

SHINING A LIGHT ON LIGHT POLLUTION

Jules Smith

It's hard to imagine Richmond Hill, Ontario as the site of the largest astronomical observatory in Canada. As part of the GTA — the Greater Toronto Area — the town sits astride the country's most populous — and arguably brightest — city. As the light pollution from that city has increased over time, the ability of the telescope at the David Dunlap Observatory to resolve fainter and more distant objects has proportionately diminished.



The David Dunlap Observatory
(cc) [Marko Kudjerski](#)

It wasn't always this way.

During the early days of the 20th century, Clarence Chant, a professor of physics at the University of Toronto, developed an interest in astronomy. He convinced the University to include in its curriculum several astronomy courses, and then to construct an observatory on the campus.

Even then the encroaching light of the city soon made that telescope all but useless. So, in 1935 Chant constructed the observatory in Richmond Hill in honor of David Dunlap with financing from Dunlap's widow. At the time the town was an ideal location, near enough to the campus so University students and professors could commute, yet with a population of only about 2,000 and very little light to drown out the night sky.

Of course, the population grew, reaching its present 170,000, and with it came light, lots of light, light from homes, industries, sports fields, shopping malls, and street lamps. There was so much light that the David Dunlap Observatory was finally closed and sold in 2008. It was simply unable to serve the needs for which it had originally been built. Other telescopes in other less populated and darker parts of the world were deemed better investments of the University's money.

BIOLOGY IN THE DARK

Astronomical observatories aren't the only victims of light pollution. The biological rhythms of nocturnal animals and insects is disrupted when the night sky isn't as dark as nature intended.

Artificial light at night can disrupt foraging and hunting patterns, an advantage for some animals, a disadvantage for others. The net result isn't zero. Instead, the food chain is weakened or even broken. Consider just one example. We've all seen moths and other insects attracted to — and killed at — bright lights. We might think that this would make them easy prey for the birds and bats that feed on them. But those animals are frightened away by the lights, and must seek a reduced food supply elsewhere.

Artificial lights also interfere with reproduction cycles. Female turtles may be repelled by bright lights, avoiding shores where they would otherwise nest, while turtle hatchlings may be drawn toward inland lights — and closer to dangers from automobile traffic and predators — when they should instead crawl toward the darker waters.

Bright city lights have also been found to confuse bird navigation, drawing them away from their natural migration patterns and increasing the frequency of fatal collisions with buildings and towers.

Any damage to our environment will eventually affect humans as well, but we also suffer directly.

By design we need consistent cycles of light and dark that coincide with our own biological cycles, called circadian rhythms. When these rhythms are upset by artificial light our brains may not produce enough melatonin, a hormone that helps regulate the sleep cycle and that acts as an antioxidant in the body. Significantly, a study by the International Agency for Research on Cancer (IARC) has linked a deficiency of melatonin to some cancers. The study noted that “constant light, dim light at night, or simulated chronic jet lag can substantially increase tumour development. Other experimental studies show that reducing melatonin levels at night increases the incidence or growth of tumours.”

BRIGHT IDEAS

There is a relatively simple solution to light pollution: turn off the lights. Unfortunately, dark city streets are not conducive to safety. Airports need bright lights directed skyward to guide incoming pilots. Profit concerns dictate that retail establishments stay open late and maintain bright lights to attract consumers — like moths to street lamps. But many city lights can be shut off at night with no drawbacks.

While it may be wise to have the lights on at the ground floor of an office building to enhance security, there's little point in keeping upper floors illuminated when there's no one there. When employees work late, motion sensors can turn individual lights on and then turn them off again when the employees leave. Curtains or blinds can be used to keep that light inside where it belongs.

Street lamps can be fitted with shrouds so light is reflected downward, where it's needed, and not up into the sky. This has the added advantage of being more efficient, so lower power lamps — including energy efficient LED lights — can be used with no loss of necessary illumination.

(It should be noted that even these preferable light sources are not without problems. A report by the International Dark-Sky Association warns that some LED and induction lamps emit excessive light in the blue end of the spectrum and that “short wavelength light also increases sky glow disproportionately. In addition, blue light has a greater tendency to affect living organisms through disruption of their biological processes that rely upon natural cycles of daylight and darkness.”)



Sunset over Kejimikujik National Park
(cc) [Ryan Anderson](#)

DEFENDING THE DARK

While it may be too late to recover the night sky in Richmond Hill, efforts are underway to protect other wilderness areas from the encroaching glare of city lights. One favored location is Kejimikujik National Park in Nova Scotia, which the Halifax chapter of the Royal Astronomical Society of Canada hopes to have declared a dark sky preserve.

Jonathan Sheppard, a Parks Canada official with Kejimikujik, noted that members of the Society had visited the park to conduct light audits and found the results promising. “The readings that they got from here in Keji were already among some of the best that they had taken in the eastern part of Canada, and as good as in some places that are already dark sky preserves,” said Sheppard.

Achieving preserve status will require some changes, however. Certain parking lot and washroom lights will have to be shrouded so they reflect light downward. But those changes are doable, and well worth the effort. Sheppard explains, “If you’re here at night, you can see the Milky Way clearly, which is a breathtaking sight. It’s nice because there are so many lakes and rivers in Keji as well, that gives you an expansive sky, but also when you’re on the beach, the whole starry sky is reflected in the lake below.”

LIGHTS OUT

The David Dunlap Observatory is open again and in use under a new owner, albeit primarily for spectrographic analysis and community outreach and education. Astronomers have had to settle for this since major optical observations at the site have been rendered impractical.

While we may need to settle for less when it comes to star gazing, we should not — must not — settle for less when it comes to our environment and our health. Nor do we have to, if we truly appreciate the importance of dark skies and recognize that light pollution is as much a threat to our well-being as any other type of pollution.

If that means turning off a few lights, it’s a sacrifice well worth making.

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