Sabbatical visit Adam Muzzin

Adam Muzzin is an Associate Professor at York University in Toronto, Canada. His primary research interests are in the evolution of galaxies over cosmic time and the growth of large-scale structure. He has a long-time collaboration with both Profs Hoekstra & Franx, particularly fostered during his postdoctoral fellowship in Leiden from 2011 – 2014. To strengthen these connections, Prof Muzzin would like to spend six months of his upcoming sabbatical at Leiden Observatory, July 2022 - Dec 2022, specifically to collaborate with Prof Henk Hoekstra and Prof Marijn Franx, and their research groups, on several science projects related to ongoing and upcoming space-based infrared missions. The common projects and synergies between complementary projects will benefit greatly from this collaborative period.

One of the objectives of the visit is to advance the development of algorithms for the discovery of IR bright gravitational lenses in Euclid data. Prof Muzzin is a Canadian member of the Euclid collaboration, and he has carried out exploratory studies in the past with with both Prof Hoekstra & Franx (e.g., Muzzin et al. 2012, Hill et al. 2016, Muzzin et al., in prep.) In particular, Profs Muzzin, Hoekstra and Franx will work on the development of algorithms to detect these red objects within the Euclid data alone based using existing space and ground-based catalogues. The outcome of this will be optimized algorithms for the detection of > 1000 of these such objects in the Euclid data. This would be a significant step forward for the field, as at the moment, < 10 such objects are known. These highly magnified sources are ideal for follow-up with AO observations from GIRMOS (of which Muzzin is project scientist) which will allow a first-look at the internal structure of massive galaxies in the early universe and provide key clues on their evolution. This work will benefit from the expertise of the developers of the Euclid NIR pipeline (co-led by Bouwens) in Leiden.

Prof Muzzin is also a member of the JWST NIRISS GTO science team. He is a member of the CANUCS project, a 204hr guaranteed-time survey with NIRISS, NIRCAM and NIRSpec on JWST. Within CANUCS he is the photometry working group leader, the team that is responsible for delivery of photometric catalogues to the CANUCS collaboration. Prof Franx is a member of the JWST NIRSpec GTO team who are performing complementary spectroscopic observations to NIRISS. Now that JWST has been launched and an expected in-orbit checkout of 2-6 months, the GTO data from both teams will become first available during Prof Muzzin's sabbatical in Leiden. Prof Muzzin plans to collaborate with Prof Franx on synergies between the two GTO teams. In particular the simultaneous exploitation of the two datasets for the discovery and spectroscopic confirmation of the most distant galaxies in the universe is a top goal of both projects. Although both teams are using NIRSpec to confirm objects, the selection of targets will be done with different data. Prof Muzzin will work with Prof Franx to optimize target selection for pending observations. In particular he plans to focus on colour-selection methods that take advantage of strong emission lines that should be detectable in the broad/medium bands for both projects. The result of which will be optimized detection of the first galaxies in both projects, which ultimately will lead to publications on their stellar populations and formation history based on JWST NIRSpec spectroscopy.

Research Budget: Prof Muzzin has his own Canadian research grants from NSERC, but funding rules prevent Prof Muzzin's research grant from being used to offset the cost-of-living expenses while in Leiden. Because of his wife's career, Prof Muzzin cannot move his family to Leiden and will be living there alone during his sabbatical. He therefore cannot rent his house in Toronto out, and the cost of maintaining two residences would make it impossible for the sabbatical to occur without additional funding.

The cost of a suitable long-term rental in Leiden is about €2200 per month, while travel costs amount to about €1000. We therefore request a total of up to €14000 from various sources to help defray the costs of Prof Muzzin's visit to Leiden. We request €4000 from NOVA to support this visit. The remainder of the costs are covered by personal grants of Hoekstra and Franx, and by Leiden Observatory.

References

Muzzin et al. 2012, ApJ, 761, 142
Hill et al. 2016, ApJ, 819, 74