the business and human rights debate beyond the dichotomy between human rights and corporate wrongs and the equation that no treaty means no solution. He has provided a framework that credibly claims to reflect international law but also harnesses the power of voluntarism by allowing States to build upon it and business innovate with it. For a human rights lawyer, however, Ruggie's solution might look rather too 'soft'. Ruggie's answer to that charge appears to lie in the promise of tomorrow. He repeatedly emphasises that his work is just the 'end of the beginning'. What is crucial to turning business's perverse human rights impacts into positive ones is how others will pick up his mantle. The interested student of business and human rights does not need to look very far from Ruggie himself to identify possible ways forward: in the business arena, Ruggie's colleague at Harvard, Michael Porter, suggests that businesses can actually profit from solving social problems, while human rights could benefit from the resource-generating capacity of business. At the United Nations, there are already frameworks—such as UNICEF's *Children's Rights and Business Principles*—that provide practical guidance for business on how to respect and support the human rights enshrined in specific treaties. Ruggie even sees signs of his framework crystallising into hard law in section 1502 of the Dodd–Frank Wall Street Reform Act, which requires annual corporate disclosure of the measures taken to exercise 'due diligence' on the source and chain of custody of conflict minerals.

Indeed, the basis of the book's interest—or frustration—for an international legal audience is the lessons it offers on the way the law develops, from policy formation to the slow solidification of guiding principles into hard law and meaningful redress. For anyone interested in corporate social responsibility issues, the book also adds colour to the official UN publications on this topic, showing the policy decisions, compromises and aspirations those documents contain. For business leaders or general counsel on the boards of multinational businesses, the book impresses the importance of integrating human rights concerns into business strategy before they become a legal, public relations and financial liability. For all of those people, John Ruggie's book is essential reading. After all, it is only with their help that it will be possible to realise his vision that business too can be just.

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Science and the Precautionary Principle in International Courts and Tribunals: Expert Evidence, Burden of Proof and Finality by Caroline E Foster [Cambridge University Press, Cambridge, 2011, 375pp, ISBN 978-0-521-51326-5, £77 (h/bk); ISBN 978-1-107-66903-1, £25.99 (p/bk)]

Science and Risk Regulation in International Law by Jacqueline Peel [Cambridge University Press, Cambridge, 2010, 398pp, ISBN 978-0-521-76863-4, £71 (h/bk); ISBN 978-1-107-62533-4, £27.99 (p/bk)]

ADDRESSING THE TURN TO SCIENCE IN INTERNATIONAL LAW

I. INTRODUCTION

Scientific evidence and risk assessment have played an inescapable role in international adjudication and decision-making in recent decades. As international lawyers have confronted problems ranging from chemical weapons disarmament to climate change, they have increasingly called upon scientific and technical experts to help map out an understanding of how the world works and how its threats can be contained. The ways in which science and international law have affected one another through this interaction are complex. On the one hand, international law has changed in response to developments in scientific knowledge. On the other hand, international law

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has affected how such knowledge is generated and understood: among other things, by changing incentives for research and innovation, by requiring regulation to be scientifically justified and by privileging particular forms of expert knowledge over others in adjudicative and regulatory decision-making.

Although the relationship between science and domestic law has long been the subject of scholarly consideration, it is only recently that attention has turned to the relationship between science and international law. With these two books, Caroline Foster and Jacqueline Peel have each made important and meticulously researched additions to this emerging literature. Considering both in tandem helps to highlight the distinctive contributions made by each author, as well as the limitations of their respective projects. It also provides an opportunity to reflect on the different ways in which scientific knowledge may be approached and understood by international lawyers.

II. FROM INTERNATIONAL ADJUDICATION TO GLOBAL GOVERNANCE

Much of the scholarship on science and international law to date has been driven by the WTO's jurisprudence on the treatment of scientific evidence and risk assessment in the Agreement on the Application of Sanitary and Phytosanitary Measures ('SPS Agreement'). Although Foster and Peel both engage carefully with the SPS case law, for each such analysis only forms part of a more expansive project. Foster's book focuses on the challenges that scientific complexity and uncertainty pose for international adjudication, particularly in relation to the treatment of expert evidence, how to allocate the adjudicative burden of proof, and the principle of finality of adjudication. Much of her analysis is centred on nine international disputes in which scientific evidence played a central role. These disputes are described straightforwardly as providing 'a representative selection',[1] although it is not clear what makes them so. Rather than targeting the jurisprudence of any one court, the cases are drawn from various international courts and tribunals, including the International Court of Justice, the International Tribunal for the Law of the Sea and the WTO dispute settlement organs. Other cases involving State responsibility (including investment arbitration cases) are introduced as the book progresses, but receive less attention.

An advantage of this diffuse approach is that it provides a broad snapshot of how various international adjudicative bodies have attempted to wrestle with the problems of scientific complexity and uncertainty. As a map of varied practice, Foster's book provides a useful insight into the commonalities and differences between these bodies. Foster's drawing together of the different methods for taking expert evidence in scientific disputes, from the parties hiring their own experts to having 'neutral experts'[2] determine disputes altogether, is a particular highlight. This elevated vantage point also helps to bring certain high-level trends into focus, such as the 'unmistakable trend [. . .] towards the use of procedures that bring greater judicial involvement in the scientific aspects of these cases'.[3] Furthermore, the book provides a welcome respite from the occasionally myopic focus on the WTO found elsewhere in the literature (although the WTO is far from neglected here).

Foster's chosen methodology nonetheless has some significant limitations. The breadth of her selection of cases leaves her with little space to consider why differences in practice have arisen between these international courts and tribunals. There is very little consideration of how the rationales for their varied approaches may have been shaped by distinctive institutional, jurisprudential, historical or sociological factors. For instance, in discussing how adjudicators have procured expert evidence through consulting with international organizations, there is no indication of the extent to which a pre-existing formal or institutional link to such organizations—as the WTO has with, among others, the International Monetary Fund and the Codex Alimentarius Commission—might affect how evidence is framed and understood.[4] This detached approach is not uncommon

[1] CE Foster, *Science and the Precautionary Principle in International Courts and Tribunals: Expert Evidence, Burden of Proof and Finality* (Cambridge University Press, Cambridge, 2011) 33.
[2] ibid 129. [3] ibid 131. [4] ibid 102–6.

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in international law, but does not make for rigorous comparative scholarship. Moreover, it undermines the persuasiveness of some of Foster's broader prescriptive claims. It is harder to make a convincing argument that certain practices should change when their reasons for existing in a given context have not been clearly articulated.

The primary focus of Peel's book is on processes of risk regulation and global governance, especially those relating to environmental and public health issues. In seeking to capture these diverse processes, Peel analyses science-related governance mechanisms ranging from the Biosafety Protocol to the Inter-governmental Panel on Climate Change. Much of the book, however, remains caught in the inexhaustible gravitational pull of the WTO's SPS jurisprudence.[5] Rather than deriving a common set of beneficial norms and practices from this survey, Peel instead notes that it is 'not possible to generalise from this experience *the* ideal configuration for scientific and risk assessment procedures in international law'.[6] Rather, her selected case studies help provide inspiration for future 'experimentation and institutional reform'.[7]

Peel is particularly concerned with the ways in which 'science is becoming a fundamental organising principle in international regimes concerned with risk',[8] and how this affects multiple layers of regulatory decision-making. She takes the 'becoming' part seriously, tracing the emergence of two competing risk regulatory paradigms—'sound science' and the precautionary principle—from their origins in the US and EU risk regulatory systems.[9] She also draws on a rich social scientific literature to investigate 'the reasons why science and expert risk assessment enjoy their current pre-eminence in international law'.[10] Her analysis of how these paradigms have come to dominate international debates is historically and sociologically grounded. Moreover, by focusing on the WTO as a central case study, she is able to highlight the essential interconnectedness of contemporary regulatory regimes. In particular, she draws attention to how the WTO's narrow and technical approach to science and risk in the SPS jurisprudence has influenced the workings of the Codex Alimentarius Commission, the Biosafety Protocol negotiations and national/regional food safety regimes. In the process, she transforms the book's somewhat lopsided focus on the WTO from a potential weakness into a strength. That said, further elaboration of the role played by non-adjudicative governance mechanisms such as the SPS Committee[11] would have been welcome.

III. ALTERNATIVE VISIONS OF SCIENCE

Foster and Peel's differences in approach also extend to how they envision the role of science in international law debates. Foster's book suggests a strong faith in scientific endeavour as a means of discerning truth, as well as in adjudicative processes for recognizing such truth and cloaking it with legal authority. In this vein, she claims that international adjudicators have historically been given a relatively free hand in dealing with evidence as '[a]n overarching emphasis has been placed on finding the "truth" lying at the heart of an international dispute'.[12] This focus on science as a source of truth is reflected in Foster's articulation of 'the rationalist tradition', which requires a strict separation of fact and law and understands rules of evidence and procedure as directed towards bringing about the 'rectitude of the decision through correct application of valid law to true facts'.[13]

[5] The book provides a comprehensive assessment of the WTO SPS jurisprudence predating *Australia—Apples*: see *Australia—Measures Affecting the Importation of Apples from New Zealand*, WTO Doc WT/DS367/AB/R (29 November 2010). See also Jacqueline Peel, 'Of Apples and Oranges (and Hormones in Beef): Science and the Standard of Review in WTO Disputes under the SPS Agreement' (2012) 61(2) ICLQ 427.

[6] J Peel, *Science and Risk Regulation in International Law* (Cambridge University Press, Cambridge, 2010) 332 (emphasis in original).

[7] ibid; see also 383.

[8] ibid 5.

[9] See also J Peel, 'Risk Regulation under the WTO SPS Agreement: Science as an International Normative Yardstick?' (2004) Jean Monnet Working Paper 02/04 available at <http://www.jeanmonnetprogram.org/archive/papers/04/040201.pdf>.

[10] Peel, *Science and Risk Regulation* (n 6) 108.

[11] ibid 185–90.

[12] Foster (n 1) 3.

[13] ibid 5 (citations omitted); see also 77.

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Foster argues, however, that the rationalist tradition in adjudication is threatened by the scientific uncertainty central to many contemporary disputes, as 'international courts and tribunals are called upon to make judicial decisions in circumstances where potentially decisive facts about future events cannot be obtained at the time of adjudication'.[14] Moreover, international norms are often drafted in forms where questions of fact and questions of law cannot be easily separated. For Foster, however, scientific fallibility and a blurred fact/law distinction do not threaten to topple the rationalist tradition altogether. Rather, they become problems to be managed by adjusting adjudicative procedure to 'facilitate satisfactory dispute resolution in scientific cases and help ensure the integrity and authority of international adjudication'.[15] Thus problems associated with scientific error in completed cases can at least be managed by allowing for revision or reassessment when significant new scientific evidence has come to light. Most such problems can be addressed with the right set of procedures, sufficient time and sufficient research. Similarly, although Foster recognizes that normative elements may shape expert evidence and advice, she seeks to mitigate their capacity to distort adjudicative decision-making by calling for greater transparency and informal interaction between experts and adjudicators.[16]

Peel too acknowledges the value of science in providing a 'credible' basis for risk regulation. However she is much more sceptical about the likelihood that scientific uncertainty and error may be managed with the passage of time. She considers that the risks associated with the types of scientific uncertainty that can be identified for technical resolution are 'often dwarfed by more pervasive issues of ignorance and indeterminacy that are not readily amendable [sic] to resolution through further research of the application of uncertainty management techniques'.[17] Scientific uncertainty and error are here not just problems to be contained and managed—they are pervasive and inescapable aspects of regulatory life with deep implications for the legitimacy of excessively science-centred approaches to risk regulation.

Beyond its empirical and analytical utility, Peel also views science as providing a powerful vocabulary of legitimation for those seeking to advance or impede particular regulatory projects. Indeed, this vocabulary is increasingly invoked by international organizations seeking to justify their authority in matters of risk regulation. Such organizations may seek to accumulate expert legitimacy by framing issues as 'merely technical', thereby artificially separating these issues from the arena of values and politics. Peel argues that these organizations are then able to draw on a well-established symbolic universe to strengthen their claims, in which the concepts of 'science' and 'expertise' are associated with progress, universality and objectivity.[18] Those working towards opposite goals can draw on a set of counter-associations, by appealing to notions of scientific uncertainty and contingency.

Nonetheless, Peel recognizes 'that expert knowledge is limited in its capacity to legitimise public authority, even in areas treated as scientific and technical in nature'.[19] Science and expertise may provide powerful tools for more reliably determining the probability of risks, but they also tend to undermine opportunities for political participation and contestation in risk-related decision-making. When combined with conspicuous examples of scientific fallibility ranging from mad cow disease to Chernobyl, public confidence in science and expertise is already fragile. As such, expertise provides 'a necessary but not sufficient rationale' for the legitimacy of global risk governance.[20] She thus recognizes the need 'for the expertise deployed in international risk regulation to be bolstered by other mechanisms in order to be legitimate', in particular 'democratic mechanisms and values'.[21] As globalization leads to increasingly complex forms of global administration and the world is mapped in ever greater scientific detail, acknowledging these limits of expert legitimacy becomes all the more important.

[14] ibid 5–6.
[15] ibid 31.
[16] ibid 134 and 154. See also CE Foster, 'Public Opinion and the Interpretation of the World Trade Organisation's Agreement on Sanitary and Phytosanitary Measures' (2008) 11 JIEL 427.
[17] Peel, *Science and Risk Regulation* (n 6) 238; see also 98–102.
[18] ibid 58–66.
[19] ibid 54.
[20] ibid 53.
[21] ibid 55.

IV. NORMATIVE PROPOSALS

To contain the threat posed to the rationalist structure of international adjudication by scientific uncertainty and error, Foster turns to the precautionary principle. She claims that, subject to ensuring such views are made sufficiently transparent, 'the injection of precautionary considerations by well-informed experts should be welcomed'.[22] More contentiously, she also argues that adjudicators should reverse the burden of proof to give effect to the precautionary principle in cases of significant scientific uncertainty where doing so would 'ensure the sound administration of justice'.[23] The precautionary principle also informs her proposal to institutionalize reassessment proceedings for disputes involving scientific uncertainty.

Although there is an initial appeal to Foster's proposals, they lack a rigorous theoretical basis and are thus not as persuasive as they could be. Foster's normative claims are essentially built around the relation between three concepts: precaution, scientific uncertainty and the administration of justice. Unfortunately, each of these concepts is heavily under-specified. First, notwithstanding its presence in the book's title, the precautionary principle itself is given relatively little attention. Foster claims that it need not be applied here as a legally binding rule, but rather as a guiding principle 'to be applied as part of the decision-making process'.[24] This is a rather meagre basis for applying something as contested as the precautionary principle. It also provides little guidance as to how to operationalize such a 'guiding principle' in specific circumstances. Second, Foster mainly treats scientific uncertainty as identifiable and resolvable—the type of uncertainty that rule-makers may already 'have in mind', and which can be 'accommodated' by legal rules.[25] This tends to ignore risks associated with scientific ignorance and irresolvable uncertainty, even though such risks are central to contemporary challenges such as climate change. Third, Foster frequently invokes 'the administration of justice' as a self-evident basis for the inherent powers of international courts and tribunals to reverse the burden of proof; without further explication this concept seems dangerously malleable. When combined with the vagueness of the precautionary principle as guiding principle, this would grant adjudicators a large degree of discretion[26] in making procedural decisions which can have a profound effect on the substantive outcomes of disputes. This requires a lot of faith in the adjudicators; particularly those who, as is the case with some WTO panel members, lack any legal training.

More specifically, Foster's suggestion that the WTO make more use of expert review groups to advise on legal questions—such as whether or not a measure may be considered 'necessary'[27]—is also problematic. Even with the caveat that the expert group 'be given no discrete mandate or jurisdiction to determine such issues',[28] this would seem to invite trouble. This is especially so given WTO panels' previous struggles to delineate the expert and adjudicative roles in *EC—Biotech*[29] and *Canada/US—Hormones Suspension*.[30] Moreover, when it comes to SPS matters, the WTO seems to have moved decisively away from this approach. Article 14.9 of the old Tokyo Round Standards Code provided for the convening of a technical expert group that could be tasked with making 'such findings as will assist the Committee in making recommendations or giving rulings on the matter, including [. . .] whether the measure was necessary for the protection of human, animal or plant life or health'. Not only was this provision never put into use, it was altogether abandoned in the Standards Code's successor agreements, namely the SPS Agreement and the Agreement on Technical Barriers to Trade.

Peel, like Foster, acknowledges the 'normative that lurks within the technical'.[31] Peel's emphasis, however, is more on how law can be used to channel this inherent normativity in a more

[22] Foster (n 1) 182. [23] ibid 240. [24] ibid 244. [25] ibid 6.
[26] As Foster herself acknowledges: ibid 192–3 and 275–6. [27] ibid 168. [28] ibid.
[29] *EC—Measures Affecting the Approval and Marketing of Biotech Products*, Report of the Panel, WTO Docs WT/DS291-3/R (29 September 2006); see discussion of this precise issue in Foster (n 1) 141–3.
[30] *United States—Continued Suspension of Obligations in the EC—Hormones Dispute*, Report of the Panel, WTO Doc WT/DS321/R (31 March 2008).
[31] S Jasanoff, 'Technologies of Humility: Citizen Participation in Governing Science' (2003) 41(3) Minerva 223, 240, cited in Peel, *Science and Risk Regulation* (n 6) 341.

'democratized' fashion. Her aim is to incorporate 'a broader array of perspectives or values'[32] in decision-making to improve the legitimacy of international risk governance. Drawing on a range of interdisciplinary sources, while again focusing on WTO SPS disputes, Peel canvasses various proposals to apply to risk governance at both the domestic and international levels. These include, for instance, extending the types of expert advice that the WTO dispute settlement organs take into account in cases involving risk regulation; deferring to national risk preferences; and encouraging greater transparency through normalizing open hearings and providing for real-time release of dispute settlement documents. She notes that these are all 'imperfect alternatives',[33] which require us to make institutional choices. Overall, however, Peel indicates a normative affinity with more localized regulatory processes, suggesting that 'the drive for science-based global risk regulation may need to slow its pace'[34] to allow time for the development of trust and legitimacy in relation to international risk governance.

V. SCIENCE, EXPERTISE AND THE POLITICS OF INEQUALITY

As a final point, a more explicit engagement with the politics of inequality associated with access to scientific knowledge and expertise is conspicuously absent from both books. Foster acknowledges that science may be politicized or enlisted in favour of particular causes. However, she then frames this as a problem of expert neutrality for judicial management.[35] Foster also discusses the problem of asymmetrical access to relevant information, but only in the sense that governments are more likely to have better access to their own documents.[36] This does not address the broader problem faced by less wealthy States which may struggle to access the legal and scientific expertise needed to effectively advance their claims and counter those of their opponents in international disputes. Indeed, relaxing the finality of adjudication by encouraging further revision or reassessment proceedings has the potential to compound this problem.

Peel does make a few references to the problems raised by such differential access to expertise. For instance, she cites Kal Raustiala to note how regulatory convergence has been 'premised on the adoption of the environmental and other standards of "advanced" nations by "weaker states"'.[37] She also notes that a lack of technological and institutional capacity may undermine developing countries' ability to participate effectively in the mechanisms governing the importation of living modified organisms under the Biosafety Protocol.[38] Overall, however, her primary focus remains on the regulatory competition between the US and the EU arising from their contending approaches to risk regulation, and on the WTO Members that have made extensive use of the dispute settlement system. Even her review of proposals for democratizing risk governance does not deal expressly with how less wealthy States may be affected specifically. It would have been intriguing to consider whether these proposals could also be used to serve the interests of such States more effectively than current arrangements.

VI. CONCLUSION

Foster and Peel have each here made wide-ranging and valuable contributions to the ongoing debates about the relationship between science and contemporary international law. Both books propose developments of the law in ways which have a clear practical import. Indeed, Foster's book was cited by Judges Al-Khasawneh and Simma in their Joint Dissenting Opinion in the *Pulp Mills* case,[39] and both books have been cited by counsel for Japan in the *Whaling in the*

[32] Peel, *Science and Risk Regulation* (n 6) 338. [33] ibid 372. [34] ibid 375.
[35] See eg Foster (n 1) 84 and 90–1. [36] ibid 207–9.
[37] Peel, *Science and Risk Regulation* (n 6) 13; see also 30 and 64–5. [38] ibid 301–2.
[39] *Case concerning Pulp Mills on the River Uruguay (Argentina v Uruguay)*, Judgment of 20 April 2010, ICJ Reports 2010 (Joint Dissenting Opinion of Judges Al-Khasawneh and Simma) 110.

Antarctic case.[40] Foster's book makes an ambitious contribution to the literature in drawing together the practice of multiple courts and tribunals and raising awareness of the key problems that scientific complexity and uncertainty pose for international adjudicative procedure. Her central normative proposals on reversing the burden of proof and relaxing the principle of finality are appealing, but require further development. Peel's book usefully opens up the debate to focus on non-adjudicative governance mechanisms. Overall, it exhibits less faith in the capacity of both science and law to manage contemporary risks or respond to democratic preferences, and thus advocates a more cautious reliance on science in the attempt to develop the legitimacy of international risk governance. The role played by scientific knowledge and expertise in international adjudication and governance is only set to increase. These books remind us that there is much to be gained from welcoming this development, but that one should not be too quick to put one's faith in either scientists or lawyers.

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[40] *Whaling in the Antarctic (Australia v Japan: New Zealand Intervening)*, ICJ, Counter-Memorial of Japan (9 March 2012), 415n1104 and Annex 202, available at <http://www.icj-cij.org/docket/files/148/17384.pdf>.

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