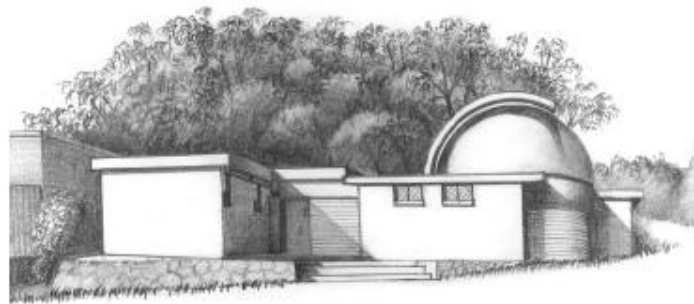


# Southern Observer

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## Observations

by Snaevarr Gudmundsson

Intro by Lou Pagano

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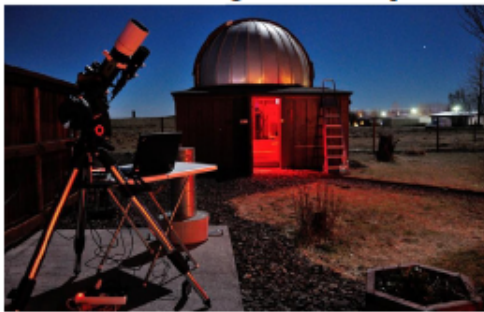
### *Photometric Observations of Eclipsing Binaries and Transiting Exoplanets*

This is the fifth report, since 2013, summarizing astronomical photometric observations made by Icelandic amateur observer, Snaevarr Gudmundsson. This comprehensive report is published by the South East Iceland Nature Research Center. It highlights photometric observations of selected eclipsing binaries and exoplanet transits, obtained in 2020, by Snaevarr. Observations were made of the eclipsing EW stars HX UMa, V 523 Cas, V 477 Peg, V 549 And, V 705 And and V 473 Cam, and the transiting exoplanets WASP 10b, HAT-P-51b, TrES 5b, Qatar 4b, HAT-P-16b, HAT-P-19b, HAT-P-52b, K2-30b, XO-6b, HAT-P-32b, Qatar 1b og WASP 33b.

Snaevarr, with his partner Siddy, visited Green Point Observatory in October, 2018, where he gave a presentation to SASI members on Icelandic Astronomy as well as Icelandic Geology.

#### *Abstract (from pg V):*

In this report, astronomical observations obtained in 2020 from the Nes Observatory, Southeast Iceland, are highlighted with emphasis on photometric observations of the eclipsing EW stars HX UMa, V 523 Cas, V 477 Peg, V 549 And, V 705 And and V 473 Cam. The goal of these projects is to determine accurate timings of mid-eclipses and



compare the results with predictions. Routinely these do not coincide and one of the causes is orbital fluctuation. The measure-

ments test published periods and ephemerides and provide information about the stability in such systems. Secondly, transits of the Bright Transiting Exoplanets (BTE) WASP 10b, HAT-P-51b, TrES 5b, Qatar 4b, HAT-P-16b, HAT-P-19b, HAT-P-52b, K2-30b, XO-6b, HAT-P-32b, Qatar 1b og WASP 33b were observed in 2020. The general goal was to estimate deviation in duration, depth and time. Results from observations of eclipsing binaries and exoplanet transits were submitted to the international databases of B.R.N.O. and TRESKA, the Variable Star and Exoplanet Section of the Czech Astronomical Society, where they are accessible to the astronomical community.

This is the fifth report of astronomical observations published by the South East Iceland Nature Research Centre. The preceding reports were published in 2016, 2018, 2019 and 2020. The first two were in Icelandic only. The third and fourth report, and the present one, have an abstract, text of figures and a summary of the observations in English. These reports are available for free downloading at:

<https://natturumyndir.is/reports/> and  
<https://nattsa.is/utgefifid-efni/>

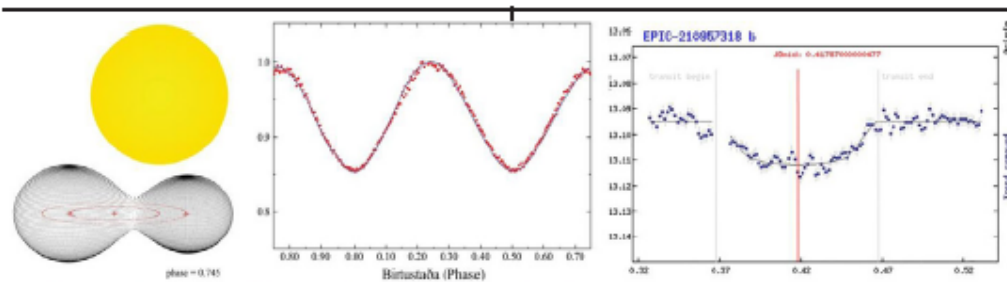
#### *Please Note:*

*The Abstract and Summary are in English but most of the data and graphics are in Icelandic.*

*The following pages have some observations and data in English: Pgs, 28, 33, 34, 38, 41, 42, 48, 54, 56, 58, 59, 62, 63, 64, 66, 68-76.*

#### *Summary (from pgs 79-80):*

This is the fifth report since 2013 summarizing astronomical observations made at the Nes Observatory in Hornafjörður, Southeast Iceland. The present report is published by the South East Iceland Nature Research Center. It highlights photometric observations of selected eclipsing binaries and exoplanet transits, obtained in 2020. Observations were made of the eclipsing EW stars HX UMa, V 523 Cas, V 477 Peg, V 549 And, V 705 and V 473 Cam, and the transiting exoplanets WASP 10b, HAT-P-51b, TrES 5b, Qatar 4b, HAT-P-16b, HAT-P-19b, HAT-P-52b, K2-30b, XO-



6b, HAT-P-32b, Qatar 1b og WASP 33b.

The observations of HX UMa, which were done in February and March 2020, revealed a minor time deviation compared to its ephemeris. The results were used, with a collection of data submitted to the AAVSO and B.R.N.O. databases, to examine the period and depth of eclipses. To model the system, parameters from Selam et. al (2005) were adopted. Data on radial velocity, accessible at the David Dunlap observatory, Toronto, Canada, were used to constrain the model. It is worth noting that the author's observations of this rather bright object were done with a 80 mm refractor. Data acquired by the B.R.N.O. database submitters Jaroslav Trnka, Jan Benáček and R. Mrllák, and the AAVSO submitters Vance Petriew, Shawn Dvorak and G. Persha reinforced the results of this project.

In the autumn of 2020, a handful of observations were aimed at V 523 Cas. Author had previously observed this star in 2012 and 2014, and the intention was to continue data acquisition and examine the period and its O—C graph. Along with radial velocity data, accessed at the D. Dunlap Observatory in Canada, the photometric data was used for modelling the binary. The orbital period of V 523 Cas is amongst the shortest known and the star is noted for variations in light curve and changes in period. The existence of a third star in the system has been postulated. Because V 523 Cas is a rather bright star, a 80 mm refractor was used for the mission. Although this yielded satisfactory results, there is no doubt that a larger telescope would be a better choice for measurements of this kind. The results indicate light fluctuations during maximum, most likely originating in the photosphere or chromosphere of the star, possibly stellar flares. Probable spots on the surface of the star have to be considered when model-

ling. Magnetic disturbances and starbursts are well-known events on EW binaries.

Although very few observations are presented in the O—C diagram, the time deviation is significant.

Three observations were implemented of V 477 Peg in the fall of 2020. Very little information exists about this star, and it is only specified in three papers at time of writing. Observations, obtained over a period of ten days, revealed mid-eclipse occurring 24, 34 and 36 minutes later than B.R.N.O. predicted timings. Orbital instability characterizes several EW binary systems, and has been noted in previous reports. The period was determined from the very sparse data and turned out ~17 seconds longer than the accepted orbital period. The amplitude of V 477 Peg varied significantly. The secondary eclipse measured on September 15, 2020 turned out shallower than the two others. The author can offer no explanation of this strange result. Evidently more observations are needed.

From September 2020 to April 2021, several observations of transiting exoplanets were obtained at the Nes Observatory. 31 transiting events of 22 exoplanets were measured during the season. For comparison, from 2010 (the first time measurement) to 2019, the author managed 29 observations of such events.

To read the rest of the report and results of more eclipsing binaries and transiting exoplanets, see: <https://natturumyndir.is/reports/>

To summarize, 31 nights were used for observation from August 19 to December 31, 2020. Two telescopes (pages 24-25) were used to increase data acquisition. Weather conditions in Iceland provide few opportunities for measurements of these kinds. The small refractor was mainly aimed at bright eclipsing binaries, while the 40cm reflector was used for the exoplanet transits.