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SEA ICE AND THE LAW OF THE SEA: THE MYTH OF ARTICLE 234

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ABSTRACT

The sea ice of Article 234 of UNCLOS represents not the physical ice of the Arctic Ocean but a negotiated myth of ice as it affects the Arctic littoral states. The stability of this prescription is threatened by anthropogenic climate change causing a preferential evacuation of ice from the eastern Arctic compared to the western Arctic, as well as expectations for a possible future ice-free Arctic. This is leading to an intensification of claims on marine space. The irreducible uncertainties of the future trajectory of Arctic change demands a dynamic response. The myth of Article 234 will ultimately align with the complexities of the phenomenon of disappearing ice. It is in the dynamic nature of international law that prescriptions do not remain constant and neither does ice.

INTRODUCTION

A century ago, it was presumed that much of international law, including the Law of the Sea, was inapplicable to the Arctic due to the overwhelming presence of ice.[1] The continuity of ice and consequential suppression of human activity was presumed. To the wider world social relations appeared minimal, and so was law. As high north exploration, trade, and maritime activity accelerated, law became essential to advance and mediate the interests of states littoral to the Arctic Ocean and states which through skill, wealth, and power could get there. The third International Polar Year in 1957–58 underscored the scientific importance of the Arctic—for understanding the planet as well as supporting Arctic activities.[2] By the 1970s, the strategic and resource significance of the region was clear. By 1982, the United Nations Convention on the Law of the Sea (UNCLOS) included a provision negotiated with the Arctic in mind—the ice-covered waters provision of Article 234.[3] The provision had been in the draft treaty since 1977 to obtain Canada's support for the agreement, and it provided support for Canada to implement its 1970

1. James Brown Scott, *Arctic Exploration and International Law*, 3 AM. J. INT'L L. 928, 938-39 (1909).

2. The third International Polar Year (IPY) coincided with the first International Geophysical Year (IGY) of 1957-58. The IGY was prompted by the success of the first two IPYs (1882-83 and 1932-33) in encouraging and aligning scientific research across nations to understand Arctic phenomena. The first IPY was proposed by the German Maritime Observatory and included eleven nations, including six of the eight Arctic states. The second IPY was proposed and promoted by the International Meteorological Organization, the predecessor of the World Meteorological Organization, and included contributions from forty-four nations. However, because of the advent of the Second World War, most of the observational data and scientific analyses from the second IPY were lost. This prompted the establishment of World Data Centers as part of the IGY, which continue to this day to support the collection and archival of meteorological and oceanographic data despite hot and cold wars. Sixty-seven countries participated, and the launch of *Sputnik 1* was part of the Soviet Union's contribution to the IGY. The People's Republic of China was a notable exception to participation in the IGY, but China did participate in the fourth IPY in 2007-08. *See generally* Dave Carlson, *Reading and Thinking About International Polar Years: Five Recent Books*, 32 POLAR RSCH. 1, 1-3 (2013).

3. UNCLOS was concluded and opened for State party signature at Montego Bay, Jamaica on December 10, 1982. U.N. Convention on the Law of the Sea, art. 234, Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994) [hereinafter UNCLOS]. The United States is not a party although abides by the provisions of the convention that reflect customary international law.

Arctic Waters Pollution Prevention Act.[4] UNCLOS is the most recent and comprehensive strategic expression of the doctrine of *mare liberum*,[5] and Article 234 has calibrated that expression for the Arctic. Since UNCLOS entered into force, climate change has been dramatically reshaping oceanic trends and projections worldwide across a range of activities owing to warming, acidification, sea level rise, and cryospheric diminution.

Part II of this Article introduces the science of ice, Part III appraises the law of the sea in ice covered areas, Part IV examines Arctic climate change, and the Article concludes that the complexities of Arctic change, accompanied by the irreducible uncertainty of the trajectories of change, will confound the uniform application of UNCLOS Article 234 in the Arctic. This Article suggests that Article 234, which over time has acquired a *lex imperfecta* quality[6] is being overtaken by a new operational code because of the incontrovertible science of ice.

I. THE SCIENCE OF ICE

Sea ice is frozen seawater, and as such, is marine space under UNCLOS. Even under the challenging conditions of high Arctic field research, our understanding of sea ice has advanced rapidly in recent decades, underpinned by basic physics, and by the technology of satellite and computational era. The formation, growth, and melting of sea ice are influenced by temperature, salinity, and pressure. The process typically begins when the air temperature drops low enough to cool the upper layer of the ocean. As the water temperature decreases, it reaches a freezing

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4. Third United Nations Conference on the Law of the Sea, *Informal Composite Negotiating Text*, art. 235, U.N. Doc. A/CONF.62/WP.10 (July 15, 1977) [hereinafter Informal Composite Negotiating Text]. In the Informal Composite Negotiating Text, the provision on ice-covered areas was Article 235 rather than 234. THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA: A COMMENTARY 396 (Myron H. Nordquist et al. eds., 1991).

5. Grotius wrote:

> the sea appears capable of being made a property by the power possessed of the shore on both sides of it . . . ; [b]ut this right of property can never take place where the sea is of such a magnitude, as to surpass all comparison with that portion of the land which it washes. And the right, which one people or prince possesses, may also be shared by a great number of states, among whose respective territories the sea flows.

HUGO GROTIUS, THE RIGHTS OF WAR AND PEACE 80 (A.C. Campbell trans., M. Walter Dunne, 1901) (1625).

6. Charles H. Norchi & Amanda H. Lynch, *Arctic Navigation and Climate Change: Projections from Science for the Law of the Sea*, 99 INT'L L. STUD. 491, 514 (2022).

point that depends on the salinity of the sea water and the atmospheric pressure. Typically, this point is around -2°C. Ice crystals or "frazil" ice begins to form and coalesce into a slushy and elastic "nilas" ice.[7] Over time, if temperatures remain low, ice thickens to become "young" ice, then "first-year" ice, and if it survives a summer melt season, "multi-year" ice. Sea ice is generally understood to be a viscous (at low stresses) plastic (at high stresses) material, but the mechanical behavior of sea ice varies with age and thickness. For instance, young ice tends to be more flexible and less resistant to deformation—cracking and ridging—compared to older, thicker ice. Ice drift, driven by ocean currents and surface winds, diverging in the open ocean and converging in narrow straits, depends upon these mechanical characteristics.

During the freezing process, salt is expelled from the ice, creating pockets and channels of brine within the ice structure. This brine affects properties of the ice such as its buoyancy and melting point, influencing its behavior in the ocean. Some brine drains into the upper layers of the ocean, making the surface water less buoyant and influencing the structure and motion of the ocean itself. Moreover, the properties of sea ice play a pivotal role in its interaction with the atmosphere and ocean. Sea ice acts as a boundary between the ocean and atmosphere, influencing heat exchange processes, affecting heat content and buoyancy in atmosphere and ocean layers, and the formation of clouds in the atmosphere. Finally, the impact of ice cover on the albedo[8] of the planet is significant—ice reflects more sunlight than the ocean surface, impacting the global energy balance.[9] This is one of the key processes contributing to the phenomenon of "Arctic Amplification,"[10] whereby climate changes are observed earlier and with more intensity in the Arctic. It is this phenomenon that focused scientific attention decades ago on the Arctic as a harbinger of global climate change.

Land ice comprises glaciers and ice sheets. This type of ice fulfills a different role in the Arctic climate system and is pertinent to UNCLOS because of its impact on sea level under climate change. Ice sheets are the

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7. For a useful summary for ice properties and behavior, *see generally* Chris Petrich & Hajo Eicken, *Overview of Sea Ice Growth and Properties*, *in* SEA ICE 1, 1-37 (David N. Thomas ed., 3d ed. 2017).

8. Albedo is the fraction of solar energy reflected from a surface, rather than being absorbed.

9. *See* Donald K. Perovich, *On the Aggregate-Scale Partitioning of Solar Radiation in Arctic Sea Ice During the Surface Heat Budget of the Arctic Ocean (SHEBA) Field Experiment*, 110 J. GEOPHYSICAL RSCH.: OCEANS 1, 2 (2005).

10. Mark C. Serreze & Roger G. Barry, *Processes and Impacts of Arctic Amplification: A Research Synthesis*, 77 GLOB. & PLANETARY CHANGE 85, 85 (2011).

massive accretions of ice covering Greenland and Antarctica, which collectively account for around 70% of the world's freshwater.[11] Glaciers are smaller and typically found at high altitudes and latitudes, as well as around the edges of ice sheets. Both are formed by the accumulation and compaction of snow over decades and centuries. As a result, glaciation cannot take place where snow is only seasonal in nature. Like sea ice, land ice provides essential ecosystem services, notably by preserving fresh water in its frozen state through multiple seasons, thereby functioning to redistribute water resources from winter to spring.[12] This function is particularly important for high altitude agrarian communities in arid regions of the Himalayas and the Andes.

Land ice masses are dynamic, constantly moving due to the interplay between gravity and the complex internal deformations of ice. As they flow, they shape the landscape, carving valleys and fjords. One critical aspect is the melting and freezing between the base of the ice and the underlying land surface, which can significantly influence the stability and movement of glaciers and ice sheets. This in turn influences the rate of ice discharge, icebergs, into the sea at the terminus of marine-terminating ice sheets and glaciers. Basal melt rates are affected by geothermal heat flux and friction, as well as heat from surface meltwater infiltrating through the ice sheet.[13] The presence of liquid water between ice and the underlying land surface acts as a lubricant, accelerating loss of total ice mass in the flow of ice downstream. Ice also melts and sublimates at the upper surface. Atmospheric phenomena such as the deposition of dark soot on ice surfaces can increase the absorption of solar radiation, further contributing to surface melt.[14] Finally, warmer oceanic water masses that come into contact with marine-terminating glaciers can hasten the melting process.[15]

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11. *Glaciers: Quick Facts*, NATIONAL SNOW & ICE DATA CENTER, https://nsidc.org/learn/parts-cryosphere/glaciers/glacier-quick-facts (last visited April 2, 2024) [https://perma.cc/4MWA-BR6D].

12. Paul Mayewski et al., *The Hindu Kush Himalaya: An Endangered "Water Tower" in a Warming World*, GLOBAL GENEVA (Sept. 20, 2021), https://global-geneva.com/the-hindu-kush-himalaya-an-endangered-water-tower-in-a-warming-world/ [https://perma.cc/P7X5-D4HK].

13. *See* Nanna B. Karlsson et al., *A First Constraint on Basal Melt-Water Production of the Greenland Ice Sheet*, 12 NAT. COMMC'NS 1, 2 (2021).

14. Borgar Aamaas et al., *The Climate Impacts of Current Black and Organic Carbon Emissions*, CTR. FOR INT'L CLIMATE AND ENV'T RSCH. 1, 16 (2018).

15. David M. Holland et al., *Acceleration of Jakobshavn Isbræ Triggered by Warm Subsurface Ocean Waters*, 1 NATURE GEOSCIENCE 659, 659 (2008).

II. THE LAW OF THE SEA AND ICE-COVERED AREAS

Arctic actors—Indigenous peoples, states, scientists, merchant and coast guard vessels, fishers, whalers and sealers, reindeer herders, drillers and miners—pursue values through formal and informal institutions using a wide array of strategies and resources. They operate in a social process that is now shaped by climatic change. There is more open water and greater access to a previously limited geographic area. Local claims to control confront distant demands for access. The five Arctic littoral states—the United States, Canada, Russia, Norway, and Denmark (Greenland)—have historically asserted broad Arctic claims, as have the non-littorals that possess territory above 66°33'44" North[16]—Finland, Sweden, and (by virtue of the island of Grímsey) Iceland.[17] This intense space both elicits and limits interactions and activities. It is a social process that has generated practices, customs, codes and prescriptions that, when applied, may constitute effective law. And most law in the Arctic intersects with ice, even—perhaps especially—as it recedes.

Because much of the Arctic is an ocean, it is subject to the international law of the sea.[18] "The historic function of the law of the sea has long been recognized as that of achieving an appropriate balance between the special exclusive demands of coastal states, and other special claimants, and the general inclusive demands of all other states in the world arena."[19] The primary legal instrument and framework is UNCLOS.[20] UNCLOS was debated, negotiated, and drafted over nearly a decade from 1973 to 1982 in the Third United Nations Conference on the Law of the Sea. States pressed for final text reflecting their interests, some shared, based on geography—coastal, landlocked, islands, and archipelagos. The resulting 1982 convention establishes maritime zones, clarifies flag State and coastal State jurisdiction, preserves freedom of navigation, conservation of fish stocks, environmental protections, defines procedures for marine scientific research, hydrocarbon extraction, seabed

16. Charles H. Norchi, *The Arctic in the Public Order of the World Community*, 22 OCEAN & COASTAL L.J. 5, 7 (2017) (defining the Arctic as "an area above the Arctic Circle parallel of the latitude that runs 66°33'44" north of the Equator").

17. *Id.* at 8.

18. Approximately 70% of the area north of the Arctic Circle is marine space. This includes the Arctic Ocean and marginal seas.

19. Myres S. McDougal & William T. Burke, *Crisis in the Law of the Sea: Community Perspectives Versus National Egoism*, 67 YALE L.J. 539, 539 (1958).

20. *See generally* UNCLOS, *supra* note 3.

mining, and establishes institutions including the Tribunal for the Law of the Sea (ITLOS).[21]

UNCLOS is the core codification in the constitutive process of the oceans.[22] It establishes structures of authority and specifies procedures which must be followed for legal or lawful decisions. The United States has not ratified the instrument but applies and invokes UNCLOS provisions that reflect customary international law.[23] This constitutive process evolves via claims to the seas that are critical to the present and future public order of the oceans. Thus, the UNCLOS text must be appraised in context—its antecedents, post-outcome effects, flow of words, and flow of behavior. Achieving that balance in the intense marine space of the Arctic, the world's smallest ocean, is an urgent exercise in complexity.

The fundamental applicability of UNCLOS to the Arctic was underscored in 2008 when the five littoral states met at Ilulissat, Greenland and issued the following declaration:

> The Arctic Ocean stands at the threshold of significant changes. Climate change and the melting of ice have a potential impact on vulnerable ecosystems, the livelihoods of local inhabitants and indigenous communities, and the potential exploitation of natural resources . . . the law of the sea provides for important rights and obligations concerning the delineation of the outer limits of the continental shelf, the protection of the marine environment, including ice-covered areas, freedom of navigation, marine scientific research, and other uses of the sea. We remain committed to this legal framework and to the orderly settlement of any possible overlapping claims. This framework provides a solid foundation for responsible management by the five coastal States and other users of this Ocean through national implementation and application of relevant provisions. We

21. *Id.*

22. "The constitutive process is authoritative power exercised to provide an institutional framework for decision to allocate indispensable functions; the particular decisions which emerge from this process may be specialized to the shaping and sharing of wealth, enlightenment, respect and all other values." Myres S. McDougal, Harold D. Lasswell & W. Michael Reisman, *The World Constitutive Process of Authoritative Decision*, 19 J. OF LEGAL EDUC. 253, 257 (1967).

23. "Although not yet a party to the treaty, the U.S. nevertheless observes the UN LOSC as reflective of customary international law and practice." *Law of the Sea Convention*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (Jan. 5, 2023), https://www.noaa.gov/law-of-sea-convention [https://perma.cc/BU3A-V36T].

> therefore see no need to develop a new comprehensive international legal regime to govern the Arctic Ocean.[24]

Thus, the primacy of UNCLOS in the Arctic was confirmed by the most immediately affected—the littoral States.[25] This was also a signal to the increasing number of distant yet polar-capable States acquiring interests in Arctic research, security, shipping, mining, and hydrocarbons.

During the Third United Nations Conference on the Law of the Sea, two states set aside Cold War ideologies to make common cause with respect to mutual interests: Canada and the Union of the Soviet Socialist Republics (U.S.S.R.). Their common interest was the Arctic waters, comprising more than half their coastlines. They proposed a text that would plausibly allocate to coastal States broad prescriptive and enforcement jurisdiction in ice-covered areas.[26] When modified, so as to be adopted by the conference, Article 234 appeared in the final text as follows:

> Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance. Such laws and regulations shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence.[27]

Article 234 is embedded in UNCLOS Part XII, *Protection and Preservation of the Marine Environment* which affirms that "States have the obligation to protect and preserve the marine environment."[28] Article 194 requires that States shall adopt " . . . individually or jointly as

24. The Ilulissat Declaration, May 28, 2008, 48 I.L.M. 362, 362.

25. *See id.*

26. The United States became aware of the proposal in a cable whose subject line was "Canadian-Soviet Proposal on Arctic" addressed to Ambassadors Learson and John Norton Moore. Note from the U.S. Mission Geneva to the Sec'y of State, U.S. Dep't of State (Feb. 3, 1976) (declassified and released by U.S. Dep't of State May 4, 2006).

27. UNCLOS, *supra* note 3, art. 234.

28. *Id.* art. 192.

appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source . . ."[29] This broad allocation of competence is apparently tempered: " . . . in taking measures to prevent, reduce or control pollution of the marine environment, States shall refrain from unjustifiable interference with activities carried out by other States in the exercise of their rights . . . ."[30] Further, in adopting laws and regulations, States must take " . . . into account internationally agreed rules, standards and recommended practices and procedures."[31] Thus, Article 234 has a textual context and is not to be read in isolation.

The protection and preservation of fragile ecosystems is an important policy for both the ecosystem services they provide and their intrinsic value. Article 234 is a key tool to advance that goal in polar waters "with due regard to navigation."[32] However, the provision includes an imprecise spatial limitation, "the presence of ice covering such areas," and a similarly ambiguous temporal limitation, "for most of the year."[33] Views as to the spatial application of Article 234 differ. A strict interpretation holds that coastal State competence is limited, that is, from the seaward limit of the territorial sea to the limit of the Exclusive Economic Zone (EEZ).[34] A broader interpretation insists the provision applies from the baseline of a coastal State to the limits of the EEZ, authority to adopt and enforce enhanced regulations plausibly burdening navigation.[35] Another view accepts the wider geographic application of Article 234 while

29. *Id.* art. 194(1).

30. *Id.* art. 194(4).

31. *Id.* art. 207(1). It should be noted that where international standards may not protect a coastal state's EEZ from vessel-source pollution, States may, in consultation through the competent international organization (the International Maritime Organization [IMO]), make a submission to the IMO which can implement the required standards. *Id.* art. 211(6)(a).

32. *Id.* art. 234.

33. UNCLOS, *supra* note 3, art. 234. Helmut Tuerk has noted, "Article 234 is thus directed at preserving the fragile ecology of ice-covered areas, but only within the limits of a coastal State's EEZ, such as the U.S. Canadian and Russian EEZ that extend into the Arctic." Helmut Tuerk, *The Arctic and the Modern Law of the Sea*, *in* GOVERNING OCEAN RESOURCES 115, 130 ((Jon M. van Dyke et al. eds., 2013).

34. *United Nations Convention on the Law of the Sea: A Commentary* 393 (Nordquist et al. eds., 1st ed. 1991); Tuerk, *supra* note 33.

35. Donald Pharand, *The Arctic Waters and the Northwest Passage: A Final Revisit*, 38 OCEAN DEV. & INT'L L. 3, 47 (2007).

insisting that pollution prevention competence cannot exceed those granted in the territorial sea.[36]

Climate change and associated extremes raise questions pertaining to the scope and continuing application of Article 234. How much ice coverage is required? For purposes of interpretating this provision of the Convention, what is the "ordinary meaning" of "ice cover", or "for most of the year?"[37] Furthermore, Article 234 reflects climatic conditions at the time of drafting.[38] Its applicability and viability must reconcile the law with current science. This is a path from text to context, from words in their ordinary meaning to complex operation. The Vienna Convention on the Law of Treaties draws attention to the object and purpose of the instrument and text in their ordinary meaning for purposes of interpretation.[39] Taking into account the "object and purpose" of UNCLOS Part XII, what is the "ordinary meaning" of "presence of ice covering such areas for most of the year?" Is the answer found in the words alone? As Myres McDougal trenchantly observed during the negotiation of the document that would become the Vienna Convention on the Law of Treaties:

> . . . it is *hubris* of the highest order to assume that the presence or absence of shared subjectivities at the outcome phase of any sequence of communications, much less that of an international agreement, can be read off in simple fashion from a manifest content or 'ordinary meaning' of words imprinted or embossed in a document.[40]

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36. J. ASHLEY ROACH & ROBERT W. SMITH, EXCESSIVE MARITIME CLAIMS 491 (Vaughan Lowe & Robin Churchill eds., 3d ed. 2012).

37. *See* Vienna Convention on the Law of Treaties art. XXXI, § 1, 1155 U.N.T.S. 331, 8 I.L.M. 679 (entered into force Jan. 27, 1980).

38. Peter Luttmann, *Ice-Covered Areas under the Law of the Sea Convention: How Extensive Are Canada's Coastal State Powers in the Arctic?*, 29 OCEAN YEARBOOK 85, 85 n. † (2015).

39. *See* Vienna Convention on the Law of Treaties art. 31, May 23, 1969, 1155 U.N.T.S. 331.

40. Myres S. McDougal, *The International Law Commission's Draft Articles upon Interpretation: Textuality Redivivus*, 61 A.J. INT'L L. 992, 997 (1967). This view is consistent with conclusions of the Harvard Research in International Law: "A treaty is to be interpreted in the light of the general purpose which it is intended to serve. The historical background of the treaty, travaux préparatoires, the circumstances of the parties at the time the treaty was entered into, the change in these circumstances sought to be effected, the subsequent conduct of the parties in applying the provisions of the treaty, and the conditions prevailing at the time interpretation is being made, are to be considered in

The text of Article 234 reflects the Arctic environment and conditions in the 1970's. At that time the mechanism of Arctic amplification was not yet articulated. A handful of scientists were working on anthropogenic climate change.[41] There is no record of the topic in the negotiations and the word climate does not appear in the Convention. In the context of the time, the Cold War and climate were immutable, and so was ice in the Arctic. The rubric of "ice cover for most of the year" bears little resemblance to the complex, variable, and rapidly changing ice that is manifest throughout the Arctic today. Because Article 234 assumes the existence of a natural phenomenon, appraising the provision's legal character is less an exercise in exegesis than in empiricism.

Arctic navigation, current and prospective, must contend with narrow waterways known as straits which are often ice-covered, potentially impeding marine accessibility. A strait in international law is defined as a naturally formed, narrow, accessible waterway that connects two larger bodies of water.[42] The special status of straits used for international navigation was underscored in 1949 by the International Court of Justice in the Corfu Channel case wherein the Court held that the Corfu Channel was an international strait, because of "its geographical situation as connecting two parts of the high seas and the fact of its being used for international navigation."[43] In the view of the Court, "it is sufficient that a strait be a useful route for international maritime traffic for it to be considered an international strait."[44]

Straits are sufficiently critical for maritime traffic that UNCLOS devotes an entire section to what is now termed a regime.[45] When the

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connection with the general purpose which the treaty is intended to serve." Harv. L. Sch. Fac., *Harvard Research in International Law* (pt. 3), 29 A.J. INT'L L. 657, 937 (Supp. 1935).

41. In the 1970's, climate scientists were working on a range of issues associated with anthropogenic and intrinsic change in the climate system, including ice ages, nuclear winter, and El Niño. Anthropogenic climate change driven by greenhouse gas emissions was emerging, based on a century of progress in theory and observations, as a potential focus of research. However, the wider significance of climate change was not yet well understood. Rapid advances, driven by accelerating improvements in observation and simulation technologies, began to be made in the decade following the signing of the Convention.

42. Lewis M. Alexander, *International Straits*, 64 INT'L L. STUD. 91, 91.

43. Corfu Channel (U.K. v. Alb.), Judgment, 1949 I.C.J. 4 (Apr. 9).

44. *Id.*

45. STEPHEN KRASNER, INTERNATIONAL REGIMES 2 (Stephen Krasner ed., 1983). A regime may be understood as "sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations." *Id.*

breadth of the territorial sea was extended to twelve nautical miles during the Third Conference on the Law of the Sea, previous high seas routes through many of the world's straits were absorbed by territorial seas.[46] Thus, with the exception of innocent passage, coastal states would possess maximum jurisdictional competence over such waters. To meet risks of navigational servitudes in straits used for international navigation, transit passage was proposed. It was a compromise to obtain United States acquiescence to a twelve-mile nautical sea.[47]

UNCLOS Part III Article 37 defines straits as "used for international navigation between one part of the high seas or an exclusive economic zone and another part of the high seas or an exclusive economic zone."[48] In such waters, vessels are accorded a navigational right codified in UNCLOS, transit passage:

> all ships and aircraft enjoy the right of transit passage which shall not be impeded except that if the strait is formed by an island of a State bordering the strait and its mainland, transit passage shall not apply if there exists seaward of the island a route through the high seas or through an exclusive economic zone of similar convenience.[49]

Transit passage is intended to facilitate the efficient movement of vessels through certain coastal waters deemed essential for international navigation. Transit passage affords fewer navigational servitudes or controls imposed by the coastal state than does innocent passage or, for that matter, the regulatory competence seemingly afforded by Article 234.[50]

Transit passage is defined as "freedom of navigation and overflight solely for the purpose of continuous and expeditious transit of the strait between one part of the high seas or an exclusive economic zone and another part of the high seas or an exclusive economic zone."[51] The provision includes the qualification that "continuous and expeditious transit does not preclude passage through the strait for the purpose of entering, leaving or returning from a State bordering the strait, subject to the conditions of entry to that State."[52] Vessels are required to proceed

46. UNCLOS, *supra* note 3, Part II, art. 3.

47. Press Release No. 64, *United States Outlines Position on Limit of Territorial Sea* (Feb. 25, 1970) (62 U.S. DEPT. STATE BULL. 332, 343 (Mar. 16, 1970)).

48. UNCLOS, *supra* note 3, Part III, art. 37.

49. *Id.* art. 38 (1).

50. J. ASHLEY ROACH, EXCESSIVE MARITIME CLAIMS 297 (3d ed. 2021).

51. UNCLOS, *supra* note 3, art. 38(2).

52. *Id.*

without delay and must not threaten or use force against the sovereignty, territorial integrity, or political independence of states bordering straits, and not violate any of the principles of international law embodied in the United Nations Charter.[53] Where a strait links the high seas or an exclusive economic zone with the territorial sea of a foreign state, pursuant to Article 45, non-suspendable innocent passage would apply, and not transit passage.[54]

Pursuant to Article 42, states bordering straits may adopt laws and regulations relating to transit passage through straits for safety of navigation, the prevention and reduction of pollution, immigration, fiscal, and sanitary matters.[55] However, such measures may not "discriminate in form or in fact among foreign ships or in their application have the practical effect of denying, hampering or impairing the right of transit passage."[56] Article 44 underscores the duties of states bordering straits: "States bordering straits shall not hamper transit passage and shall give appropriate publicity to any danger to navigation or overflight within or over the strait of which they have knowledge. There shall be no suspension of transit passage."[57] The requirement that known dangers to navigation be publicized is a legacy of the *Corfu Channel* case.

Straits are strategically and economically vital due to their role as maritime choke points, controlling and surveilling access to regions and resources. They are a focal point in international maritime law, reflecting the balance between the interests of coastal states and the wider international community in terms of navigation, security, and environmental conservation. Arctic straits are a zone of complex convergence by ice. What effect, if any, could Article 234 have on transit passage in straits?

Contemporary trans-Arctic navigation depends upon straits (Figure 1). Perhaps the most strategic is the Bering Strait through which Frederick William Beechey sailed in 1852. This is the connection between the Bering Sea and the Chukchi Sea, providing access from the Pacific Ocean to Arctic coastal seas and the Arctic Ocean. The littoral states are Russia and the United States. The Nares Strait between Ellesmere Island (Canada) and Greenland (Denmark) links the near Arctic Ocean Lincoln Sea and Baffin Bay onward to the Davis Strait, Labrador Sea and the Atlantic

53. *Id.* art. 39.

54. *Id.* art. 45.

55. Certain straits are governed by specific regional treaties or agreements that supplement UNCLOS, such as the Treaty of Lausanne applicable to the Turkish (Bosphorus) Straits.

56. UNCLOS, *supra* note 3, art. 42(2).

57. *Id.* art. 44.

Ocean. The littoral states are Canada and Denmark. It is an access route to the Northwest Passage. Between Greenland (Denmark) and Svalbard (Norway)[58] is the Fram Strait which provides access from the Atlantic to the Arctic Ocean. The Danish Strait is between Greenland (Denmark) and Iceland. Like Fram Strait, it is sufficiently wide that high seas freedoms of navigation principally apply.[59]

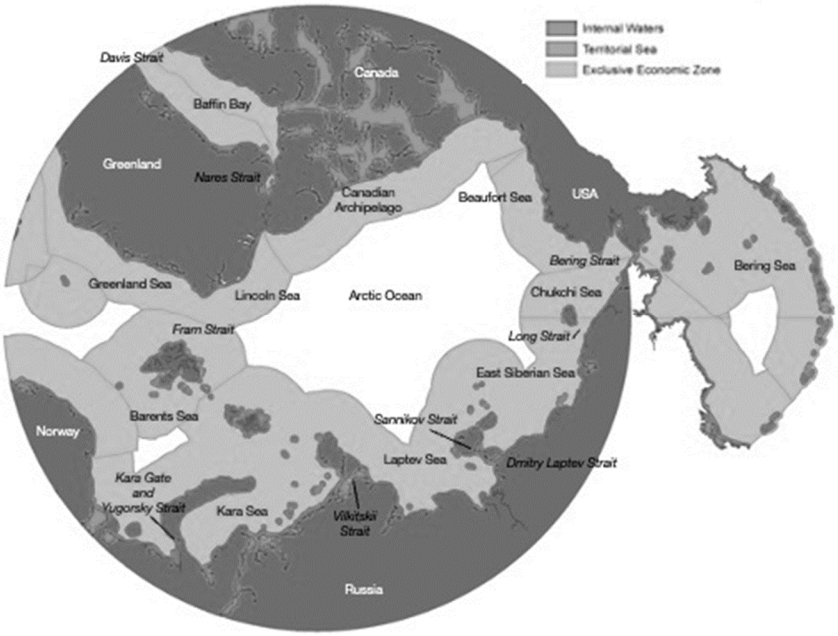

Figure 1: *Map of the Arctic Ocean, showing peripheral seas, major straits, and Arctic littoral states.*[60]

The UNCLOS regime of straits bears on the yet unsettled matter of whether the Northwest Passage and sections of the Northeast Passage are

58. The Svalbard Treaty, officially known as the Treaty concerning the Archipelago of Spitsbergen, was signed in Paris on February 9, 1920 and entered into force on August 14, 1925. This treaty, signed by forty-seven states, recognizes the sovereignty of Norway over the Svalbard archipelago, which includes the main island of Spitsbergen and several surrounding islands. However, there are restrictions to the exercise of sovereignty, including international access for mining and demilitarization. *See* Øystein Jenson, *The Svalbard Treaty and Norwegian Sovereignty*, 11 ARCTIC REV. ON L. & POLS. 82 (2020).

59. *See* Donald R. Rothwell, *International Straits and Trans-Arctic Navigation*, 43 OCEAN DEV. & INT'L L. 267, 276-77 (2012).

60. Figure 1 was created by author Amanda Lynch.

straits used for international navigation or internal and territorial waters.[61] Foreign vessels do not generally enjoy the right of innocent passage through internal waters and domestic law applies there fully.

The United States regards both the Northwest and Northeast Passages as straits used for international navigation subject to the regime of transit passage. Canada's internal waters claims along the Northwest Passage have been called "the most excessive maritime claims of any Arctic nation."[62] The United States and Canada have provisionally settled the matter through the 1988 Arctic Cooperation Agreement.[63]

The Northeast Passage, which traces the northern coast of Eurasia, has historically been a highly valued maritime route due to its potential to significantly shorten shipping distances between the Atlantic and Pacific Oceans as ice evacuates preferentially from the Eurasian side of the Arctic.[64] In the contemporary context, as climate change accelerates the melting of Arctic ice, this passage is becoming increasingly viable for navigation.[65] Within this corridor lies the Northern Sea Route (NSR), a component of the Northeast Passage that runs along Russia's Arctic coast from the Kara Sea to the Bering Strait (Figure 1). In the early 2010's, Russia advanced claims that certain segments of the NSR are internal waters, thereby asserting a greater degree of sovereign control than would be permissible under the international legal regime governing transit passage.[66] The United States found this claim expansive and incompatible

61. "Open water depths for the NSR vary from 20 to 200m. Different route options require transiting one or more of the many straits along the route." JAMES KRASKA, RUSSIAN MARITIME SECURITY LAW ALONG THE NORTHERN SEA ROUTE: GIVING SHAPE TO ARTICLE 234 IN THE LAW OF THE SEA CONVENTION, in CHALLENGES OF THE CHANGING ARTIC: CONTINENTAL SHELF, NAVIGATION AND FISHERIES 593, 602 (Myron Nordquist et al. eds., 2016).

62. James Kraska, *International Security and International Law in the Northwest Passage*, 42 VAND. J. TRANSNAT'L L. 1109, 1118 (2021).

63. *See generally* Agreement Between the Government of Canada and the Government of the United States of America on Arctic Cooperation, Can.-U.S., Jan. 11, 1988, 1852 U.N.T.S. 1-31529.

64. Ron Kwok, *Arctic Sea Ice Thickness, Volume, and Multiyear Ice Coverage: Losses and Coupled Variability (1958–2018),* 13 ENV'L RSCH LETTERS 1, 5 fig. 3 (2018).

65. Xueke Li & Amanda H. Lynch, *Projections for Arctic Marine Accessibility: Risk Under Climate Change*, 29 OCEAN & COASTAL L.J. 353, 355 (2024).

66. Kraska, *supra* note 62, at 1117.

with international law.[67] The Russian rules, revised in 2020,[68] established protocols and criteria for entry into different sectors of the NSR, stipulating provisions for icebreaker support, Polar Code ice ratings and seasonal conditions. These rules relied in part on a broad interpretation of Article 234 that allocates enhanced jurisdiction to coastal states over ice covered waters.[69] On December 5, 2022, further legislation was signed into law by the Russian president that military and other non-commercial government vessels must receive Russian authorization ninety days in advance to traverse these waters.[70] Only one vessel is allowed at a time, and submarines must surface and show their flag. These regulations apply only to Russian internal waters, but crucially, these waters contain the Sannikov, Dimitry Laptev and Vilkitskii Straits, the Kara Gate and Yugorsky Strait, but only parts of the Bering and Long Straits.

III. CLIMATE, ICE AND SEA LEVEL RISE

Throughout UNCLOS, the establishment of maritime zones and legal characterization of ocean activities, the law of the sea meets science. In the Arctic under the amplification mechanism, the relevant science is anthropogenic climate change which shapes ice. Sea ice forms from the freezing of seawater and melts back into the ocean. As a result, fluctuations in ice cover do not affect global sea level, but sea ice nevertheless fulfills a critical role in the climate system of the Earth. Indeed, a loss of sea ice under anthropogenic climate change will have

67. "On May 29, 2015, the United States delivered a diplomatic note to the Russian Federation regarding its Northern Sea Route ("NSR") regulatory scheme, which had been subject to legislative changes in 2012 and new regulations issued in 2013. The note presents U.S. objections to aspects of the scheme that are inconsistent with international law, including: requirements to obtain Russia's permission to enter and transit the exclusive economic zone and territorial sea; persistent characterization of international straits that form part of the NSR as internal waters; and the lack of any express exemption for sovereign immune vessels. The note also encourages Russia to submit relevant aspects of the scheme to the International Maritime Organization ("IMO") for consideration and adoption." Territorial Regimes and Related Issues, 2015 DIGEST OF UNITED STATES PRACTICE IN INTERNATIONAL LAW, ch. 12, § 5 at 526.

68. RULES OF NAVIGATION ON THE WATER AREA OF THE NORTHERN SEA ROUTE, 2020, No. 1487.

69. UNCLOS, *supra* note 3, art. 234; *see also* Norchi & Lynch, *supra* note 6, at 504.

70. Andrey Todorov, *New Russian Law on Northern Sea Route Navigation: Gathering Arctic Storm or Tempest in a Teapot?,* BELFER CTR. FOR SCI. AND INT'L AFF., HARVARD KENNEDY SCH. (Mar. 9, 2023), https://www.belfercenter.org/publication/new-russian-law-northern-sea-route-navigation-gathering-arctic-storm-or-tempest-teapot [https://perma.cc/UQ3Y-CLQU].

many implications. What is observed now as a wholesale regime shift in the polar sea ice[71] is having far-reaching consequences for atmosphere and ocean circulation patterns worldwide, and locally impacts the viability of ice-dependent species under water, on ice, and in the air. Regime shifts in the climate system are manifestations of system complexity, leading to abrupt changes that are challenging and sometimes impossible to predict even as scientific understanding continues to improve. As a result, while the end point of unfettered climate change, an ice-free[72] Arctic Ocean, is known, the trajectory and timing of this evolution remains uncertain. And indeed, international agreements limiting global greenhouse gas emissions suggest that projections of even an ice-free summer are beset by high uncertainties.[73]

A second linkage between climate change and UNCLOS is the impact of sea level on baselines, a potential threat to the legal framework. Sea level rise provides an integrative measure of changes in the climate system. The amount of rise comprises contributions from thermal expansion of the ocean as heat content increases, large-scale and regional changes in oceanic circulation, and freshwater runoff from melting glaciers and ice sheets. As noted, melting sea ice does not contribute directly to sea level rise, although indirect effects associated with the impact of sea ice retreat on ocean heat content and circulation are evident.[74] Additional impacts on sea level due to climate change include complex changes to global and regional scale hydrological cycles and the potential for isostatic rebound, a process whereby the land surface, having been compressed under the weight of an ice sheet, rises and returns to its

71. The climate is a chaotic system, wherein the state of the system varies across a restricted range of possible states that form an attracting set, or "chaotic attractor." This is often called a "regime" in climate science, to be distinguished from the sense of "regime" in law. When the system transitions to a different set of states, this is called a "regime shift." *E.g.*, Amanda H. Lynch et al., *Linkages Between Arctic Summer Circulation Regimes and Regional Sea Ice Anomalies*, 121 J. OF GEOPHYSICAL RSCH: ATMOSPHERES 7868, 7870 fig.1 (2016) (presenting evidence of recent regime shift in Arctic ice); *see, e.g.*, Hiroshi Sumata et al., *Regime Shift in Arctic Ocean Sea Ice Thickness*, 615 NATURE 443, 444 (2023).

72. An 'ice-free' Arctic is determined when the area covered by sea ice falls below 1 million km^2 rather than no ice whatsoever, as thick ice is likely to be maintained in the Canadian Archipelago. Laura Landrum & Marika M. Holland, *Extremes Become Routine in an Emerging New Arctic*, 10 NATURE CLIMATE CHANGE 1108, 1110 (2020).

73. *See, e.g.*, James A. Screen & Daniel Williamson, *Ice-free Arctic at 1.5°C?*, 7 NATURE CLIMATE CHANGE 230, 230 (2017); Landrum & Holland, *supra* note 72.

74. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2021: THE PHYSICAL SCI. BASIS 1246 (2021).

original shape when the ice melts.[75] Recent projections of 21st century climate using the Coupled Model Intercomparison Project, phase 6 (CMIP6)[76] have revealed that the highest regional increases in sea level are to be expected along North Atlantic coasts and, due primarily to thermodynamic changes, in the Arctic.[77] This finding is robust across different climate models and for emissions scenarios ranging from aggressive abatement to business as usual. Trends range from 2 mm yr^{-1} over the 21st century in the strong abatement scenario (SSP1.2-6) up to 4 mm yr^{-1} for continued emissions growth (SSP5.8-5), *not* including uncertainties associated with nonlinear effects on sea level rise from the potential for abrupt collapse of ice sheets.[78] Sea level trends are highest in the Arctic peripheral seas.[79] Uncertainties in the amount of sea level rise, particularly in the context of nonlinear ice sheet dynamics, remain both large and irreducible with current technologies,[80] but there is a consensus surrounding the direction: a continued increase in sea level in the Arctic.[81]

From a scientific perspective it is apparent that escalating sea levels will result in shifting baselines[82] and along with this, morphological changes in Arctic coastal zones and straits. The elevation of sea levels leads not only to the augmented width of Arctic straits, but also to the modification of the depth and sedimentary composition of the coastal shelf region. Enhanced coastal erosion associated with increased wave action with retreating sea ice is likely to add to these changes.[83] Alterations in Arctic geography will precipitate shifts in coastal infrastructure, regional marine biodiversity, and navigational access.

Climate change will also affect the presence of ice in straits. Straits can be regions of complex ice dynamical behavior, as well as sites of ice

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75. *See*, A. B.A. Slangen et al., *A Review of Recent Updates of Sea-Level Projections at Global and Regional Scales*, 38 SURV. IN GEOPHYSICS 385, 398 (2017).

76. Li & Lynch, *supra* note 65, at 357; *see also* VERONIKA EYRING ET AL., *OVERVIEW OF THE COUPLED MODEL INTERCOMPARISON PROJECT PHASE 6 (CMIP6) EXPERIMENTAL DESIGN AND ORGANIZATION*, 9 GEOSCIENTIFIC MODEL DEV. 1938 (2016).

77. Bruno Ferrero et al, *Long-term Regional Dynamic Sea Level Changes from CMIP6 Projections*, 38 ADVANCES IN ATMOSPHERIC SCIS. 157, 161-67 (2021).

78. *Id.* at 162.

79. Matthew P. Couldrey et al., *What Causes the Spread of Model Projections of Ocean Dynamic Sea-level Change in Response to Greenhouse Gas Forcing?*, 56 CLIMATE DYNAMICS 155, 169 (2021).

80. Alexander M. R. Bakker et al., *Sources and Implications of Deep Uncertainties Surrounding Sea-Level Projections*, 140I CLIMATIC CHANGE 339, 342 (2017).

81. INTERGOVERNMENTAL PANEL, *supra* note 74.

82. Norchi & Lynch, *supra* note 6, at 493.

83. Irina Overeem et al., *Ice-Dominated Arctic Deltas*, 3 NATURE REVS. EARTH & ENV'T 225, 226 (2022).

bridge formation and collapse. But the climate models on which future scenarios are built for the international policy process are not capable of representing narrow straits: in Table 1, a selection of CMIP6 models[84] was compared with minimum width measurements derived from the authoritative International Bathymetric Chart of the Arctic Ocean (IBCAO), version 4.2, with 200m resolution.[85] A minimum distance estimative analysis of these models reveals that many models artificially widen straits to support the numerical solution of sea ice dynamics, a practice that is likely to yield inaccuracies in future projections of sea ice cover and sea level that are critical for forward assessments for route utilization. As a result, projections for the regime of straits in the Arctic, particularly in the context of unresolved differences of interpretation along the Northeast Passage, suffer from large and irreducible uncertainties.

84. Li & Lynch, *supra* note 65, at 359.

85. Martin Jakobsson et al., *The International Bathymetric Chart of the Arctic Ocean: Version 4.0*, 7 SCI. DATA 1, 3 (2020).

Table 1: *Selected strait widths (in kilometers) in climate models used for developing policy scenarios in international climate agreements. Grey shading denotes the absence of the strait from the model representation. Note that in several climate models, the Dmitry Laptev and Sannikov Straits are merged into a single passage. Calculations provided with acknowledgement by Maria Luisa Rocha Santos da Silva.*

Source	Nominal resolution (km)	Bering Strait (km)	Vilkitsky Strait (km)	Dmitry Laptev Strait (km)	Sannikov Strait (km)	Kara Gate (km)
Data: IBCAO	0.2	84.3	52.2	49.1	53.9	43.2
				110.8 (combined)		
ACCESS-CM2	100	335.3	137.7		196.2	266.4
AWI-CM-1-1-MR	25	218.4	62.6	55.8	104.6	179.1
BCC-CSM2-MR	100	333.0	151.3			69.6
CESM2	100	405.0			214.2	508.9
CESM2-WACCM	100	405.0			214.2	508.9
CNRM-CM6-1	100	546.0	196.7	266.3		482.9
IPSL-CM6A-LR	100	546.0	196.7	266.3		482.9
MIROC-ES2L	100	555.8	179.6	201.6		253.7
MIROC6	100	555.8	179.6	201.6		253.7
MPI-ESM1-2-HR	50	318.6	102.8		113.7	254.2
MPI-ESM1-2-LR	250	465.3			189.8	598.2
MRI-ESM2-0	100	666.7	155.3	374.6		683.8
NESM3	100	541.0				210.6
NorESM2-LM	100	336.7	152.2		224.6	211.7
NorESM2-MM	100	336.7	165.6		224.6	211.7

Management of uncertainty has emerged as a key issue in the evolving science of climate change[86] and particularly in the study of highly impactful extreme or unprecedented weather events.[87] Uncertainties have long been understood to arise from (i) imperfect scientific understanding and differing scientific opinion leading to uncertainties in the appropriate mathematical or numerical representation of physical phenomena in models; (ii) inadequate computational resources limiting the fineness of model grids, length of experiments, and number of ensemble members which in turn limits the quality of scenarios; (iii) incomplete and poor quality data for initializing model experiments leading to divergent evolution of climate state; (iv) unknown future trajectories of economic development, including activities that limit or expand greenhouse gas emissions; (v) imprecise future projections of human population, migration patterns, technological innovation, and land use; (vi) unexpected large scale events including volcanic eruptions and nuclear war; and (vii) the fundamental nonlinear variability of the chaotic system. While the recent advent of Artificial Intelligence approaches to climate simulation have demonstrated some early promise in overcoming several of these problems[88], there will always remain sources of irreducible uncertainty due to the nature of the system and indeed, of the future.

Prescriptions stabilize community expectations manifest in statutes, regulations, case law, customary law, contracts, and other instruments including international agreements.[89] Effective treaties that are in force ensure a stream of prescribed outcomes as understood by the parties. This understanding is rooted in the process of agreement that results in a factual context formalizing reciprocally beneficial commitments to collaborative behavior. The moment of formulation of a treaty between parties represents a comparatively high level of consensus. The good faith principle of *pacta sunt servanda* insures the authoritative character of the instrument. A fundamental change of circumstance, an abrupt or gradual *rebus sic stantibus,* may lead to the non-performance of original terms in

86. Ed Hawkins et al., *Irreducible Uncertainty in Near-Term Climate Projections*, 46 CLIMATE DYNAMICS 3807, 3808 (2016).

87. Amir AghaKouchak et al., *Climate Extremes and Compound Hazards in a Warming World*, 48 ANN. REV. OF EARTH & PLANETARY SCIS. 519, 524 (2020); *see also* JENS H. CHRISTENSEN ET AL., UNFATHOMABLE FUTURES: EXPLORING UNPRECEDENTED EXTREMES, AM. GEOPHYSICAL UNION FALL MEETING ABSTRACT A12F-01 (2023).

88. Christopher Irrgang et al., *Towards Neural Earth System Modelling by Integrating Artificial Intelligence in Earth System Science*, 3 NATURE MACH. INTEL. 667, 669 (2021).

89. *See* Myres S. McDougal & W. Michael Reisman, *The Prescribing Function in International Law: How International Law Is Made*, 6 YALE STUD. WORLD PUB. ORD. 249 (1980).

whole—or in part, thus preserving the object and purpose of the instrument. The object and purpose of UNCLOS Part XII can be maintained as Article 234 falls into desuetude.

IV. ARTICLE 234: IRREPRESSIBLE MARCH OR FUNCTIONAL MYTH?

Societies and communities exhibit multiple normative systems, understood as myths, relevant to any given arena. A myth is a stable, but not static, pattern of meaning that underpins the social framework for action, and may be empirically false or factual, or anywhere in between.[90] It may appear or be represented to apply on its face while actual behavior differs.[91] As such, the reliability of a myth system as normative guidance is open to empirical appraisal. Every myth is comprised of "innate, strategic, and asserting" functions.[92] The innate function, or doctrine, serves to explain and justify the possession and use of power and other values in a community or state. The strategic function, or formula, provides a tangible expression of a normative doctrine through prescribed rules-in-form and unofficial rules-in-use[93], the latter often called the operational code.[94] The asserting role takes the form of symbols and communications in the shaping and sharing of norms and prescriptions.

Myth is fundamental to the human ordering of things, including law[95] and science.[96] Even when rarely explicit, it can be inferred from behavioral or textual evidence. When a myth is explicit, as in the case of the Enlightenment myth of the scientific method, the operational code may vary even as the underlying doctrine continues to be strongly asserted. The formal formula of the scientific method has evolved from its beginnings in empiricism and mathematization to a stronger emphasis on

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90. *See* Michael Reisman, *Myth System and Operational Code,* 3 YALE STUD. WORLD PUB. ORD., 229, 231 (1977).

91. W. MICHAEL REISMAN, FOLDED LIES: BRIBERY, CRUSADES, AND REFORMS 16 (1979).

92. AMANDA H. LYNCH & SIRI VELAND, URGENCY IN THE ANTHROPOCENE 16 (2018).

93. Elinor Ostrom*, Beyond Markets and States: Polycentric Governance of Complex Economic Systems*, 100 AM. ECON. REV. 641, 647 (2010).

94. Reisman, *supra* note 90.

95. A.V. Dicey wrote:

> The whole body of beliefs existing in any given age may generally be traced to certain fundamental assumptions which at the time, whether they be actually true or false, are believed by the mass of the world to be true with such confidence that they hardly appear to bear the character of assumptions.

A.V. Dicey, HAROLD D. LASSWELL & A. KAPLAN, POWER AND SOCIETY: A FRAMEWORK FOR POLITICAL INQUIRY 117 (1950).

96. LYNCH & VELAND, *supra* note 92, at 26.

collaboration, peer review, interdisciplinarity, and ethical approaches. At the same time, the informal operational code has moved away from a formal process of rejection of a null hypothesis as a result of constrained experimentation to the acceptance of a hypothesis through the convergence of multiple streams of evidence. Throughout, the symbols of objective, reproducible science continue to be asserted, and largely, though not universally, upheld.

Multiple institutions, *inter alia,* universities, churches, governments, and international organizations rely upon myths. "The participants in every social process act in the frame of reference of the myth . . . [which is] . . . a pattern of stable perspectives among the members of a collectivity."[97] As such, Article 234 serves a purpose that is challenged by the emergence of a fundamental change in circumstances—*rebus sic stantibus*. Thus, in respect of states invoking Article 234 the problem is "how to distinguish an authoritative claim to a share in the power process from an impermissible claim."[98] This is an empirical matter.

The ice of Article 234 has always been more myth than tangible phenomenon. It represents not the physical ice of the Arctic Ocean, but an idea of ice as it affects the Arctic littoral states, and a formula that reflects that negotiated significance. This was true when the provision was negotiated and drafted, notwithstanding State parties' expectations at the time. Importantly, the ice of the eastern Arctic, and the Northeast Passage, is clearly following a trajectory of change that is distinct from the ice of the western Arctic, and the Northwest Passage. This complex changing nature of the physical ice destabilizes the foundation of the myth of ice in Article 234. Furthermore, a straightforward assessment that Article 234 is no longer applicable due to climate change in any region of the Arctic is beset by the irreducible uncertainties of ice retreat in the context of a chaotic system, an evolving science, and a contested climate policy space. Meanwhile, the Arctic remains icy, stormy, dark, remote, treacherous—and fragile. As such, interpretation of Article 234 and indeed, assessment of when and how its provisions become moot, becomes "a coupled problem of phenomenon and discourse."[99]

The future applicability of Article 234 will turn on the myth of an area that can be identified as enduringly covered with some distribution of ice that justifies the imposition of navigational friction. In some parts of the

97. Harold D. Lasswell & Allan R. Holmberg, *Toward a General Theory of Directed Value Accumulation and Institutional Development*, in POLITICAL AND ADMINISTRATIVE DEVELOPMENT 380 (Braibanti ed.,1969).

98. McDougal et al., *supra* note 22 at 195.

99. LYNCH & VELAND, *supra* note 92, at 17.

Arctic, this UNCLOS provision is devolving into *lex simulata*, law which neither elites nor the target audience expect to apply. This expectation will be shaped by the physical condition of Arctic sea ice, moving rapidly and getting stuck, varying in thickness from mere slush to towering ridges, advancing and receding over days, seasons, and decades. Myths are "frozen meaning"[100] but not static—the myth of Article 234 will ultimately align with the phenomenon of disappearing ice. It is in the dynamic nature of international law that prescriptions do not remain constant and neither does ice. Law-making is a process of communication, conveying doctrine, indicating control, and generating expectations of authority; the prescriptions as applied.[101] As ice disappears so can prescriptions, codes, rules, and UNCLOS provisions whose subject is ice. They evolve. They terminate.

100. HAROLD D. LASSWELL ET AL., THE COMPARATIVE STUDY OF SYMBOLS: AN INTRODUCTION, 12 (Stanford Univ. Press 1952).

101. *See* W. MICHAEL REISMAN, *International Law-making: A Process of Communication*, 101 PROC. OF THE AM. SOC'Y. INT'L. L. 105 (1981).