Local Group galaxies

J. Menzies, South African Astronomical Observatory, South Africa

This will discuss the results of an infrared survey of all Local Galaxies accessible at SAAO.

AGB variables in NGC6822

P. Whitelock, South African Astronomical Observatory & University of Cape Town, South Africa

I will describe a search for stars with high mass-loss rates in NGC6822.

Mass loss from giant stars: its variance with metallicity and evolution

I. McDonald, University of Manchester, UK

We can now claim some understanding of the processes behind mass loss, the rate at which it occurs and the return to the ISM. This understanding becomes hazy, however, as we move outside the solar-metallicity environment of our local region and current epoch. Using globular clusters as 'time capsules', we explore how metallicity affects mass-losing stars, the rate at which they lose material, and the dust and gas which they lose. We also place these stars in an evolutionary context and explore the conditions required for dust formation to occur, how they change, and how they relate to pulsation. The surprising results have implications for dust production throughout the Universe's history.

The Herschel MESS program on evolved stars

M. Groenewegen, Royal Observatory of Belgium, Belgium

MESS (Mass-loss of Evolved StarS) program is a 300 hour guaranteed time key program using the PACS and SPIRE instruments on board Herschel. I will give an overview of the current status of the program and present some key science results.

A possible solution to the mass-loss problem in M-type AGB stars
S. Sacuto, Uppsala University, Sweden

Mass loss is a fundamental, observationally well-established feature of AGB stars but many aspects of this process still remain to be understood. To date, self-consistent dynamical models of dust-driven winds reproducing the observed mass-loss rates seem only possible for M-type stars if the grains in the close circumstellar environment grow to larger sizes than previously assumed. In order to study the grain size distribution where the mass loss is initiated, high-spatial-resolution interferometry observations are necessary. We have observed two M-type stars using the VLTI/MIDI instrument to constrain the dust-grain sizes through modeling the 10 micron silicate feature.

Constraining Stellar Mass-Loss through HI 21-cm Line Observations with the Very Large Array
L. Matthews, Massachusetts Institute of Technology, Haystack Observatory, USA

I will present an update on work by our group using the Very Large Array to study the mass-loss histories of evolved stars through observations of the HI 21-cm line. Because HI is not destroyed by the interstellar radiation field, it can be used to trace circumstellar envelopes (CSEs) at significantly larger distances from the star than molecular lines (up to a parsec or more), thereby probing stellar mass-loss over very extended timescales. HI also supplies unique kinematic information on the interaction between CSEs and their interstellar environments. The sample of stars that we have imaged in HI continues to grow, providing unique constraints on the geometry and timescale of mass-loss for evolved stars spanning a range of properties. We have recently expanded our survey to Cepheid variables, and I will report on implications for mass-loss during the Cepheid stage as a means of resolving the long-standing "Cepheid mass discrepancy".

Session III: Interacting binaries and circumstellar discs (1)

Herschel's view of evolved binary stars
A. Jorissen, Institut d'Astronomie, Université libre de Bruxelles, Belgium

I will present results from the MESS consortium (Mass loss of Evolved StarS) relating to Herschel observations of binary stars involving mass-losing components.

Creating a circumbinary dust disc from a Roche Lobe-overflowing red giant: the SS Leporis system

T. Verhoelst, Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Belgium

We present our ongoing study of the A+M binary SS Leporis, which we believe is a system currently creating a circumbinary dust disc through non-conservative Roche Lobe overflow. We discuss to what extend it could be a progenitor to the many post-AGB systems with circumbinary discs, and we derive an important constraint on the evolution of the dust grains in the circumbinary environment: at formation the grains are purely amorphous, and crystallinity probably occurs only after long-term exposure to the hot radiation field in a Keplerian orbit.

Hunting and characterizing stratified disks around evolved stars
O. Chesneau, Dpt Fizeau, Observatoire de la Côte d'Azur, France

I will report on the VLTI optical interferometry observations of disks of plasma and dust detected around evolved stars from the least massive to the most massive stars. Growing evidence will be discussed on the link between thin, stratified disks and the influence of a seen/unseen companion.

High-resolution spectroscopic investigation of post-AGB binary candidates with disks
N. Gorlova, Katholieke Universiteit Leuven, Belgium

We present a time series of high-resolution optical spectra for a few post-AGB binary candidates selected based on the presence of the dusty disks. The spectra were obtained over two years of observations with the Hermes spectrograph on the Belgian 1.2 m telescope Mercator. We investigate the chemical composition, the orbital parameters from the radial velocity measurements, the line shape variations with the orbital phase, including H alpha, and the relation between the radial velocity and the light curves. An evidence is presented for an on-going mass transfer in two systems with P~140 days.

Dust processing in Keplerian discs around post-AGB binaries

C. Gielen, Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Belgium

We discuss a particular class of binary post-AGB stars, for which the circumstellar material is locked in a Keplerian circumbinary disc, and not the typical outflow shell, as seen for single post-AGB stars. The origin and evolution of the discs is still unknown, but appears to play a lead role in the further evolution of the entire binary system.
We now have about 45 Galactic and 25 extragalactic LMC disc sources, and by combining photometry, interferometry, radial velocity monitoring and spectroscopy, we study in detail the binary nature of the central stars, as well as the geometry and mineralogy of the discs.
In all stars, the dust is oxygen rich and highly crystalline. Except for a few atypical sources, where PAHs and buckyballs are seen, no carbon-rich material is observed. The submillimetre fluxes show that cm-sized grains are present, or that the discs are optically thick.

A mid-infrared imaging catalogue of post-AGB stars

E. Lagadec, European Southern Observatory /Garching, Germany

We used imaging in the mid-infrared to study the inner part of evolved stars to probe direct emission from dusty structures in the core of Post-AGB stars in order to better understand their shaping mechanisms. We imaged a sample of 93 evolved stars and nebulae in the mid-infrared using VISIR/VLT, T-Recs/Gemini South and Michelle/Gemini North. We found that all the Proto-Planetary Nebulae we resolved show a clear departure from spherical symmetry. 59 out of the 93 observed targets appear to be non resolved. The resolved targets can be divided in two categories. The nebulae with a dense central core, that are either bipolar or multipolar. The nebulae with no central core have an elliptical morphology. The dense central torus observed likely host binary systems which triggered fast outflows that shaped the nebulae.

Session IV: Interacting binaries and circumstellar discs (2)

The influence of binaries on dust in planetary nebulae
B. Miszalski, South African Astronomical Observatory, South Africa

Three Planetary Nebulae (PNe) are known to show extraordinary R Coronae Borealis (RCB) like obscuration events in their lightcurves. Dust cloud formation in the line of sight is suspected to be responsible but exactly how these events are triggered is uncertain. According to a simple RCB star model the lightcurves tells us the dust is forming in excess of 70 AU. An interaction with a binary (e.g. at periastron) or a dust disk would be required to form dust at this distance. The former is inconsistent with the unpredictable recurrence of the events, but there is increasing evidence that binaries are required to build dust disks. Current evidence suggests stochastic instabilities in dust disks are responsible for these events. I will also briefly report on the role of dust in PNe with close binary central stars, which may be responsible for SN1987A-like rings of low-ionization structures in PNe.

Examining the influence of central star binarity on the morphologies of PNe
D. Jones, European Southern Observatory, Chile

The role of binarity in the shaping of planetary nebulae has been the subject of much debate, with single stars believed to be incapable of producing the most highly collimated morphologies. However, observational support for binary-induced shaping has been sadly lacking. Here, I will present the most recent results of a programme to spatio-kinematically model the morphologies of all PNe known to contain a close binary central star. Spatio-kinematical modelling accurately determines the orientation of the PN, allowing the theoretically predicted perpendicular alignment, between nebula and orbital plane, to be tested. To date, every PN subjected to this investigation has displayed the predicted alignment, indicating that central star binarity has played an important role in the formation and evolution of these nebulae. The results from this programme will be key in determining the importance of binary-induced shaping in the formation and evolution of PNe in general.

Mass Transfer in Mira-type binaries

S. Mohamed, Argelander Institute for Astronomy, University of Bonn, Germany

Mass transfer in symbiotic stars

J. Mikołajewska, Nicolaus Copernicus Astronomical Center, Warszawa, Poland

Among the most fundamental questions posed by symbiotic binaries is the process of mass transfer, whether it is due to Roche lobe overflow (RLOF) or stellar wind, and possibility of an accretion disc formation. Although many researchers still believe that they all are detached binaries, the ellipsoidal light curve changes are being recently found in increasing number of systems with orbital periods below 1000d.Tidally distorted giants and the RLOF can be thus quite common in symbiotic binaries, especially those with shorter Porb.
I will present and discuss some problems posed by these systems which may have important implications for our understanding of late phases of binary evolution.

The Symbiotic Channel for Type Ia Supernovae

P. Podsiadlowski, Department of Astrophysics, University of Oxford, UK

Recent observations strongly support the single-degenerate model for at least a subset of Type Ia supernovae (SNe Ia), in particular systems that contain red-giant companions resembling the S-type symbiotic RS Oph. I will summarize the present status of understanding of this channel, including updated population synthesis calculations that resolve earlier issues, and three-dimensional hydrodynamical simulations that show the effects of a giant companion on the structure of the supernova remnant, which provides a new observational test of this channel (applicable to remnants such as Tycho).

Connecting Thermonuclear Supernovae with their Progenitors

I. Dominguez, Universidad de Granada, Spain

Observations show that thermonuclear supernovae (SNIa) properties correlate with those of their host galaxies: brighter SNIa are more frequent and appear associated with star forming galaxies as compared with dimmer ones. This seems to indicate that SNIa properties vary with redshifts, casting doubts, unless we unveil that dependence, on this cosmic light house from which we have learnt that the expansion rate of the Universe is accelerating. Models show that the thermonuclear explosion of a white dwarf with a mass closed to the Chandrasekhar mass explains most of SNIa properties and requires different ^{56}Ni masses, synthesized during the explosion, to account for the observed range of maximum magnitudes. However, the link between the stellar populations and explosion properties is still missing.
In the last years we have studied the influence of the progenitors on SNIa. I will discuss our results concerning the mass and metallicity of the exploding WD progenitor, rotation acquired during the accretion phase, WD crystallization, ^{22}Ne sedimentation and the current efforts done on this subject.

Session Va: Interacting binaries and circumstellar discs (3)

Importance of circumbinary discs in the evolution of low- and intermediate-mass binaries
A. Jorissen, Institut d'Astronomie, Université libre de Bruxelles, Belgium

The 'Ba star mystery' [how to suppress the period gap (100 - 1000 d) predicted by the canonical binary-evolution scenario, and how to account for the short-period (P < 1000 d), eccentric orbits present among Ba systems?] is revealing a serious flaw in our understanding of binary-star evolution. I will briefly discuss processes that have recently been proposed to solve the mystery, and especially to account for the short-period eccentric systems: white-dwarf kicks (Izzard et al. 2010) and tidal interaction between a circumbinary disc (CB) and the binary. The latter scenario is supported by the prevalence of CB discs in many different systems: post-AGB, d'-symbiotics, silicate J stars, dusty K giants.

Chemical abundances in Barium and S stars

S. Van Eck, Université libre de Bruxelles, Belgium

The chemical overabundance pattern of a sample of barium stars observed with the HERMES spectrograph (La Palma) and presenting a wide range of orbital elements is analyzed. We investigate a possible anti-correlation of the global overabundance level with the orbital period, as well as s-process characteristics ([hs]/[ls]) as a function of metallicity. These results put strong constrains on pollution scenarios. As far as S stars are concerned, detailed abundances in key s-process elements are derived thanks to dedicated S stars MARCS model atmospheres, and are used to set constraints on nucleosynthesis and stellar evolution models.

Session Vb: Chemistry of evolved stars and their environment

The Spitzer Spectroscopic Survey of S-type Stars
K. Smolders, University of Leuven, Belgium

S-type stars are peculiar red giants with a C/O near unity. Their chemical composition differs from the oxygen-rich chemistry in M stars and the carbon-rich chemistry in C stars. We present infrared spectra, obtained with the Spitzer Infrared Spectrograph, of a homogeneous sample of 90 S-type stars (Program ID 30737, P.I. S. Hony) and we will:
(i) briefly present and evaluate the selection criteria used to compose a homogeneous, unbiased sample of intrinsic S-type AGB stars
(ii) discuss the presence of PAH emission in these stars with a seemingly oxygen-rich stellar photosphere
(iii) show that the infrared spectrum of naked stellar photospheres is critically dependent on the C/O ratio of the star
(iv) discuss the dust formation sequence in these S-type AGB stars, zooming in on some key-results of our study: the strong dependence of the composition of the circumstellar dust species on the C/O ratio of the central star and the detection of MgS in the dusty circumstellar environment and compare the formation mechanism of MgS in these oxygen-rich stars to the formation of MgS in carbon-rich environments.

Non equilibrium chemistry in the shocked inner wind of AGB stars
I. Cherchneff, University Basel, Switzerland

There have been growing observational evidences over the years of the importance of the inner wind of AGBs in shaping the chemical composition of the entire envelope. Both the synthesis of dust and the formation of 'exotic' species occur at the high gas temperatures and densities characterising the shocked inner layers above the photosphere. I will present new theoretical evidences for the processing of unexpected molecules in carbon stars, including hydrides, oxygen- and phosphorous-bearing species, as a result of non-equilibrium chemistry induced by stellar pulsation and shock activity.

First fluorine abundance determinations in extragalactic AGB carbon stars: Is there a new fluorine problem?

C. Abia, Universidad de Granada, Spain

Fluorine abundances are derived in carbon stars belonging to the SMC, LMC and the Carina dwarf spheroidal galaxy. This is the first study to define the behaviour of F with metallicity in intrinsic AGB stars. Fluorine has been detected in all except one star (LMC SMX 663) which is probably a hot super-giant rather than an AGB star. Our LTE analysis show F enhancements but lower than predictions from nucleosynthetic models for low-mass, metal-poor AGB stars. Furthermore, the predicted correlation between F and s-element enhancements, observed at solar metallicity, seems not to be present when the stellar metallicity decreases. We discuss briefly the possible solutions for this discrepancy and conclude that the mechanism for F production in low-metallicity low mass AGB stars needs further study together with additional F measurements to better constrain the models.

Chemical abundances in planetary nebulae and their central stars

G. Stasińska, Laboratoire Univers et Théories, Observatoire de Paris/Meudon, France

Carbon chemistry in Galactic Bulge Planetary Nebulae

L. Guzman-Ramirez, Jodrell Bank Centre for Astrophysics, University of Manchester, UK

Galactic Bulge Planetary Nebulae show evidence of mixed chemistry with emission from both silicate dust and PAHs. This mixed chemistry is unlikely to be related to carbon dredge up, as third dredge-up is not expected to occur in the low mass Bulge stars. We show that the phenomenon is widespread, and is seen in 30 nebulae out of 40 of our sample, selected on the basis of their infrared flux. HST images and UVES spectra show that the mixed chemistry is not related to the presence of emission-line stars, as it is in the Galactic disk population. We also rule out interaction with the ISM as origin of the PAHs. Instead, a strong correlation is found with morphology, and the presence of a dense torus. A chemical model is presented which shows that hydrocarbon chains can form within oxygen-rich gas through gas-phase chemical reactions. The model predicts two layers, one at $A_V \sim 1.5$ where small hydrocarbons form from reactions with C^+, and one at $A_V \sim 4$, where larger chains (and by implication, PAHs) form from reactions with neutral, atomic carbon. These reactions take place in a mini-PDR. We conclude that the mixed chemistry phenomenon occurring in the Galactic Bulge Planetary Nebulae is best explained through hydrocarbon chemistry in an UV-irradiated, dense torus.

Session VI: Circumstellar molecules and dust (1)

Carbon particles in circumstellar and interstellar environments
A. Omont, Institut d'Astrophysique de Paris, France

Elusive Fullerenes found in Space

J. Bernard-Salas, Institut d'Astrophysique Spatiale, France

The C60 molecule was discovered in laboratory experiments aimed at understanding the formation of long carbon chains in the circumstellar environment of carbon stars. Because of their remarkable stability, fullerenes have been predicted to survive the harsh conditions of the ISM. However, targeted searches for the presence of fullerenes in various astrophysical environments were unsuccessful or not conclusive. I will present the first conclusive detection of C60 and C70 on Tc1, a young Planetary Nebula, and subsequent work on the subject. The molecules amount to a few percent of the available cosmic carbon, showing that fullerenes can form efficiently in space. C60 has now been detected in several astronomical environments. Once injected into the ISM, these species could be widespread in the Galaxy where they could contribute to interstellar extinction, heat the gas, charge exchange with ions, and provide active surfaces for complex chemical reactions.

Unveiling the dusty envelope of C-rich AGB stars
C. Paladini, Vienna University, Austria

I will present our recent results obtained applying the high angular resolution technique for investigating the atmosphere of C-rich Asymptotic Giant Branch stars. I will focus on the Mira variable R Fornacis. This star shows an apparent change in its pulsation period which could be associated with a change in the mass-loss. The multiperiodic modulation of its light curve suggests an obscuration event. The most likely reasons for this obscuration are: an interplay of two dynamic processes, a condensation mechanism in the shell, or an eclipse by dust could. Our Midi observations allow us to complete the dynamic picture of this star, putting strong constraints on the morphology of the circumstellar environment where. I will conclude giving a short overview on our very recent accepted ESO Large program which aims to study asymmetries in the mass-loss process of AGB stars by combining Herschel, MIDI, and VISIR observations.

The Crystalline Silicate abundance around oxygen-rich Asymptotic Giant Branch stars
O. Jones, Jodrell Bank Centre for Astrophysics, University of Manchester, UK

While silicates in the ISM appear to be completely amorphous, silicates in the dust shells around O-rich AGB show a considerable degree of crystallinity. A threshold value for the mass-loss rate exists, above which the features due to forsterite and enstatite appear. We are investigating the origin of this threshold value by expanding the crystallinity studies to the low metallicity environments of the Magellanic Clouds. We analyze the 5-38 micron Spitzer-IRS spectra of 87 O-rich AGB and RSG; these encompass a range of spectral features and band strengths; from the spectrally rich which exhibit a wealth of crystalline and amorphous silicate features to the ‘naked’ (dust-free) stars, across a range of mass-loss rates. Combining spectroscopic observations with a grid of models exploring the effects of dust composition, mass-loss rate and outer radius, we hope to trace correlations between the feature strength of crystalline silicates and the dust or gas density. We compare our results to those for O-rich AGB stars in the Galaxy.

Crystalline dust in the circumstellar environment of evolved stars
J. Blommaert, Instituut voor Sterrenkunde, KU Leuven, Belgium

I will present PACS spectroscopy covering the 69 micron forsterite dust feature of evolved stars. With the spectral resolution and sensitivity of PACS we can fit the profile of the forsterite feature which is very sensitive to temperature. By studying the forsterite feature in a wide range of evolved stars and from different populations (including Galactic Bulge and LMC) we want to determine the role of forsterite in the dust formation in the circumstellar environments.

An unbiased view of the molecular emission from the red supergiant VY CMa over the 270-355 GHz range

K. Menten, Max-Plack-Institut fuer Radioastronomie, Germany

The Submillimeter Array was used to image the molecular line emission in the circumstellar envelope of the peculiar red supergiant star VY Canis Majoris of the 870 micrometer atmospheric window. Employing adaptive calibration using the object's continuum emission we achieve high quality one arcsecond resolution imaging of the whole 280-355 GHs range within which we find 211 distinct spectral lines from 33 molecules (including isotopologues) plus 40 unidentified lines. From the distribution of molecules we are obtaining their abundances and isotopologic abundance ratios. Using data for multiple transitions in a number of molecules we are deriving the physical conditions in the circumstellar envelope to reach a picture of the star's chemistry that can be compared with models. Our legacy survey is accompanied by a strong laboratory effort that aides in the identification of possibly newly found molecules traced by unidentified lines.

Dust and metallicity
G. Sloan, Cornell University, USA

Observations with the Spitzer Space Telescope have taught us a great deal about the production of dust by evolved stars in systems spanning a range of metallicities: the Galactic Bulge, Galactic globular clusters, the Magellanic Clouds, and smaller dwarf galaxies in the Local Group. Studies utilizing infrared spectroscopy have generated a series of papers showing that the rates at which carbon stars produce dust do not depend measurably on metallicity, while for oxygen-rich stars, metallicity plays a more significant role. This presentation will place these results in the context of (1) on-going efforts to include spectroscopy of fainter and less massive stars and (2) less biased photometric samples using photometric monitoring programs like the OGLE surveys. This last step is essential if we are to generalize what we have learned spectroscopically and understand the role of pulsation in the mass-loss process.

Dust production in AGB and RSG stars in the Magellanic Clouds
M. Boyer, Space Telescope Science Institute, USA

Highly evolved stars (massive stars and intermediate-mass Asymptotic Giant Branch -or AGB- stars) can become heavily enshrouded in dust. This material is ejected into the interstellar medium, driving galactic chemical evolution. Here, we present an analysis of the complete AGB and red supergiant populations in the Magellanic Clouds using photometry from the *Spitzer* SAGE survey. With radiative transfer modeling, we estimate the dust production rates in a selection of oxygen-rich and carbon-rich stars. We then extrapolate our findings to the entire evolved star populations in both galaxies, allowing us to examine the effect that metallicity has on the dust production. We find that the heavily enshrouded carbon-rich stars dominate the total dust input in both galaxies, but that the oxygen-rich stars play a larger role in the higher-metallicity Large Magellanic Cloud.

V1309 Scorpii: Death of a Binary and Birth of a New Star

R. Tylenda, Nicolaus Copernicus Astronomical Center, Toruń, Poland

After a brief discussion of basic points from astrophysics of contact binaries and red transients (red novae), I will concentrate on the eruption of V1309 Sco observed in 2008. In particular, archive photometric measurements of the V1309 Sco progenitor obtained in the OGLE project during 6 years before the eruption will be presented. Analysis of the available data leads to a conclusion that the progenitor of V1309 Sco was a contact binary quickly evolving towards its merger. The violent phase of the merger was observed as the 2008 eruption. The post-outburst remnant is a single object most likely surrounded by a disc-like envelope storing most of the angular momentum from the merged binary. The evolution of the disc can give birth to a planetary system of the newly formed star.

Session VII: Circumstellar molecules and dust (2)

Herschel/HIFI observations of molecular lines from planetary and proto-planetary nebulae
V. Bujarrabal, Observatorio Astronomico Nacional, Spain

We will present Herschel/HIFI observations of intermediate-excitation molecular lines in the far-infrared/sub-mm from several planetary and protoplanetary nebulae. The high spectral resolution provided by HIFI allows accurate measurements of the line profiles, whose structure corresponds to the various kinematics of the nebular components, notably fast bipolar outflows and slow shells. We have detected in our sources lines of several molecules, including in particular ^{12}CO, ^{13}CO, and H_2O, as well as other species like NH_3, OH, $H_2{}^{18}O$, HCN, SiO, etc. Wide profiles often showing spectacular line wings have been found. The observed lines are particularly useful to study warm gas, which is not probed by the low-J lines observable from the ground. In particular, we have studied the excitation properties of the high-velocity emission, coming from fast bipolar outflows, in which we detect the presence of gas components with temperatures over 100-200 K.

Examining the extended CO emission in IRC+10216 with APEX

T. Kamiński, Max-Planck-Institute fur Radioastronomie, Germany

We present results of APEX observations of the extended CO emission in IRC+10216, the prototypical carbon-rich AGB star. The extended emission from the envelope was traced with APEX up the CO(7-6) transition. In addition, a comprehensive set of sensitive observations at the stellar position is presented for CO lines up to CO(9-8) transition and some isotopomeric lines (^{13}CO and C^{18}O). The observed lines are modeled with a radiative transfer code to study excitation conditions and the photo-dissociation effects of the envelope.

Modeling of the circumstellar ammonia lines in carbon-rich AGB stars by the Herschel/HIFI

M. Schmidt, Nicolaus Copernicus Astronomical Center, Toruń, Poland

Ammonia has been found to exist in circumstellar envelopes of evolved stars in amounts that exceed predictions of the current chemical models. In the framework of the HIFISTARS Herschel Guaranteed Time Key Project a number of sources was observed with the HIFI instrument in the ground-state rotational transitions NH_3 J_K = 1_0 -- 0_0 transition near 572.5 GHz. Clear emissions have been detected in envelopes of 6 objects, including earlier detection in IRC+10216. We present results of the non-LTE radiative transfer modelling conducted with the goal to derive NH3 abundances and put constraints on the inner radius of its formation. The model of ammonia includes IR radiative pumping via ν_2=1 vibrational band at 10μ.

POSTERS (by author in alphabetical order)

P-12.
The photometric and spectral variability of the hot protoplanetary nebula IRAS 19336-0400
Burlak Marina, Ikonnikova Natalia, Sternberg State Astronomical Institute, Moscow State University, Russia

We present the results of spectroscopic and photometric observations in 2006-2010 for the B1Iape star with an IR excess, hot post-AGB candidate IRAS 19336-0400. We found out fast irregular light variations with the amplitudes: $\Delta V = 0^m.3$, $\Delta B = 0^m.3$, and $\Delta U = 0^m.4$ and color-magnitude correlations. The typical time scales are in the range of several days. We consider a variable stellar wind to be mainly responsible for the photometric variability of the star, although rapid pulsations are not ruled out either. The spectrum of IRAS 19336-0400 consists of low excitation forbidden lines and Balmer emissions generated in gaseous nebula and superposed on the continuum of a B1I star. The Balmer lines equivalent widths appeared to be variable due to the continuum level change and to correlate with B and V brightness. Nebular electron density and temperature were derived.

P-15.
Post-AGB evolution speed
Gęsicki Krzysztof, Torun Centre for Astronomy, Nicolaus Copernicus, Poland

We discussed the sample of planetary nebulae collected over years and analyzed with Torun models. We found an observational selection effect that is operating on our data. The well exposed images and spectra were obtained for PNe not older than about 10 000 yr. This is in agreement with hydrodynamic models (Schonberner et al. 2007) which show a significant decline in nebular emissions after that time. Our finding should be taken into account when comparing the observed and expected numbers of PNe. The population synthesis numbers of PNe is expected to be reduced.

P-11.
IRSF/SIRIUS near-infrared variable star survey in the Magellanic Clouds
Ita Yoshifusa, Astronomical Institute, Tohoku University, Japan

In the poster, we would like to present the results from the IRSF/SIRIUS near-infrared variable star survey in the Magellanic Clouds. In total 3 square degrees along the bar in the LMC and also 1 square degree of the central part of the SMC have been monitored. This observation was started in Dec. 2000, and continued until last year. Some parts of the survey area have observed by AKARI satellite, and we also show near- to mid-infrared spectra for some interesting objects.

P-9.
A new view of the S-star symbiotics ER Del and V420 Hya
Jorissen Alain, Institut d'Astronomie, Université libre de Bruxelles, Belgium

ER Del and V420 Hya are two poorly-studied symbiotic stars involving an S star. Thanks to a monitoring with the new spectrograph HERMES (Roque de los Muchachos Observatory, La Palma), we are able to confront the variations of the Ha line shape with the orbital phase, and get insights into the mass flows in the system.

P-7.
The new BINSTAR code
Jorissen Alain, Institut d'Astronomie, Université libre de Bruxelles, Belgium

I will describe first results obtained with the new stellar evolution code BINSTAR following in a fully self-consistent manner the structural evolution of the two stars of a binary system, including tidal effects, thermohaline mixing, accretion of mass and angular momentum, orbital evolution etc...

P-8.
The e - log P diagram of barium and post-AGB stars finally understood
Jorissen Alain, Institut d'Astronomie, Université libre de Bruxelles, Belgium

We present a new population synthesis of barium stars and post-AGB stars able to account for the main properties of their e - log P diagrams.

P-10.
Herschel's view into Mira's head
Mayer Andreas, University of Vienna, Department Of Astronomy, Austria

Herschel's PACS instrument observed the environment of the binary system Mira Ceti in the 70 and 160 μm band. The obtained images reveal bright structures shaped as four broken arcs, and fainter filaments in the ejected material of Mira's primary star, the famous AGB star o Ceti. A comparison with GALEX images shows no similar features in the UV and IR. The overall shape of the IR emission from Mira shows a significant discrepancy with the expected alignment with Mira's exceptionally large space velocity. The observed broken arcs are neither connected with each other nor of a circular shape and stretch over angular ranges of 80 and 100 degrees. Results from simulations of the mass flows within the binary system, originating from Mira's wind, are shown and resemble some of the observed structures.

P-6.

TT Cyg & UX Dra observed with Herschel: Circumstellar dust shells in the far-IR

Mecina Marko, University of Vienna, Department of Astronomy, Austria

In the course of the MESS (Mass-loss of Evolved StarS) Guaranteed Time Key Programme a variety of stars showing circumstellar structures were observed with the PACS instrument onboard the Herschel satellite in the 70 and 160μm band. Based on the obtained images and adopting data from literature, elementary quantities, such as angular and physical diameters were measured and time scales were estimated.
Additionally, modelling of spherically symmetric circumstellar shells, using the 1D radiative transfer code DUSTY was carried out to give an estimate of further parameters. The results are shown exemplarily for the carbon stars TT Cyg and UX Dra.

P-13.
Identification of new Galactic Bulge and Large Magellanic Cloud symbiotic stars
Miszalski Brent, South African Astronomical Observatory, South Africa

Modern large-scale time-domain surveys offer a powerful means to identify misclassified symbiotic stars hidden within Hα selected planetary nebulae (PNe) catalogues. We have combined Galactic Bulge OGLE-III lightcurves with deep 2dF-AAOmega and VLT-FLAMES spectroscopy to identify at least a dozen new symbiotics and many more candidates. We note periodic variability of a few hundred days or slow variations due to dust in lightcurves, while spectra show telltale emission lines that may include Raman scattered O VI 6825, [O III] 4363/Hγ >1,[Fe VII] 5721 and 6087, as well as evolved stars in the continuum. Previously catalogued symbiotics also appear in our sample and some show spectroscopic variability due to orbital motion. We also present five symbiotic star candidates found in the Large Magellanic Cloud from the VISTA Magellanic Cloud (VMC) survey based on Ks-band variability, some of which have resolved nebulae.

P-14.
Abell 70 as a Rosetta stone linking post-AGB binaries and PNe
Miszalski Brent, South African Astronomical Observatory, South Africa

More than 40 close binary central stars are known that have passed through a common-envelope stage, but we know essentially nothing about orbital periods in the intermediate range (P=100500 days). Such binaries are most likely the long sought-after progeny of post-AGB binaries and chemically peculiar stars whose composition was modified by binary evolution. We have recently discovered the binary nature of the central star of Abell 70 (A70; PN G038.1-25.4) which belongs to the small class of Barium-enhanced central stars (A35, LoTr5, and WeBo1). An s-process rich cool star in a nebula ejected by the polluting star is a very transient stage that constitutes a formidable Rosetta stone for advancing multiple poorly understood aspects of stellar evolution. We give an overview of the impact A 70 will have in areas such as the s-process mechanism due to thermal pulses and the mass transfer process in binaries.

P-18.
Dust in IC418
Morisset Christophe, Instituto de Astronomía - Universidad Nacional Autónoma de México & Instituto de Astrofísica de Canarias, Spain

We construct a detailed model for the IR dust emission in the PN IC418. We succeed to reproduce the emission from 2 to 200 microns. We can determine the amount of emitting dust as well as its composition, and compare to the depletion of elements observed in the photoionized region.

P-3.
A Grid of MARCS Model Atmospheres for S Stars
Neyskens Pieter, Université libre de Bruxelles, Belgium

S-type stars are late-type giants whose atmosphere is enriched in carbon and s-process elements because of either extrinsic pollution by a binary companion or intrinsic nucleosynthesis and dredge-up on the thermally-pulsing AGB.
Dedicated S-star model atmospheres, with proper chemical composition, gravity, and effective temperature, were lacking up to now, inducing large uncertainties in the determination of the atmospheric parameters of S stars, and the derived abundances.
We will present a large grid of S-star model atmospheres covering the range 2700 <= Teff (K) <= 4000, 0 <= log g <= 5, 0.5 <= C/O <= 0.99, [s/Fe] = +0.00, +1.00, +2.00 and [Fe/H] = -0.50, 0.00. A best model finding tool is used to compare carefully selected photometric and spectroscopic indices computed on synthetic and observed S-star spectra. In this way, we are able to obtain a set of atmospheric parameters for each observed S-star.

P-5.
GRAMS: Facilitating large scale modeling of AGB stars
Riebel David, Johns Hopkins University, USA

We present preliminary results from the first application of the GRAMS model grid to the AGB population of the LMC. GRAMS is a pre-computed grid of radiative transfer models of AGB stars and surrounding circumstellar dust. The grid consists of ~80,000 models computed using both silicate-rich (O-rich) and carbon-rich dust. We have fit GRAMS models to ~30,000 AGB stars in the LMC, using 12 band photometry from the optical to the mid-infrared, covering the peak of the SED for all the stars in our sample. Using a pre-computed grid of tens of thousands of models, we can, for the first time, present reasonably detailed radiative transfer modeling for tens of thousands of stars, allowing us to make statistically accurate estimations of the carbon-star luminosity function and the global dust mass return to the ISM from AGB stars.

P-4.
GRAMS: A grid of evolved star models
Srinivasan Sundar, Institut d'Astrophysique de Paris (IAP), France

Dust outflows from AGB and RSG stars aid in the chemical enrichment of galaxies. The large number of evolved stars in a galaxy makes the calculation of individual outflow rates a time-consuming process. This can be alleviated by the use of pre-computed radiative transfer models to fit the observed photometry and spectra. For this purpose, we have generated the Grid of RSG and AGB ModelS (GRAMS). The GRAMS grid consists of over 80,000 models of stars with shells of oxygen- or carbon-rich dust, and it spans a wide range in luminosity, effective temperature, dust shell inner radius and optical depth. GRAMS synthetic spectra and photometry are available for public use.
The GRAMS models reproduce the colors of AGB and RSG stars observed in the SAGE survey of the Magellanic Clouds. Through SED fitting, we will be able to constrain the luminosities and mass-loss rates for the entire dataset of evolved stars.

P-1.
Abundance analysis of Red Giants in the Kepler field
Thygesen Anders Overaa, Aarhus University, Denmark / Nordic Optical Telescope, La Palma, Spain

Before the launch of the NASA Kepler satellite only a handful of pulsating red giants were known. Now it is evident that nearly all red giants pulsate. In order to put firmer constraints on the seismic models as well as investigate the effect of the chemical composition on the pulsations, accurate spectroscopic parameters are needed. Especially effective temperature, surface gravity and metallicity are crucial in order to derive accurate radii and ages. We used the method of spectral synthesis to derive these parameters as well as abundances for several elements. We here present results for ~50 Red Giants, obtained from high signal-to-noise, high resolution spectra, and compare them to parameters obtained from asteroseismology."

P-17.
A kinematical study of the binary-induced shaping of PN HaTr 4
Tyndall Amy, University of Manchester / Isaac Newton Group of Telescopes, Spain

HaTr 4 is a compact bipolar PN known to contain a close binary central star. Using high spectral and spatial resolution position-velocity arrays in the emission of [OIII]-5006.84, we present evidence that the binary central star is responsible for the nebular shaping.

P-2.
Elemental abundances in AGB stars and the formation of the Bulge
Uttenthaler Stefan, University of Vienna, Department of Astronomy, Austria

We obtained high-resolution near-IR spectra of some 45 AGB stars located in the Galactic bulge. The aim of the project is to determine key elemental abundances in these stars, to help constrain the formation history of the Bulge. A further aim is to link the photospheric abundances to the dust species found in the winds of the stars. Here we present a progress report of the analysis of the spectra.

P-16.
First results of the Lagadec & Verhoelst post-AGB VISIR survey
Verhoelst Tijl, Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Belgium, Belgium

We present first results from the large mid-IR imaging survey of post-AGB objects performed with the VISIR instrument over the past years. Besides an overview of the sample with a classification effort (Lagadec), we present here some special objects, such as a hitherto poorly studied (albeit bright) IRC+10420 analogue.

USEFUL INFORMATION

The conference site is:
Centrum Astronomiczne im. M. Kopernika (N. Copernicus Astronomical Center)
Bartycka 18, Warszawa, Poland
For details please check the conference web page: http://www.ncac.torun.pl/ncac_symp/

Transportation from the Hyatt Regency/Belwederski/Warsaw University (Hera) hotels:
There will be free of charge mini-bus service from Monday to Thursday leaving at 9:15 from the Hyatt Regency hotel to NCAC. It is on the opposite side of the Warsaw University hotel, and a few minute walk (~350 m) from the Belwederski hotel (see the map on the conference web site). The service will be provided by SUPER TAXI and the password will be JOANNA. There will be also our person with the NCAC sign in front of the Hyatt Regency hotel to avoid confusion.

Presentations during the Conference:
Those of you who will be giving an oral contribution are kindly requested to pass their presentation (.pdf or .ppt format) to the LOC member in charge NOT LATER than during the break preceding your session. We would like to avoid the hassle (and waste of time) of changing laptops between presentations, so please use the conference equipment for your presentation. The time allocated for each talk includes 5 min for discussion.
Keep in mind that the size of the poster panel is suitable for up to A0 size portrait (84x 119cm). It will be possible to put your poster already on Sunday, at the time of registration.

Internet
During the conference wireless Internet will be available. Participants living in the NCAC hotel will also have wire access to the Internet on their rooms.

Lunch & Breakfast:
Lunch will be served at the cafeteria of N. Copernicus Astronomical Centre and is included in the registration fee. For those living in the NCAC/SRC hotels breakfast will be served from Monday till Thursday at 9.00 at the same place. All participants are welcome to join for “weak-up coffee” and refreshments.

Social events
In addition to the Welcome cocktail Sunday, 28 August, we have scheduled the following social events, all included in the registration fee:
Monday, 29 August, 18:00: Grill party at the NCAC
Wednesday, 31 August, 19:00: Conference dinner
Thursday, 1 September, 12:30: Lunch & site seeing in Wilanów

Contact phones
In the case of any problems do not hesitate to contact:
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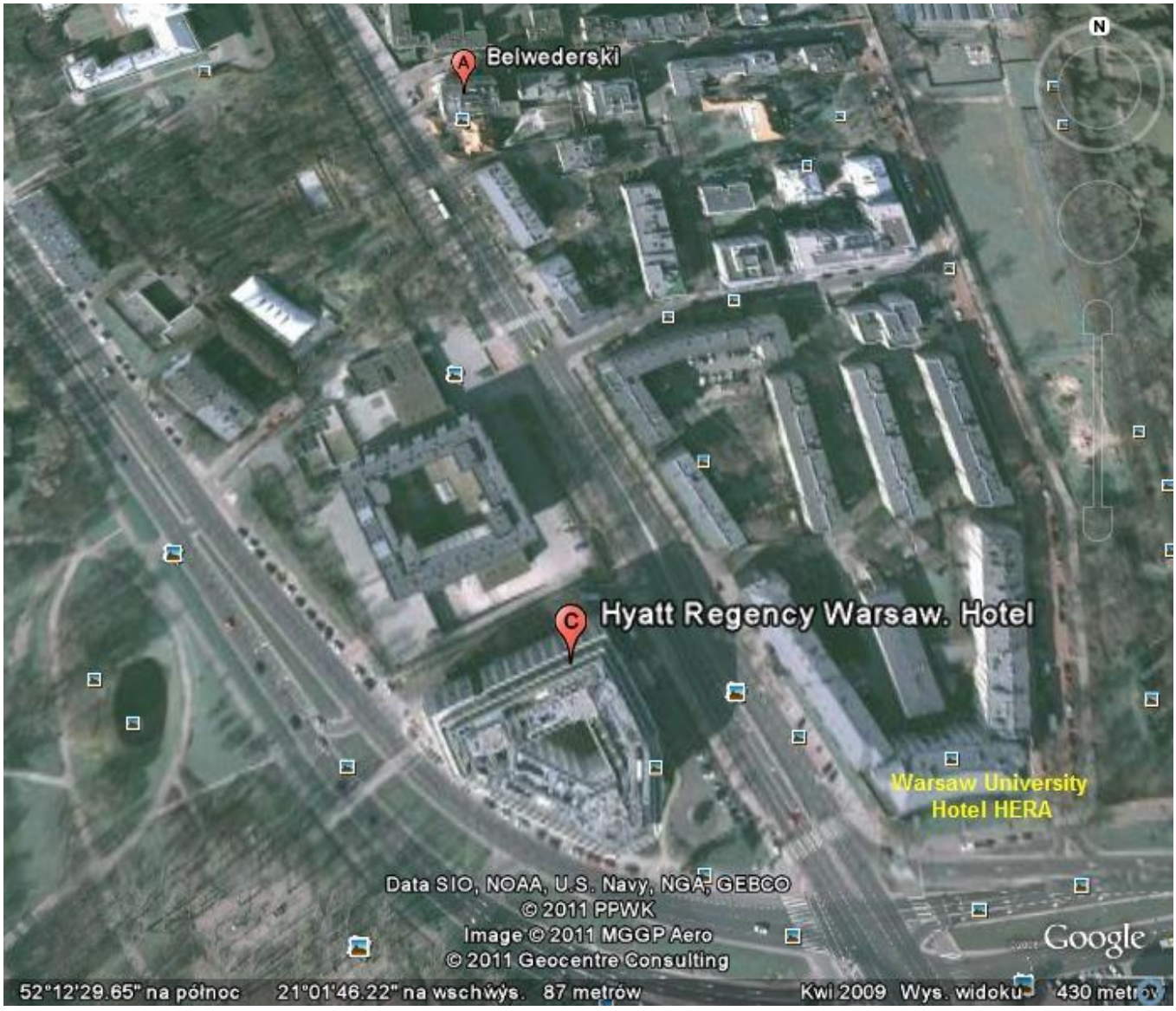
Joanna Mikołajewska - +48 609 784 836, +48 22 8724064, or
NCAC reception desk: +48 22 841 00 41

Welcome in Warsaw,
Joanna Mikołajewska and Ryszard Szczerba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A108
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