ASSA Deep-Sky Observers Section Annual report for 2020-2021

In 1665 Isaac Newton used his Plague Year quarantine time to invent calculus and discover the relation between perceived colour and the refractive index of glass, laying the foundation for what we know as optical spectroscopy.

The ASSA Deep Sky Observers Section didn't quite got that far off the deep end, but all that time plopped in front of a computer screen to stay our of Covid's cloak-and-sickle did end up with a nice clutch of *Nightfall reports*.

Multi-Topic Regular Issues

Vol. 4 #1 (June 2020) introduced embedded videos and simulations such as an Orion Nebula fly-through produced by the ESA, as well as a drone flight over Sutherland and sunset made by Willie Koorts. Magda Streicher produced an exciting account of her trip to the remote arctic to see and photograph the aurora borealis. Carol Botha introduced readers to the world of online observing using remote observatories in Chile and the Canary Islands. Martin Heigan's hydrogen-alpha images of the LMC illustrated the abundances and location of warm gas masses which can feed star-forming associations. Carol Botha further produced her images and observational charts of the Milky Way's three ultra-massive young star clusters Westerlund 1 & 2, and NGC 3603. All three are hot, heavy, and dense, and will pop supernovae off like strings of firecrackers across the next 5 million years. Finally, a young lad named Isaac Newton bought a curiously-shaped triangle of glass at a county fair and passed the year 1665 in rural quarantine from the Plague that killed 30% of London turning this toy into the rules that relate refractive index in glass to the spectrum of colours that makes up 'white' sunlight. The beautifully illustrated article is a stunning example of the scientific method put to practical use.

Vol. 4 #2 (October 2020) featured a beautifully imaged Magda Streicher report on observing all 23 of the Hogg star clusters compiled not by the renowned Helen Sawyer Hogg of the 'Harvard Computers' but rather by one Arthur Hogg, a star cluster enthusiast at what is now the Mt. Stromlo Observatory in Australia. Magda had such a difficult time identifying many of these as obvious star clusters that she wondered why Arthur Hogg was so besotted with them. That same issue saw two excellent features profiles of ASSA astrophotographers, *Tiann Niemand* and *Angus Burns*, whose work regularly appears in the *ASSA's Astrophotography Gallery*. Martin Heigan and Carol Botha also contributed superb articles and images in this issue.

Single-Topic Special Reports

The seven months from Dec 2020 to July 2021 saw no fewer than five Nightfall Special Reports—single issues devoted to a single subject.

Dec 2020 saw *Special Report #8 (SR8 for short), 'The Loneliness of the Long-Distance Nobody'*. This 27-page study shows how a remote, lonely, and very ancient spheroidal dwarf galaxy can suddenly sprout six infant spiral arms in a blaze of new star formation using a hefty

supply of pristine hydrogen supplied by the most unlikely location imaginable—an immense cosmic void regarded as one of the emptiest places in the Universe.

Jan 2021, *Special Report #9 featured the astrophotography of Yolanda Combrink*, a promising astrophotographer recommended to Nightfall by Martin Heigan Yolanda's mastery of extremely long integration times turns her ghastly Bortle 8 skies at home into magnificently detailed images of nebulae that few other imaging methods can produce. It can take Yolanda 3 weeks of painstaking photon-grabbing to produce enough selectively filtered photons for a single scientifically accurate image—and all this using inexpensive off-the-shelf equipment affordable to the average backyarder. Yolanda's commitment to thoroughness and exactitude is an inspiration to all of us. *Catch up with her latest work here*.

Jan 2021 also saw *Special Report #10, 'Cameos on Black Velvet—Precocious Planetaries*', a beautifully imaged parade of rarities in the planetary nebulae realm, some of them imaged successfully for only the first or second time—and all this using a pair of 6-inch refractors in Spain operated remotely by Peter Goodhew, who lives directly under the take-off pattern at Heathrow Airport. Peter's method is similar to Yolanda Combrink's—narrowband images integrating total capture times of 35 to 70 hours. One-night-stands these frail beauties are not.

Feb 2021 saw the arrival of *Special Report #12, 'Resource Guide for Improving the Quality of Astronomy Education in South Africa*'—a ponderous name for an impoverished topic. How DO you classroom lesson plan or home-teach your children about astronomy amid the gazillions of websites, teacher aids, YouTubes, each-you-own-kids toys you can make with scissors and paper plates, lesson plans, videos, simulations, and similar tools? Well, start here. Then click on the embedded links, which take you to more embedded links, which lead you to even more links after that. You won't get a PhD this way, but at least you can tell the kids why planets and planetaries might look the same but are radically different. And *why*.

July 2021 Special Report #11, '*Why Do Galaxies Make Bars?*', painted a detailed portrait of why Late-Type Grand Design spiral galaxies like M51 initiated rotational instabilities starting about 8.4 million years ago that resulted in roughly 2/3rds of all spirals today having some form of bar structure (about 30% of which are invisible except in the infra-red). When you look at a barred spiral galaxy today and consider the immense pressures required to force the enormous mass of a spiral arm rotating around in a circle suddenly make a sharp right-angle turn toward the central bulge of the galaxy, and fractionate all its stars, gases, and dust clouds in such a way that the stars tend to lead the bar rotation in features like the Milky Way's 3 kpc stellar lenses; why the dust clouds in a spiral arm elongate into long filamentary threads readily visible on every bar's front edge; and why the spiral arm's myriad gas clouds all smooth from clotty blobs into a bland, featureless bands of light that stretch from one side of the galaxy all the way across the middle to the other side. If you've ever used a paddle to row a boat, you know how much energy it takes. So where does the energy come from that paddles a galactic bar?

Who Read This Stuff, Anyway?

Since its revival in October 2017, Nightfall has been read 1170 times in the USA, 1051 times in South Africa, 475 reads in Australia, 278 in the UK, 176 in Italy, 104 in India, 103 in the four Scandinavian countries, 99 in Germany, 94 in Canada, 87 in Croatia, 84 in the Netherlands, 79 in Spain, 44 in Japan, 44 in Thailand, 30 times in both Chile and Brazil, 21 New Zealanders, 17 in Russia, 15 in Ukraine, and lesser numbers in countries as diverse as Malaysia, Indonesia, Vietnam, Korea, the Philippines, Taiwan, Saudi Arabia, Turkey, Columbia, and 11 other countries—even tiny Togo and Ecuador at 1 each. The grand total is 3994 readers whose average dwell time per article in 4 mins 47 seconds. (Source: ISSUU.com)

*Nightfal*l will carry on as usual into the forthcoming year.

=Doug Bullis, DSO Section director