

# **Lectures on Nuclear Astrophysics**

## **Report of Contributions**

Contribution ID: 0

Type: **not specified**

## Seminar

*Monday, 27 January 2014 09:00 (1h 45m)*

**Presenter:** COC, Alain (CSNSM Orsay)

**Session Classification:** Lecture series 1 - Big Bang Nucleosynthesis-Observation

Contribution ID: 1

Type: **not specified**

## Discussion

Contribution ID: 2

Type: **not specified**

## Seminar

*Wednesday, 29 January 2014 09:00 (1h 45m)*

**Presenter:** COC, Alain (CSNSM Orsay)

**Session Classification:** Lecture series 1 - Big Bang Nucleosynthesis-Observation

Contribution ID: 3

Type: **not specified**

## Discussion

Contribution ID: 4

Type: **not specified**

## Seminar

*Friday, 31 January 2014 09:00 (1h 45m)*

**Presenter:** COC, Alain (CSNSM Orsay)

**Session Classification:** Lecture series 1 - Big Bang Nucleosynthesis-Observation

Contribution ID: 5

Type: **not specified**

## Discussion

Contribution ID: 6

Type: **not specified**

## Seminar

*Monday, 3 February 2014 09:00 (1h 45m)*

**Presenter:** DESCOUVEMONT, Pierre (Universite Libre de Bruxelles)

**Session Classification:** Lecture series 2 - Reaction theories-Structure models for light nuclei



Contribution ID: 7

Type: **not specified**

## Discussion

Contribution ID: 8

Type: **not specified**

## Seminar

*Wednesday, 5 February 2014 09:00 (1h 45m)*

**Presenter:** DESCOUVEMONT, Pierre (Universite Libre de Bruxelles)

**Session Classification:** Lecture series 2 - Reaction theories-Structure models for light nuclei

Contribution ID: 9

Type: **not specified**

## Discussion

Contribution ID: **10**

Type: **not specified**

## Seminar

*Friday, 7 February 2014 09:00 (1h 45m)*

**Presenter:** DESCOUVEMONT, Pierre (Universite Libre de Bruxelles)

**Session Classification:** Lecture series 2 - Reaction theories-Structure models for light nuclei

Contribution ID: **11**

Type: **not specified**

## Discussion

Contribution ID: 12

Type: **not specified**

## Seminar

*Monday, 10 February 2014 09:00 (1h 45m)*

**Presenter:** BOMBACI, Ignazio (Pisa University & INFN)

**Session Classification:** Lecture series 3 - Pulsars and compact stars: experimental observations and theoretical models

Contribution ID: 13

Type: **not specified**

## Seminar

*Wednesday, 12 February 2014 09:00 (1h 45m)*

**Presenter:** BOMBACI, Ignazio (Pisa University & INFN)

**Session Classification:** Lecture series 3 - Pulsars and compact stars: experimental observations and theoretical models

Contribution ID: **14**

Type: **not specified**

## Discussion



Contribution ID: 15

Type: **not specified**

## Seminar

*Friday, 14 February 2014 09:00 (1h 45m)*

**Presenter:** BOMBACI, Ignazio (Pisa University & INFN)

**Session Classification:** Lecture series 3 - Pulsars and compact stars: experimental observations and theoretical models

Contribution ID: **16**

Type: **not specified**

## Discussion

Contribution ID: 17

Type: **not specified**

## Discussion

Contribution ID: **18**

Type: **not specified**

## **Exotic matter in neutron stars**

*Thursday, 13 February 2014 14:30 (1 hour)*

I will discuss recent measurements of neutron stars masses and radii and their implications for the equation of state of high density matter. I will focus in particular on the possible appearance of delta resonances, hyperons and strange quark matter and the dynamics of the formation process of such “exotic” degrees of freedom. Finally, I will present neutrino diffusion simulations of the cooling of newly formed strange stars.

**Presenter:** PAGLIARA, Giuseppe (Ferrara University)

Contribution ID: 19

Type: **not specified**

## "Strange" Neutron Stars

*Thursday, 13 February 2014 15:30 (1 hour)*

The high-density nuclear equation of state within the Brueckner-Hartree-Fock many-body approach is discussed. Particular attention is paid to the effects of nucleonic three-body forces, the presence of hyperons, and the joining with an eventual quark matter phase.

The resulting properties of neutron stars, in particular the mass-radius relation, are determined and compared with recent observational data. It turns out that in this approach stars heavier than about 1.4 solar masses contain necessarily quark matter.

**Presenter:** SCHULZE, Hans Josef (Catania University)

Contribution ID: 20

Type: **not specified**

## The cosmological ${}^7\text{Li}$ problem from a nuclear physics perspective

*Thursday, 30 January 2014 14:30 (1 hour)*

The primordial abundance of  ${}^7\text{Li}$  as predicted by Big Bang Nucleosynthesis (BBN) is about a factor 3 larger than what has been observed in metal-poor halo stars. We analyze the possibility that this discrepancy originates from incorrect assumptions about the nuclear reaction cross sections relevant for BBN.

**Presenter:** VILLANTE, Francesco Lorenzo (L'Aquila University)

Contribution ID: 21

Type: **not specified**

## Measurement of the reactions $^{17}\text{O}(\alpha, n)^{20}\text{Ne}$ and $^{17}\text{O}(\alpha, g)^{21}\text{Ne}$ and their impact on the s process in massive stars

*Thursday, 6 February 2014 14:30 (1 hour)*

The ratio of the reaction rates of the competing channels  $^{17}\text{O}(\alpha, g)^{21}\text{Ne}$  and  $^{17}\text{O}(\alpha, n)^{20}\text{Ne}$  determines the efficiency of  $^{16}\text{O}$  as a neutron poison in the s process in low metallicity rotating stars. It has a large impact on the element production, either producing elements to the mass range of  $A=90$  in case of a significant poisoning effect or extending the mass range up to the region of  $A=150$  if the g channel is of negligible strength.

We present results of the first measurement of the reaction  $^{17}\text{O}(\alpha, g)^{21}\text{Ne}$  and an improved study of the reaction  $^{17}\text{O}(\alpha, n)^{20}\text{Ne}$ , including an independent measurement of the  $^{17}\text{O}(\alpha, n1)^{20}\text{Ne}$  channel. A simultaneous R-Matrix fit to both the n0 and the n1 channels has been performed. New reaction rates have been calculated and used as input for stellar network calculations and their impact on the s process in rotating massive stars is discussed.

**Presenter:** BEST, Andreas (INFN - LNGS)

Contribution ID: 22

Type: **not specified**

## 14N(p,gamma)15O data at high energy

*Thursday, 6 February 2014 15:30 (1 hour)*

The  $^{14}\text{N}(p,\gamma)^{15}\text{O}$  reaction determines the rate of the CNO cycle because it's the slowest nuclear reaction of the cycle. For a precise cross section extrapolation to low energies one needs accurate knowledge of the excitation function over a wide range of energy. Therefore the non-resonant cross section of  $^{14}\text{N}(p,\gamma)^{15}\text{O}$  was studied at beam energies of 0.5 - 1.5, MeV at the 3, MV Tandatron of Helmholtz-Zentrum Dresden-Rossendorf. The talk presents the preliminary new data for the cross section of  $^{14}\text{N}(p,\gamma)^{15}\text{O}$ . With a R-matrix fit they could contribute to a more accurate extrapolation to the astro-physically relevant cross section at the Gamow-window of the reaction.

**Presenter:** WAGNER, Louis (HZDR, TU Dresden)