Interview - Michael Byers

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Michael Byers is the Co-Director of the Outer Space Institute, a network of world-leading space experts united by their commitment to highly innovative, transdisciplinary research that addresses grand challenges facing the continued use and exploration of space. He is also a Professor of Global Politics and International Law at the University of British Columbia. Dr. Byers has been a Fellow of Jesus College, Oxford University; Professor of Law at Duke University; and a Visiting Professor at the universities of Cape Town, Tel Aviv, Nord (Norway) Novosibirsk (Russia), St Andrews, and the Geneva Graduate Institute. His most recent book, co-authored with Aaron Boley, is Who Owns Outer Space? International Law, Astrophysics, and the Sustainable Development of Space (Cambridge University Press, 2023).

Where do you see the most exciting research/debates happening in your field?

Over the course of my career, I have studied the interaction of international relations and international law across a wide range of issue areas, from human rights to armed conflict, climate change, the oceans, the Arctic and now Outer Space. Needless to say, there is a lot happening presently!

I recently taught a course on the wars in Ukraine and Gaza, and another course on outer space — with a focus on four powerful actors: the United States, Russia, China, and SpaceX. I am particularly interested in how these and other actors, including coalitions of less powerful states like the European Union and the G77, seek to reshape existing international rules or create new ones, to both address emerging challenges *and* advance their interests. International law is currently quite dynamic, with some multilateral law-making bodies such as the United Nations Committee on the Peaceful Uses of Outer Space functioning quite well, even if they operate on the basis of consensus (where every state effectively has a veto).

I am also interested in how international rules and international institutions respond to extreme stress, including, at the moment, the stresses resulting from global environmental degradation, the wars in Ukraine and Gaza, and the return of Donald Trump to power. For students of international relations and international law, these are both terrifying and exciting times!

How has the way you understand the world changed over time, and what (or who) prompted the most significant shifts in your thinking?

I have become increasingly aware of the need to understand the context that surrounds everything we study. For instance, any IR scholar studying the war in Gaza needs a developed knowledge of the history of the Middle East, ideally advanced by spending some time in the region. Anyone studying the Arctic also needs to spend time there, interacting with Indigenous people, other residents, and scientists studying the many impacts of climate change on the “cryosphere” — the sea-ice, glaciers, and permafrost. And anyone studying the politics and law of Outer Space needs to learn basic orbital dynamics, which — in my experience — is not an easy thing to do! Engaging with context and experts from other disciplines has helped me understand how deeply connected everything is. If scholars wish to understand and perhaps influence how things develop, they must embrace complexity rather than trying to “control it out,” which often means pretending it does not matter!

In your book, *Who Owns Outer Space?*, you frame the analysis of "the Space and Earth environments as a single interconnected environment" within the lens of "global environmental politics". Can you briefly explain this framework and its implications?"

The Sun provides the energy that warms our planet and drives photosynthesis, making it an essential part of Earth's environment. Meanwhile, the upper reaches of our atmosphere stretch about 600 kilometres into Earth orbit, meaning that "gas drag" is a factor in the operation of satellites in lower orbits, as well as the deorbiting of space debris there. When you add in the approximately 200 asteroid craters visible on Earth's surface, including the 10 km-wide asteroid that killed off the non-avian dinosaurs, it quickly becomes clear that we live in an Earth-Space system. At the moment, I am particularly concerned that some space activities, especially the construction and operation of "mega-constellations" made up of 1000s of satellites that are "actively deorbited" after their short operational lives, might be contributing to ozone layer depletion and climate change.

My key point here is this: everything is connected, and if we want meaningful solutions to terrestrial environmental problems, we therefore need to understand how those problems are connected to Outer Space.

Your book dedicates two chapters to mega-constellations of satellites. With the number of active satellites increasing, what specific regulatory mechanisms do you propose to prevent space traffic chaos?

There is international acceptance that all satellites launched into Low Earth Orbit (between 100-2000 km from the surface) should be deorbited within 25 years of the end of their operational life. A few countries are now moving toward a 5-year deorbit requirement as part of their satellite licensing regimes, and it would be good to have that requirement accepted by all space-faring states. It would also be good to require all new satellites to have collision avoidance technology, starting with some kind of on-orbit propulsion.

Then, we need to move toward a controlled re-entry regime, whereby satellites and rocket bodies will have to be steered into remote areas of the ocean rather than abandoned in space. At the moment, most of these objects eventually return to Earth in an uncontrolled manner that puts people on the ground and in airplanes at risk. Or, they "burn up" in the upper atmosphere and contribute, potentially, to ozone depletion and climate change.

Last but not least, it is time to start an international discussion about introducing some kinds of limits on satellites, since infinite growth is impossible within a finite volume such as Earth orbit. Remember how, just a few decades ago, we thought the oceans were so big that we could dump all our garbage there?

Since your book's publication in 2023, have any major developments in space law, technology, or international cooperation reinforced or challenged your arguments? What new "grand challenges" do you anticipate will require urgent attention in the near future?

Cooperation continues on the International Space Station, with Russia being an essential partner of the United States, Canada, Japan, and European countries. Meanwhile, both Russia and China cooperate with Western countries in satellite-supported search and rescue through COSPAS-SARSAT (a treaty-based international organisation headquartered in Montreal), and in sharing satellite imagery for use in disaster relief (under the Disasters Charter, a non-binding instrument). All this reinforces my argument that cooperation is more likely to continue during a major security crisis like the Ukraine War, in "cold, dark and dangerous" regions like the Arctic and Outer Space.

In our book, Professor Boley and I identified that the deorbiting of thousands of satellites as part of the normal operation of mega-constellations like SpaceX's Starlink would change the chemistry of the upper atmosphere, since a satellite that "burns up" is being turned from one large object into millions of small particles — most of them aluminium. Sampling of stratospheric air by a NASA high-altitude research plane has since confirmed our prediction, and cutting-edge science is now needed to determine what effects these chemical changes might have on the ozone layer and Earth's energy balance (in other words, climate change). The worst case scenario could be very bad indeed, requiring a sharp change in the design of satellite constellations — to fewer, longer-lived satellites, ideally designed to survive re-entry and be directed, in a controlled manner, into remote areas of the ocean.

Given the vulnerability of satellite systems to failure, attack, and natural forces like solar storms, what redundancy strategies and backup infrastructure should Arctic governments prioritise?

All communication systems are vulnerable to failure, attack, and natural forces, so redundancies always operate in two or more directions. Single points of failure have to be avoided. In terms of satellites and the Arctic, this means having access to two or more constellations of communication satellites. Arctic residents have recently become reliant on Starlink, but there is also Eutelsat OneWeb and soon, Telesat's Lightspeed. The need for a Canadian-owned redundant system is the reason why the Canadian government has provided billions of dollars of support for Lightspeed. Indeed, the last of those billions came just after Elon Musk turned off Starlink coverage over the Black Sea, curtailing the Ukrainian military's ability to use small maritime drones to attack Russian warships!

Other Arctic communication redundancies include fibre optic cables, like those connecting the satellite ground station in Inuvik, Northwest Territories, to southern Canada. At first, there was just one cable, but now there is a second—following an entirely different route. Solar storms are more difficult to deal with, since they can disable satellites, ground stations, and fibre optic cables all at once. But these systems can be strengthened against most solar storms, and, in a worst-case/best-case scenario, could be quickly and pre-emptively powered off if a truly massive storm were incoming. But government and companies would only have a few hours warning of such a storm, so protocols and practices are needed — now!

How significant is the role of North American Aerospace Defense Command (NORAD) modernisation in Canada's overall Arctic security strategy?

For more than six decades, Canada's most significant contribution to US security has been hosting and jointly operating lines of radar stations across northern Canada, most recently the North Warning System. These stations have ensured that our neighbour and ally would receive sufficient notice of an incoming nuclear attack from the USSR/Russia to be able to launch its own missiles before they are struck in their silos. Canada is thus central to "Mutually Assured Destruction", which, despite the appropriate acronym, might have prevented a nuclear holocaust. Canada has already committed billions of dollars to upgrade these Arctic radars, which will remain the most expensive defence investment, by far, in Canada's north. It is an investment that I am comfortable with, for despite our differences with the Trump Administration, early warning of nuclear attacks is a shared interest that is certain to endure.

How is climate change shaping Canada's defence posture and operational planning in the Arctic today, and what are the key challenges and opportunities anticipated for Canadian Arctic defence policy in the coming decade?

Climate change was overshadowed by other issues during the 2025 Canadian election, partly because the campaign happened in winter, and partly because the single greatest vote decider was Donald Trump and his expressed desire to make Canada the "51^{st} state". But the seasonal surge of forest fires is rapidly growing longer, more intense, and more widespread than in the past — a trend mirrored by other extreme weather-related events such as droughts, floods, and hurricanes. This puts the new Canadian government in a difficult position, wanting to expand exports of oil and gas to Europe and Asia while confronting the physical reality that humanity has to stop using those same energy sources — and quickly.

In terms of the Canadian military, domestic disaster relief is taking up more and more of its capabilities each year, including evacuating remote communities threatened by forest fires. In the Arctic, everyone talks about climate change making the region more accessible, including for bad actors, because of the melting sea ice. This is true to some extent, but climate change is also causing glaciers to move more quickly into the sea, creating more icebergs as well as small concrete-like chunks of glacial ice called bergy bits and growlers that are very dangerous to shipping. Climate change is also making ground access more difficult, as it melts the permafrost underneath buildings, roads, and pipelines. In this context, the remote, extreme, and dangerous nature of the Arctic remains Canada's strongest defence in the region. The Canadian military has to be able to operate there, but the primary mission remains search-and-rescue, followed increasingly by disaster relief.

What is the most important advice you could give to young scholars of International Relations?

I do not want to offer advice as such, but I can speak to my own experience. First, I have found it easier to get out of bed in the morning if I am working on a topic that I am passionate about! Second, by not "following the herd" when choosing topics or pursuing explanations, I have sometimes been the first to identify new problems or puzzles. When this happens, there is an opportunity to play a role in defining, analysing, theorising, and solving a new feature in international relations, in other words, something that the existing literature cannot explain!