

PHY-765 SS18: Gravitational Lensing. Worksheet Week 4

1 Poster presentations

The main task of this week is presenting your prepared posters. Presentations will be ~ 5 -7 minutes plus a few questions from the audience.

2 The Lens Mass of The First Lens Discovered

The lens shown in Figure 1 was the first ever lens discovered (Walsh, Carswell & Wemann, 1979). The following exercise offers the opportunity to estimate the mass of the galaxy (system) lensing the background quasar. As shown in Figure 1 the two images of the background quasar ('A' and 'B') are roughly $6''$ apart. The source quasar is at redshift 1.41 and the lens galaxy, labelled 'G1' in Figure 1, is at redshift 0.36.

2.1

From the angular separation, estimate the Einstein radius for the Twin Quasar.

2.2

Use the Einstein radius to obtain an estimate of the mass of the lens galaxy, assuming a point mass lens.

2.3

Is this a large or small lensing mass for the single galaxy G1?

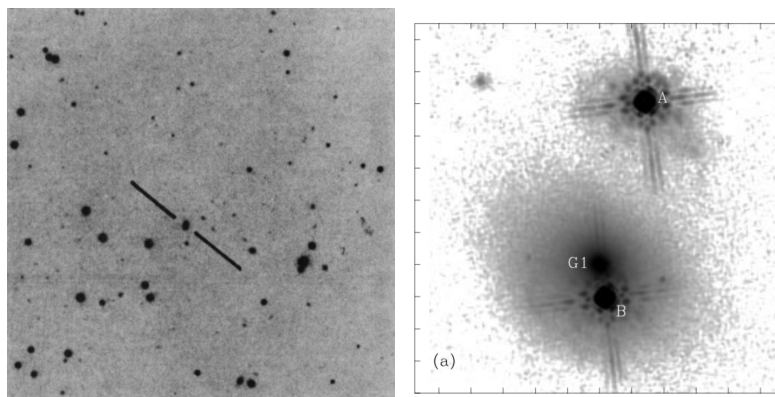


Figure 1: The first gravitational lens discovered: "the Twin Quasar" QSO 0957+561. The left panel shows the original finding chart from Walsh, Carswell & Wemann (1979), whereas the right panel presents a $\sim 12 \times 12$ arcsec zoom-in from Keeton et al. (2000).

3 Multiple images of SN Refsdal

Having seen the spectacular lens geometry of SN Refsdal in [this week's slides](#), how does the results from [exercise 2.5 on the worksheet from Week 3](#) compare to this?