

# Son et lumière

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Faculty of Science, Dalhousie University, Nova Scotia, Canada

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Thank you laureates and faculty of Dalhousie University.

I title my remarks “Son et lumière.” In bicultural Atlantic Canada, son et lumière may stir Dalhousie students whose commencement we celebrate this afternoon to think of a brilliant and clamorous display on a summer evening, animating the French fortress in Louisburg on Cape Breton Island. And certainly today’s graduates have earned saluting guns, chiming bells, and uplifting anthems, and the fireworks, if metaphorical, of parties last night and probably again tonight.

But I would like to draw the attention of the Faculty of Science to other more serious dimensions of sound and light. A quarter century ago, in 1983, I was the scribe for a report of the US National Academy of Sciences titled *Toward an International Geosphere-Biosphere Program: A Study of Global Change*. To researchers in environmental sciences and to many more people concerned about Earth’s nature, the phrase global change has become familiar. Global change brings to mind changes in the climate induced by humanity, perhaps one degree Celsius since the first telephone rang and electric lamp glowed. Global change conventionally also embraces climate’s cousins, such as alterations in land and ice cover, acidification of the oceans, and ozone depletion.

Yet, if Alexander Graham Bell were to return to his beloved Nova Scotia in 2009, Bell would find this year's climate little changed from one of the warm years of the 1890s that he passed by Bras d'Or Lake. However, the night sky would shock Bell. In 1909, over Bras d'Or, Bell's Silver Dart made the first plane flight in the British Empire. Had the Silver Dart scouted by night, pilot J.A.D. McCurdy would have seen that Nova Scotia after sunset meant darkness except for moonshine. Illumination was costly, more than 100 times per lumen the price today, and dim. The technology of Bell's light contemporary Thomas Edison had not yet diffused. When Nova Scotians looked up at the night sky a century ago, they saw swathes of stars. Today, however, our most familiar starry image may be satellites and astronauts looking down, observing the lights on Earth at night. The populated regions of the developed world are ablaze and increasingly also China and India.

Babylonians and Mayans would not have invented astronomy under a nighttime sky whitened by modern light. The loss may be not only our closeness to the heavens, which we now approach instead with platforms in space. My concern is that we have scarcely begun to think about the ecological effects of nighttime illumination. Not only bats and night owls are affected. A large fraction of insects behave sensitively to light, and the moon modifies the action of microbes. So, we may conjecture that the global change of night-time illumination is rippling through Earth's ecosystems. I wonder if some of the changes experts attribute to carbon dioxide and global warming may owe to nocturnal photons and their associates.

I call for the return of the Dark Night. Maybe a batman is amongst you to help, at least to illuminate the effects of nighttime illumination. In fact, Canadians help lead the International Dark Sky Association which campaigns to take back the night.

Now Bell, true to his name, was absorbed more by son than lumière. Bell was born into a world in which noise, except clanging hammers in a blacksmith's shop or flapping belts in a factory, was mostly natural. Had Bell placed one of his early audiometers in the Atlantic ocean, it might have heard pattering rain and

breaking waves, cracking ice, singing whales and snapping shrimp, and the occasional rumbling earthquake or marine landslide on the continental slope. Humans added little noise to the ocean until the 1870s, when marine motors began to diffuse and overtake the clipper ships that plied the China trade and the Beverly schooners that fished cod on the Scotian shelf. In the 20th century humanity multiplied the sounds of motors and propellers for shipping as well the tones to detect fish and submarines, booms to explore the seafloor for oil, and the buzz of jet ski's for fun. In fact, humans are adding about 3 decibels more sound each decade to the ocean, roughly doubling the power of the added noise. Because sound spreads widely in the oceans, human clamor touches every corner, though some regions and layers transmit less.

As I wonder about life in a darker night, I wonder about marine life in a quieter ocean. Alexander Graham Bell left us no measurements of the sound in the sea before human additions boomed. I propose scientists, environmentalists, and maritime industries organize an International Quiet Ocean Experiment in which humans refrain from adding noise to the oceans for a few hours. Because sound speeds in sea water, we might, fortunately, need to turn down the volume for only four hours or so globally to achieve a great diminuendo. During this time researchers would observe the behavior of many forms of life in the ocean that might respond to the quiet change.

At their origins *son et lumière* symbolized luxury. 17th and 18th century courts cultured festive illumination. In turn, inexpensive and thus plentiful sound and light cheered the 20th century. Forty summers ago, attending the Woodstock music festival, I enjoyed the midnight strobes flashing around the Grateful Dead and the ear-splitting purple haze of guitarist Jimi Hendrix.

But, as with many goods, humanity may have overshot. In the 21st century, I propose we widen the lens to view global change. Let us appreciate that peace with nature may involve not only choosing activities unlikely to disturb the climate but also restoring quiet and darkness. In fact, a noisy machine is an inefficient machine, as the noise is escaping energy. Cleverly engineered nightglasses already allow soldiers to see in the dark without floodlights or

torches, and super-efficient light-emitting diodes can offer the sparkle and safety of lamps, without spilling photons that hide the true stars and disturb venerable nightlife.

While loud and glaring, the 20th century witnessed great, favorable transitions for environment. By the year 2000 some 60 countries whose forests were shrinking earlier were enjoying net growth of their trees and woods. The 1912 Fernow Commission on forest conditions reported that Nova Scotia's forest resource risked exhaustion in two decades, while today forests cover a rising 77% of the province. Evidence suggests that even in the Congo and Amazon a great reversal is underway from deforestation to reforestation. The 21st century should be the century of the great restoration of nature. Dalhousie graduates and faculty lead cooperative global scientific endeavors, including the Census of Marine Life and Ocean Tracking Network. Conceive and conduct more programs, such as an International Quiet Ocean Experiment and a Global Change & Dark Night survey, that illuminate science while exciting humanity, with ingenuity, to restore nature.

In the morning, let sound awake us to possibilities and then light guide us to discovery. But tonight I hope Dalhousie graduates will enjoy their own Halifax Explosion that neither deafens nor blinds. Thank you.

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