

ASTRONOMY WITH RADIOACTIVITIES V

“FROM GAMMA RAYS TO STARDUST”

SEPTEMBER 5-9, 2005

INTERNATIONAL CONFERENCE AT

CLEMSON UNIVERSITY, SC, USA

- *FIRST CIRCULAR* -

Scope:

Within the framework of nuclear astrophysics, "astronomy with radioactivities" is concerned with measurements and interpretations of cosmic radioactive isotopes in a variety of environments. The measurements are accomplished with instrumentation ranging from gamma-ray telescopes in space to mass-spectrometers in laboratories. This conference focuses on, but is not limited to the nucleosynthesis of radioactive isotopes, the astrophysics of their production sites, and techniques for detecting and measuring them in space and in the laboratory. The conference will bring together researchers from all relevant fields, to discuss this interdisciplinary topic in a group of about 100 scientists. We also celebrate the 70th birthday of Donald D Clayton, one of the pioneers of this field and of the founding members of this workshop series.

Three decades of extensive experimental efforts have advanced the astronomy of newly formed isotopes to the forefront of observational astrophysics: Gamma-rays from the decay of radioactive material probe nuclear processes in stellar interiors during hydrostatic and explosive phases. Light from supernovae is powered by the radioactivity they produce. Cosmic rays trace subsequent particle acceleration and transport. Meteorites contain decay products of live radioactivity injected at the dawn of the solar system and grains of pre-solar origin. Even the radioactivities included in some terrestrial material reveal cosmic nucleosynthesis.

The workshop aims to integrate astronomical studies of cosmic radioactivities into the general study of astrophysical processes, specifically the sites of nucleosynthesis and their evolutionary origins and endings. The observation of key isotopes tests our understanding of element synthesis in stars and in the interstellar medium, the environmental properties of sites of massive star formation, stellar evolution, the dynamics of the ISM, galactic chemical and dynamical evolution, the origin and evolution of the solar system, and chemical evolution of the universe as a whole. We also aim to "ground" theories through in-depth discussions of the experimental constraints, and debate the potential of new equipment and techniques to advance this field.

Previous conferences in this AwR-series were "The Radioactive Galaxy" (Clemson University, 1996) and "Astronomy with Radioactivities II,III,IV" (Bavaria/Germany in 1999 and 2001 and 2003, respectively).

Program

Astrophysical questions to be addressed include, but are not limited to:

- How do supernovae explode, and how do they produce and eject new isotopes? What are the relevant astrophysical conditions we expect/observe?
- How are key isotopes such as ^{44}Ti , ^{22}Na , $^{56/57}\text{Ni}$ produced and ejected? Do we detect the expected number of sources of these isotopes?
- What is the relative contribution of AGB stars, novae, WR stars, and supernovae to the observed interstellar abundances of ^{26}Al and ^{60}Fe ?
- Where do the positrons in the Galaxy come from? What does the gamma-ray spectrum at (and below) 511 keV tell us about the annihilation environment?
- How do massive stars affect the chemical and dynamical state of the ISM? How are freshly synthesized isotopes re-distributed into the dust and gas phases?
- What are the sites of and mechanisms for cosmic-ray particle acceleration?
- How can we relate extinct radioactivities in pre-solar grains to their origins and the evolution of the early solar system?
- Do nearby supernovae leave unique traces near to or within the solar system? Can we distinguish "normal" supernovae from exceptional events like GRBs?

"Sessions" of the workshop will address these and related questions, each having an introductory talk, followed by a selected set of contributed talks, and advertisements of poster contributions. Lively discussions are a strong tradition at our workshops, and generous poster display and viewing will be arranged to ensure that each contribution is communicated effectively. Every selected presentation shall receive adequate time, and we will determine relative session "weights" according to the stated goals of this workshop and the interests expressed by the participants.

Main sessions of the workshop:

- **Production and Ejection of Radioisotopes from Source Sites**
Nuclear and hydrodynamic aspects of stellar evolution and explosions
- **Propagation and Fate of Radioisotopes in their Source Vicinity**
Early SNR phases, formation of molecules and dust, chemical evolution
- **Radioisotope Decay and Annihilation Gamma-Rays**
Diffuse ^{26}Al , ^{60}Fe , and annihilation emission, ^{44}Ti , ^{22}Na , ^7Be sources
- **Isotopic Compositions in Pre-Solar Grains**
Extinct radioactivities in pre-solar grains and their implications
- **Astronomical Capabilities and Opportunities**
Perspectives, projects, & concepts for cosmic radioactivity measurements

Organization

The workshop starts in the early afternoon of Monday, September 5, and ends early afternoon of Friday, September 9, 2005. Opportunities for hardware / project specific meetings can be arranged before & after the workshop program, if requested.

Organizers: Dieter Hartmann (Clemson University), Roland Diehl (MPE, Garching), Nikos Prantzos (IAP, Paris), and Ernst Zinner (Washington University, St. Louis). Questions on scientific aspects of the conference can be addressed by any of the organizers, but for inquiries on logistics please contact HDIETER@CLEMSON.EDU.

The workshop is informal and low-cost. A registration fee of \$100 covers workshop proceedings and excursion. Accompanying persons are welcome and will have a reduced fee.

The workshop location is the Madren Conference Center of the Clemson University in South Carolina, USA. Lodging for about 100 participants at the associated Martin Inn has been arranged, and detailed information on room reservations will be posted soon at the conference website. The special room rate for AwR participants is \$89 per night. For details please visit the conference website.

All interested scientists are welcome to participate¹. The expected number of conference participants is ~100, with all participants lodging at the conference site (e.g., the Martin Inn). There may arise the need to accommodate a larger number of participants, in which case we will make additional housing available nearby, and arrange for a shuttle service. Very limited resources are available to support your attendance. Please contact us early if you wish to attend this workshop, and depend on financial support to accomplish this.

We intend to publish proceedings with a suitable publisher, as we did for previous workshops (e.g., *New Astronomy Reviews* 48, No. 1-4, pp. 1-320, Feb. 2004).

Actions, Dates and Schedule

This circular is the initial announcement of the workshop, requesting a response to express interest and suggestions of oral or poster contributions. Subsequent circulars will describe the program and relevant information for participants. This information will also be posted on the workshop series and AwRV websites at:

<http://www.mpe.mpg.de/gamma/science/lines/workshops/radioactivity.htm>

<http://www.astro.clemson.edu/AwRV.html>

Schedule / Important Dates:

- 01 Mar 2005 Please express your interest prior to this date
- 01 Jun 2005 Provide details on your proposed contribution prior to this date
- 01 Jul 2005 Conference Program consolidation, 2nd Circular
- 01 Aug 2005 Registration deadline
- 15 Aug 2005 Final Program- and Organization Updates, 3rd Circular
- 05 Sep 2005 First day of conference
- 09 Sep 2005 Last day of conference
- 23 Sep 2005 Deadline for Proceedings Contributions
- 15 Apr 2006 Publication of the Proceedings

Please respond to this circular before **1 March (2005)** by email to hdieter@clemson.edu, to express your interest in participating in this workshop. We will remind you to provide (before **June 1 2005**) title, type (oral/poster), level (review), estimated time, etc. We look forward to your contributions to a stimulating workshop.

Clemson-Garching-Paris-St.Louis, December 2004

The Organization Committee:

Dieter Hartmann, Roland Diehl, Nikos Prantzos, and Ernst Zinner.

¹ we follow Lubchenko & Mehta 2004, *Science* Vol 305, p. 1531