

Solar Observations in Pope Sylvester II's Astronomical Observatory in Bukowiec

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(*Pope Silvester II's Astronomical Observatory in Bukowiec*)

Abstract

The activity of the Pope Sylvester II Observatory in Bukowiec (Poland) included solar observations. Among them a large pinhole solar observatory with camera obscura has been realized in the aisles of the school, 70 meters long. These results have been presented to the CAP 2013 IAU congress in Warsaw on october 15-20, 2013.

1. Location

51° 41' 28.23" N, 19° 40' 32.80" E, 214 m above sea level --
Observatory Grounds, Bukowiec, Poland [fig. 1] suburban skies
Limiting Magnitude (NELM) of 5.4...5.6, Bortle scale class 6) 18 km
SE of Lodz, Poland [fig. 2]
Vicinity: village of Bukowiec (population of roughly 1000 people)

2. Objectives

- promoting amateur astronomy
- illustrating history of astronomy
- demonstrating value of even the simplest astronomical techniques such as pinhole astronomy (i.e. *camera obscura*)
- performing meaningful scientific observations engaging the general public

3. Materials and methods used

- various pinholes
- a 102mm refractor (Celestron Omni XLT) with mylar filter
- a dedicated 60mm solar telescope (Lunt LS60THa/B1200), sometimes with a Canon EOS 550D DSLR camera

4. Solar workshops

The workshops took place on May 13-16, 2013, both at the Observatory [fig. 4] and at local Primary School in Bukowiec. The weather was stable and sunny for most of the time. The workshops were coordinated by C. Sigismondi and M. Kata.

During our workshops we observed the Sun with the exact same method Johannes Kepler did back in 16th Century. It was hence a very good lesson in the history of astronomy for all of the participants. The effect was amazing despite the obvious disadvantages of the method.

We also managed to construct possibly the biggest camera obscura in the world, which resulted in an image of the Sun that was 70cm in diameter [fig. 3].

The spots were clearly visible and generated appropriate interest from the kids. There were also many questions, sometimes very surprising, however we managed to answer all of them. The kids could also construct their own version of the device, albeit a tad smaller [fig. 5].

We also employed the telescopes described above in the course of our workshops. It allowed us to impart some knowledge regarding their construction to the participants as well.

Overall, the event was a huge success and sparked positive interest in astronomy, especially among the participants.

5. Solar workshops

On June 8, 2013, the authors took part in a picnic held at the observatory grounds, with the intention of promoting the observatory and astronomy in general, which is one of the activities

of the observatory's own *AstroMax* Astronomy Outreach Group. The sky was partially clouded. Nevertheless, the authors set up two telescopes on the field near the observatory building: a 102-mm refractor (Celestron Omni XLT) with a solar filter installed and a dedicated 60-mm solar telescope (Lunt LS60THa/B1200). Whereas in the visible band only a number of spots was visible, using the H α solar telescope the authors have managed to observe not only spicules and a clear case of solar prominence, but also a distinct shape of a solar filament.

The decision was made to swap the eyepiece used for the demonstration with a CCD camera as quickly as possible, and despite the degrading weather the authors have successfully obtained a number of frames with this phenomenon, clearly discernible, as proof of its visibility from the observatory's location at the time [fig. 6].

The filament was clearly visible from 1530 to 1730 UTC, with short interruptions due to passing clouds. After the picnic and hence the demonstration were concluded, the authors proceeded to compare the observation with the most current image to be found at the Solar and Heliospheric Observatory website and located the filament without any trouble in the image taken by the Extreme ultraviolet Imaging Telescope (EIT) at 304 Ångström, corroborating the observation [fig. 7]. Further study revealed the filament appeared as soon as on June 6 and continued at least until June 12, 2013.

Generally, solar prominences are cooler and denser regions in the corona, at least to their immediate surroundings (Tandberg-Hassen, 1995). Such prominences can also take the form of filaments, that is, dark features in absorption when observed in H α (Fuller et al., 2005). While less pronounced and of shorter duration, filaments are known to form even during solar minima (Panasenco & Pevtsov, 2010). Detected filaments and information regarding them, such as length, location, perimeter, intensity etc. are reported and featured in

databases, such as the EGSO Solar Feature Catalog (Fuller et al., 2005). However, in order to achieve continuity and completeness of observations, nearly every case of a filament should be widely reported and catalogued after confirmation. While sun spots are commonly known in amateur astronomy and to the public, due to slightly higher cost of entry-level solar telescopes, the knowledge of other possible structures observable across the Sun is less complete. Observation of such structures (and logging the results) could be, therefore, an interesting science project for secondary school students, especially those already familiarised with the basics of solar observations by the means of other presentations and exercises in pinhole astronomy (Sigismondi, 2000). A solar telescope also has other benefits, such as the ability to be deployed in the middle of the city (no light pollution), and in the case of working with children, also more socially-acceptable hours for the observational activity. It also allows the public to monitor (or at least catch a glimpse of) the Sun's activity even when there are no sunspots to be observed visually (Panasenco & Pevtsov, 2010). Finally, there is constant need for solar observations, as the current state of knowledge regarding solar cycles is not yet satisfactory, despite years of monitoring. Therefore, observations of structures on the Sun are a feasible educational activity apart from being rewarding for an amateur astronomer.

6. Conclusions

Solar observations due to more acceptable hours are important in outreach and in teaching astronomy. There is also value in reporting observation of the Sun even from simple instruments. They also serve as a practical illustration to history of astronomy. All things considered, solar observations remain an important part of our outreach program at Pope Sylvester II's Astronomical Observatory in Bukowiec.



Fig. 1. Location of the Observatory as shown by Wikipedia.

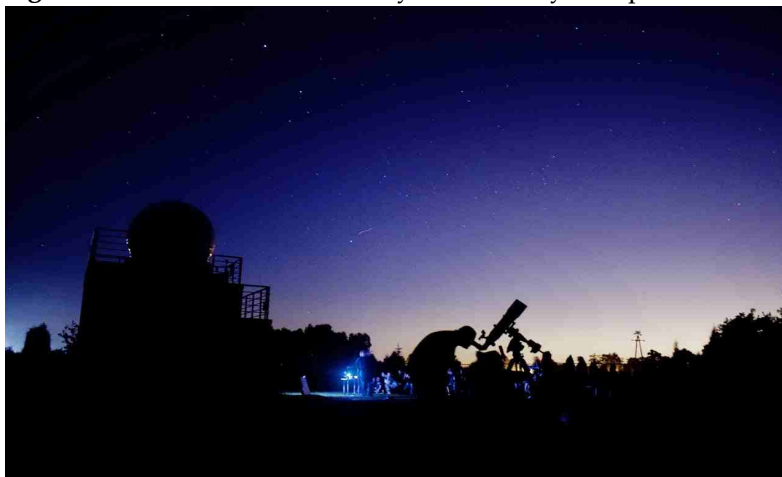


Fig. 2. suburban skies in Bukowiec.



Fig. 3. A very large pinhole telescope renders its results. The image of the Sun was 70 cm in diameter.



Fig. 4. The building of the Observatory as it looked in 2010.



Fig. 5. Some of the participants of our workshops building their observational instruments.

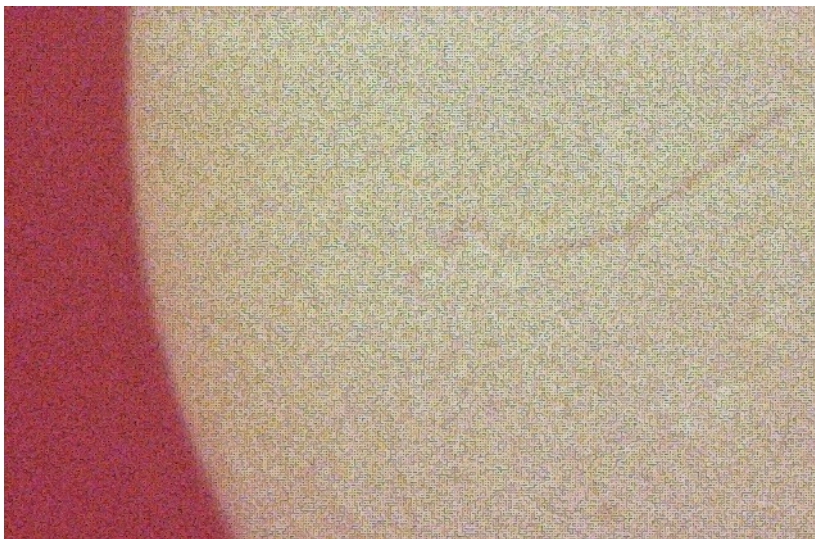


Fig. 6. The filament observed on June 8.

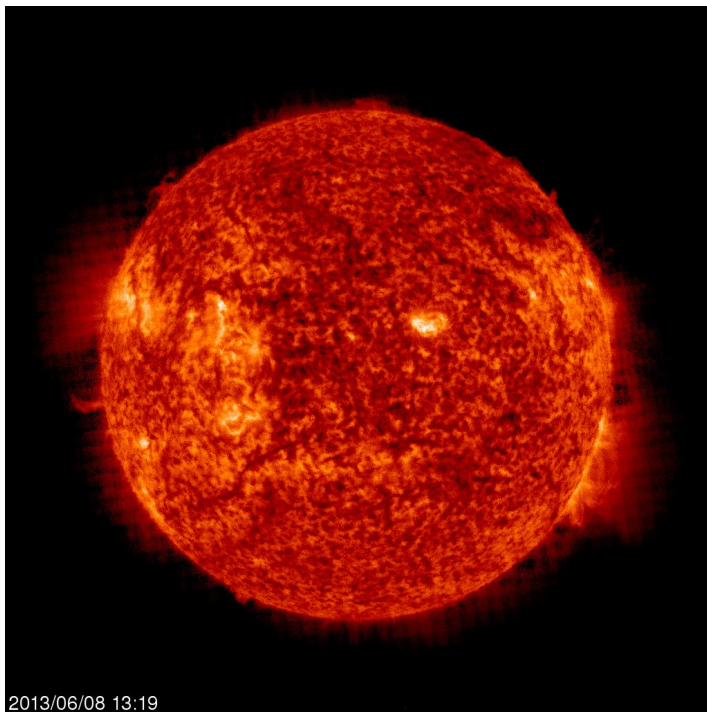


Fig. 7. The very same filament observed by SOHO's EIT 304 telescope that day. *Image credit: NASA/Goddard Space Flight Center. Courtesy of SOHO/EIT consortium. SOHO is a project of international cooperation between ESA and NASA.*

6. References

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