Boletim da Sociedade Astronômica Brasileira, **36**, no. 1, 144-145

The Three Herons Observatory: merging science and community engagement in the Mantiqueira mountains

L. de Almeida[1,2], A. T. G. de Oliveira[1,3,4], & G. S. Silveira Jr[1,3]

[1] Observatório Três Garças, Estr. da Fazenda Valparaíso, n 3, Eng. Passos, Resende, RJ, Brazil
e-mail: observatoriotresgarcas@gmail.com
[2] Laboratório Nacional de Astrofísica, Rua dos Estados Unidos, 154, Bairro das Nações, Itajubá, Minas Gerais, Brazil.
[3] Universidade Federal do Rio Grande do Norte, Campus Universitário Lagoa Nova; CEP 59078-900 Natal, RN, Brazil
[4] Universidade Federal de Alfenas, Rua Gabriel Monteiro da Silva, 700 Centro, Alfenas-MG

Abstract. The Three Herons Observatory (OTG), located in the rural area of Engenheiro Passos (Resende, RJ), aims to promote practical astronomy and conduct scientific observations. Construction began in September 2021 and was completed in January 2024, following a 'do-it-yourself' philosophy without professional labor and professional planning. The OTG features a manually rotating dome and initially houses a Celestron 5SE telescope on an equatorial mount. The pillar supporting the telescope and the dome's design can accommodate a telescope with a mirror diameter of up to 40 cm, capitalizing on the area's low light pollution for high-quality observations. The OTG will host scheduled school visits for night sky observations at least once a month and will offer introductory lectures in observational astronomy and astrophysics. OTG's scientific objectives include the characterization of exoplanets through the Transit Method for the brightest stars and tracking high-magnification gravitational microlensing events. The transit method detects the dimming of a star's brightness as a planet crosses in front of it. Simultaneously, the study of gravitational microlensing events observes the apparent brightening of a star caused by a massive object passing between the star and the observer. The fusion of scientific and educational goals allows the OTG to act as a hub for enthusiasts and researchers, fostering scientific interest among young and adult audiences. Thus, the Three Herons Observatory is distinguished as an exemplary initiative, where science and education work together to enhance knowledge and curiosity about the universe.

Resumo. O Observatório Três Garças (OTG), situado na área rural de Engenheiro Passos (Resende, RJ), tem como missão promover a astronomia na prática e também realizar observações científicas. Com a construção iniciada em setembro de 2021 e concluída em janeiro de 2024, o observatório foi erguido com a filosofia do "faça você mesmo", sem a contratação de mão de obra e planejamento profissional. O OTG dispõe de uma cúpula com rotação manual e, inicialmente, de um telescópio Celestron 5SE em montagem equatorial. O pilar que sustenta o telescópio e a arquitetura da cúpula podem abrigar um telescópio de até 40 cm de espelho, beneficiando-se da baixa poluição luminosa da região para observações de alta qualidade. O OTG irá receber visitas de escolas por agendamento para observação do céu noturno pelo menos uma vez por mês e contará com palestras introdutórias em astronomia observacional e astrofísica. Dentre os objetivos científicos do OTG estão a caracterização de exoplanetas, utilizando a técnica do Trânsito Planetário para as estrelas mais brilhantes, e o acompanhamento de eventos de microlentes gravitacionais de alta magnificação. A técnica de trânsito planetário detecta a diminuição da luminosidade de uma estrela quando um planeta transita à sua frente. Paralelamente, o estudo de eventos de microlentes gravitacionais observa o aumento aparente no brilho de uma estrela causado pela passagem de um objeto massivo entre a estrela e o observador. A combinação de objetivos científicos e educacionais possibilita que o OTG funcione como um ponto de convergência para entusiastas e pesquisadores, promovendo o interesse científico entre jovens e adultos. Assim, o Observatório Três Garças se destaca como uma iniciativa exemplar, onde a ciência e a educação caminham juntas para fortalecer a base de conhecimento e curiosidade sobre o universo

Keywords. Teaching of Astronomy, Miscellaneous,Techniques: photometric

1. Introduction

Interest in observational astronomy is growing in Brazil, however, there is a notable lack of suitable facilities for observation and education in areas distant from major urban centers. The Three Herons Observatory was conceptualized to address this gap, offering high-quality astronomical observations and promoting scientific education. The observatory aims to provide a platform equipped with telescopes and instruments that facilitate both amateur and professional research. Additionally, it is conceived to serve as an educational hub, encouraging local communities and visitors to engage with the sciences through workshops, talks, and guided observation sessions. By doing so, the observatory seeks to inspire a new generation of astronomers and contribute to the broader scientific literacy in the region.

The Three Herons Observatory (OTG) (Almeida, L 2022) was established in the Mantiqueira Mountains with the aim of integrating scientific activities and astronomical education. Located in Resende, RJ, OTG seeks to promote astronomy both for enthusiasts and the general public, through observations and educational events. This work describes the structuring, technical specifications, educational objectives, and the initial results obtained by OTG.

2. Infrastructure and Operations

- Physical Structure: The observatory dome was built using wood and covered with waterproof material. It is designed for manual rotation, with future plans for automation. An additional deck was constructed for the installation of portable telescopes and for naked-eye observation. In Figure 1 we can see the dome and deck during the day.
- Pillar and Telescope: The primary pillar is constructed of concrete with a diameter of 30 cm, ensuring a stable base for the telescope and minimizing vibrations. The "first light"

Figure 1. Dome of the OTG and deck

was achieved in June 2023, marking the commencement of observational activities.

– Operating Systems: The camera and telescope control is implemented via computer using ASCOM and Stellarium (Stellarium contributors 2024), allowing for remote and precise observations. However, there is also the option for manual operation, aimed at educational experiences.

3. Astronomy Outreach and Education

The OTG plays an important role in disseminating astronomical knowledge. Among the activities carried out are: Public observation sessions: Night presentations for observing planets, nebulae, and galaxies. Educational lectures: Explanations about celestial mechanics and the history of astronomy. Technical workshops: Teaching the handling of telescopes and astronomical tools.

The initial scientific focus of the OTG is the characterization of celestial bodies, such as star clusters and nebulae. The camera attached to the telescope allows for the capture of detailed images. Moreover, the observatory contributes to collaborative observation campaigns with other institutions. A highlight of the observations conducted is the capture of the Lagoon Nebula (Messier 8), a region of massive star formation shown in Figure 2.

4. Conclusion

In conclusion, the creation of the Three Herons Observatory marks a significant milestone in the promotion of astronomy in the region of the Mantiqueira Mountains. By bridging the gap between urban and remote communities, the observatory not only enhances scientific observation facilities but also cultivates an educational environment that invites both enthusiasts and the general public to engage with astronomical sciences. Through its robust infrastructure, innovative educational programs, and collaborative efforts, the observatory plays a crucial role in advancing scientific literacy and inspiring future generations of astronomers. The Three Herons Observatory stands as a beacon of scientific progress, inviting people to look up and explore the wonders of the universe with informed curiosity.

Figure 2. Messier 8. First light of OTG using a Canon T3i camera attached to the Celestron 5SE telescope.

Acknowledgements. This work greatly depended on the financial support of Maria Lúcia Pereira. The definitive associates of OTG are: Dr. Leandro de Almeida as the founder; Dr. Aléxia Thamy Gomes de Oliveira as co-founder; Maria Lúcia Pereira, George Siqueira da Silveira Júnior, and Martin Cruisk as associates.

References

L. de Almeida. Observatório Três Garças. LNA em dia, https://www.gov.br/lna/ p. 28 - 30, 28 nov. 2022

Stellarium contributors *Stellarium v24.3 Astronomy Software*. 2024 `https://stellarium.org/`. 10.5281/zenodo.13825639