

**Scientific forecasting?
Performing objectivity at the UK's Meteorological Office, 1960s-1970s**

Janet Martin-Nielsen
janet.nielsen@utoronto.ca
Aarhus Universitet

“It was time that meteorology had its place in the sun”
- John Mason¹

When Basil John Mason, an academic cloud physicist, arrived at the UK's Meteorological Office in the autumn of 1965 to take over as director, meteorology — the discipline, its methods, and its vision of the future — was in flux. With the advent of computers, the accumulation of before inconceivable quantities of data, and the great advances in numerical forecasting stateside, meteorology was developing a new culture: an objective, numerical and scientific culture, Mason argued, that would raise the discipline into the league of the highly respected sciences.

This paper investigates Mason's efforts to shape this new culture and to cement the UK as a leading nation in meteorology during his early tenure at the Meteorological Office. It highlights three guiding aims of Mason's work, each centered on a particular form of authority. First, Mason argued for the epistemic authority of numerical weather models on the basis of their objective interpretation of physical theories. He then used this epistemic authority to build social authority in models – that is, to make them be seen as trustworthy testifiers and adjudicators – and, finally, to boost the social authority of the Meteorological Office itself.² These aims shaped and were shaped by the many forces at work at the Meteorological Office in the mid-to-late 1960s and the 1970s: feelings of inadequacy compared to other sciences, accusations about poor

¹ John Mason referring to the 1960s in an interview conducted by R.J. Ogden, 4 June 1985 (Royal Meteorological Society Distinguished Voices Archive, hereafter 'RMS DVA'), Part 1, 1:18:02

² Mike Hulme discusses forms of authority in Hulme, “How climate models gain and exercise authority”, in K. Hastrup & M. Skrydstrup, eds., *The Social Life of Climate Change Models: Anticipating Nature* (London: Routledge, 2013), 30-44

forecast accuracy, budgetary cutbacks, and new industries demanding new meteorological services, amongst others. By investigating Mason's actions through these lenses, this paper delivers a new look at the changing culture of meteorology in the UK, and speaks to the broader epistemic, technical and social 'relocation' of meteorology as a means of speaking objectively about the near future in the post-war period.

John Mason arrives at the Meteorological Office

On October 1, 1965, a young cloud physicist from Imperial College (London) arrived at the UK's Meteorological Office to take over as director. At 42 years of age, John Mason (1923-2015) was decidedly young to be named a senior civil servant. Moreover, Mason had no experience in government or administration: trained in physics and mathematics at the University of Nottingham, he had spent his early career as a lecturer in meteorology (1948-1961) and then as a professor of cloud physics (1961-1965) at Imperial College.³ His work on rainmaking, or weather modification, had made Mason's name in both the British and US meteorological communities in the 1950s, and, all the more, put him in the public eye: the Duke of Edinburgh even came to hear Mason speak on rainmaking at the British Association, and a popular softcover version of Mason's book *Clouds, Rain and Rainmaking* sold over 15,000 copies.⁴ The US Ambassador to the UK personally invited Mason to advise on rainmaking in the US, where cloud seeding and other weather modification techniques were a booming business,⁵ and Mason's American lecture tour of in 1959-1960 resulted in many job offers, all with salaries much higher than Mason's English salary at the time – but he and his wife decided that they did not want to raise their young family in America.⁶ In 1965, Mason was elected to the Royal Society, one of 44 scientists from the UK and the Commonwealth selected to join the UK's foremost learned society that year. It was on the basis of this prodigious and prolific early career that Lord Shackleton, Minister of Defence for the Royal Air Force, offered Mason the directorship of the Meteorological Office.⁷ The offer came as a surprise to Mason and, after considerable reflection and consultation, he accepted, confidently declaring to Shackleton that he would “build it up to be the best met service in the world”.⁸ Mason's portrait hanging in

³ Mason's university studies were interrupted by the war when, in 1944, he was called up by the Royal Air Force and trained as a radar instructor, eventually serving in the UK, India and Burma. He returned to Nottingham after the war and completed his degree in 1947.

⁴ John Mason, Interview conducted by Hessam Taba, November 1994 (WMO Bulletin Interviews, Vol. 44, Issue 4), p. 318.

⁵ For rainmaking in the US in the 1950s, see Kristine C. Harper, 'Climate Control: United States Weather Modification in the Cold War and Beyond', *Endeavour* 32 (2008), 20-26.

⁶ John Mason, Interview conducted by R.J. Ogden, 4 June 1985 (RMS DVA), Part 1, 43.00.

⁷ At this time, never in the history of the Meteorological Office had the director been an internal appointment. In this sense, Mason's appointment was not an aberration. He was, in fact, interviewed for the position, but the decision had for all intents and purposes been made in advance.

⁸ John Mason, Interview conducted by R.J. Ogden, 4 June 1985 (RMS DVA), Part 1, 1:16:00.

London's National Portrait Gallery, a bromide print from the autumn of 1967, shows a man who looks younger than his age, his dark hair carefully coiffed, sitting in a relaxed stance and seeming to engage directly with the artist with just a hint of a smile.

Upon assuming directorship of the Meteorological Office, Mason oversaw a budget of £7.2 million and directed a staff of nearly 4,000 employees spread across 128 domestic and 43 overseas facilities.⁹ Of these staff, 1,000 worked at the Meteorological Office's Bracknell headquarters (opened in 1961 in the new town of Bracknell in Berkshire) whilst most of the rest were deployed with the Royal Air Force at home and overseas, manning a 90-station world-wide weather service.¹⁰ The Meteorological Office's mandate, and thus Mason's responsibility, spoke to the dual military-civilian nature of the organization, as well as to the office's mid-19th century origins as a marine weather warning service: the office was to "provide a comprehensive weather service for the Royal Air Force, civil aviation, agriculture, shipping, public utilities, industry, commerce and the general public, and undertake the greater part of the country's research effort in meteorology and atmospheric physics".¹¹

From the first days of his appointment as director, Mason proved a bold thinker, willing to take risks and to cross his senior advisors, not afraid to make hard decisions, and with a keen ability to navigate the currents of government and politics. Through his tenure as director, from 1965 to 1983, Mason brought a strong vision and agenda to the Meteorological Office, shaping and changing the UK's national weather service – and his forceful personality (he had a "rather imperious persona", according to colleague John Day)¹² gained him both admirers and detractors amongst his subordinates at the Meteorological Office and his masters at the Ministry of Defence.¹³ "The most outstanding quality and characteristic of John Mason is perhaps his extreme frankness", wrote the World Meteorological Organisation's Hessam Taba in an otherwise affectionate piece: "He expresses his opinions so forcefully that, at times, it borders on aggression".¹⁴ Mason's leadership style can be clearly seen in his first major decision as director of the Meteorological Office, the inauguration of operational numerical weather prediction.

Just weeks after assuming the directorship of the Meteorological Office, Mason made his mark by declaring that numerical weather prediction would be made operational – effective

⁹ This was the budget for the 1965-1966 financial year. Budget: John Mason, 'The Future Development of the Meteorological Office', *The Meteorological Magazine* 107 (1978: 129-140), 129-130. Staff: John Mason, 'The Meteorological Office – Today and Tomorrow', *Contemporary Physics* 8 (1967), 73

¹⁰ John Mason, 'The Role of Meteorology in the National Economy (based on a lecture given at the Summer Meeting of the Royal Meteorological Society in Brighton, 26 July 1966)', *Weather* 21 (1966), 383.

¹¹ John Mason, *The New Age of Weather Forecasting*, London, 1967 (National Meteorological Archive, Exeter hereafter 'NMA', P134(MASO), Item ID 794728-1001), 1.

¹² John Day, 'A Tribute to a Colleague and Friend', *Yambill Valley News-Register*, 9 July 2005.

¹³ From 1919 until 1964, the Meteorological Office fell under the purview of the Air Ministry, the British government body responsible for managing the Royal Air Force. After 1964, when the Air Ministry merged with the War Office and the Admiralty to form the Ministry of Defence, the Meteorological Office also moved under the purview of the Ministry of Defence.

¹⁴ John Mason, Interview conducted by Hessam Taba, November 1994 (WMO Bulletin Interviews, Vol. 44, Issue 4), p. 316.

immediately. This decision, and this attitude more broadly, were opposed by senior staff who thought that more research and testing – at least six to twelve months more – was needed, but Mason pushed forwards contrary to their advice, determined to lift numerical forecasting “out of research mode and into real-time”.¹⁵ For Mason, numerical forecasting, and computers more broadly, offered a means of bringing meteorology into the league of the highly respected sciences: “big computers come to the rescue”, he announced boldly and publicly.¹⁶

Numerical forecasting had first been discussed at the Meteorological Office in the spring of 1948 during a meeting with the Department of Meteorology at Imperial College, but it took more than a decade for the Meteorological Office to obtain its own computer for numerical work.¹⁷ Through the late 1940s and early 1950s, scientists in the Meteorological Office’s Forecast Research Division were unsure at best about numerical forecasting, and enthusiasm for the enterprise was low. “The mathematics are only approximate and there is still no evidence that the computer will do as well as the conventional forecaster”, stated the Meteorological Office’s gloomy annual report for the year ending on March 31, 1952.¹⁸ Sutcliffe, then director of research, worried that new recruits trained in computer methods wouldn’t have “the deep feeling for the weather systems [like the] real forecasters”, and wouldn’t develop the ability to make intuitive judgements about the weather.¹⁹ Tellingly, Sutcliffe declined to mention computer techniques at all in his speech on the future of research and science at the Meteorological Office during the office’s centenary celebrations. And at a discussion with high-profile Swedish-US meteorologist Carl-Gustaf Rossby and US meteorologist Joseph Smagorinsky in 1954, Meteorological Office researchers bemoaned that their rudimentary numerical model, tested on a borrowed LEO 1 computer, was “not an adequate forecasting tool”.²⁰

Matters began to improve later that year when Meteorological Office researchers gained night-time access to the University of Manchester’s Ferranti Mark 1 computer.²¹ “Numerical forecasting was still in its infancy”, reported famed Scottish wartime meteorologist James M.

¹⁵ John Mason, Interview conducted by Hessam Taba, November 1994 (WMO Bulletin Interviews, Vol. 44, Issue 4), p. 320.

¹⁶ ‘Press Conference’, *Meteorological Magazine* 95 (1966), 29.

¹⁷ For early numerical weather forecasting in the UK, see Malcolm Walker, *History of the Meteorological Office* (Cambridge: Cambridge University Press, 2011), p. 317ff; Anders Persson, ‘Early Operational Numerical Weather Prediction Outside the USA: An Historical Introduction, Part III: Endurance and Mathematics – British NWP, 1948–1965’, *Meteorological Applications* 12 (2005), 381-413. For the Meteorological Office in the postwar era, see Alexander Hall, *Risk, Blame and Expertise: The Meteorological Office and Extreme Weather in Post-War Britain* (PhD thesis, University of Manchester, 2012).

¹⁸ Annual Report of the Director of the Meteorological Office Presented by the Meteorological Committee to the Secretary of State for Air for the Year Ending 31 March 1952 (NMA, ORGS UKMO A DUP 1951/52, Item ID 38078000284887).

¹⁹ Reginald C. Sutcliffe, Interview conducted by J.M.C. Burton, 1981-1983 (RMS DVA), 19:33, 22:55.

²⁰ Meteorological Office Discussion: Dynamical Forecasting by Numerical Methods, *The Meteorological Magazine* 83 (1954), 176. The LEO 1 computer was owned by the food giant J. Lyons & Co. and located at their Cadby Hall office in London.

²¹ In the post-war years, Manchester was one of the UK’s three leading computer centers, along with Cambridge University and the National Physical Laboratory in Teddington.

Stagg, but “considerable progress was being made”.²² The following year, the government gave the Meteorological Office funds to buy its own Ferranti Mercury, which the researchers nicknamed *Meteor*: a valve machine with 5,000 bytes of main memory, capable of doing 30,000 calculations a second. However, plagued by delays, *Meteor* only entered use at the Meteorological Office’s Dunstable office in early 1959, a setback which exacerbated the gap between the Meteorological Office and the US Weather Bureau in terms of numerical weather prediction – a gap which Mason would strive to close during his tenure.²³

Even with the arrival of *Meteor*, the Meteorological Office’s senior scientists retained, on the whole, cautious-to-negative attitudes towards numerical weather prediction. In 1960, a year after *Meteor* finally came into use, Sutcliffe wrote that he was “rather pleased to be able to say [that NWP is] not yet a great success story” – and, he continued, there is “no danger of the art of forecasting being entirely superseded”.²⁴ Sutcliffe’s attitude, which contrasted with that of Mason, was representative of the older generation’s way of thinking about and doing meteorology: one in which human experience trumped machine capacity. For Mason, the critical advantage of numerical forecasting was that it replaced traditional forecasting – subjective and reliant on the imperfect experience and knowledge of individuals – with computers: objective tools capable of bringing meteorology to the next level.²⁵ The Meteorological Office’s advisory council agreed with Mason’s vision: to move swiftly towards implementing operational computer forecasting and analysis across all areas of the office, and to replace human data processing by computers wherever possible – even if the results weren’t satisfactory at first. “At present computed analyses do not always match in accuracy those produced by conventional methods and occasionally there may be serious discrepancies”, the committee reported later, but still “complete reliability on machine analysis would be of great value in many ways, and efforts will be directed towards this end”.²⁶

²² Meteorological Office Discussion: Dynamical Forecasting by Numerical Methods, *The Meteorological Magazine* 83 (1954), 182. As the chief weather forecaster to General Dwight D. Eisenhower, Stagg set the date for the Allied invasion of Europe of June 6, 1944.

²³ For the situation in the US, as well as more general accounts of the rise of numerical weather forecasting, see Kristine C. Harper, *Weather by the Numbers: The Genesis of Modern Meteorology* (Cambridge, MA: MIT Press, 2008) and Frederik Nebeker, *Calculating the Weather: Meteorology in the Twentieth Century* (San Diego: Academic Press, 1995), among others.

²⁴ R.C. Sutcliffe, ‘Weather Forecasting as a Problem in Fluid Dynamics’, *Yearbook of the Physical Society of London* (1960), 9-15.

²⁵ Meteorological Committee: A New Computer for the Meteorological Office, September 1967 (Document MC/P75, File BJ5/302, Meteorological Office: Administrative Records, National Archives, Kew, hereafter ‘KEW’), p. 1.

²⁶ Meteorological Committee: Progress in Numerical Forecasting in the Meteorological Office, 28 September 1966 (Document MC/P70, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 5. Not everyone at the Meteorological Office shared Mason’s enthusiasm for numerical weather prediction in the mid-to-late 1960s. The office’s 1967 annual report noted that some scientists were still cautious, treating NWP as a “second opinion” and comparing human and computer forecasts “all the time”, but still Mason thought that “it appeared likely that the forecasters would soon accept the numerical forecast as it stood” – and, indeed, Mason’s prediction was correct and by the 1970s the voices of dissent were all but gone (Meteorological Committee: Director-General’s Annual Report, 31 January 1967 (Document MC/P72, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 4).

In 1960-1961, the Meteorological Office undertook full-scale real-time numerical weather prediction experiments on *Meteor*, only to conclude that the new computer was too slow and too unreliable for NWP to be made operational.²⁷ “The Ferranti Mercury was a very useful machine; it was the fastest we could get at the time”, recalled then-director Sutton, “but it was never really quite adequate to provide a forecast in useful time with the sort of resolution and area we needed”.²⁸ And at a regular Monday evening discussion in the autumn of 1960, the office’s C.J. Boyden dismissed computer methods out of hand, asserting that “at present there is no adequate substitute for the subjective assessment of forecasts based on experience in using them”.²⁹ Still, in the following years, from 1961 to 1965, numerical methods were gradually integrated into daily operations and Meteorological Office scientists began to warm up to the technology: in late 1961, researchers described the 24-hour numerical forecasts as “encouraging”, and by early 1965 the Meteorological Research Committee reported that the Meteorological Office’s scientific staff had developed and run trials demonstrating “not only that the mathematical forecast charts were superior to those produced by mind and hand, but also that the process could be used as part of the routine forecasting operations of the Central Forecasting Office”.³⁰ With a mandate to oversee the Meteorological Office and advise the Secretary of State for Air on matters pertaining to the national weather service, the Meteorological Research Committee was a powerful and influential force.³¹ With this slow yet sure change in attitudes, coupled with Mason’s firm belief that “traditional techniques have been pushed nearly as far as seems profitable” and that computers offered the only potential for “dramatic improvements in the quality and range of the weather forecast”, Mason decided to make numerical weather prediction operational.³²

Numerical weather forecasts were inaugurated at the Meteorological Office on November 2, 1965, just a month after Mason took over as director. As a number of historians of science have noted, objectivity cannot just simply be claimed, but must be performed. Daston and

²⁷ For a description and analysis of these experiments, see Meteorological Office Discussion: Numerical Forecasting at Dunstable, *The Meteorological Magazine* 90 (1961), 77-88.

²⁸ J.S. Sawyer, Interview conducted by Phil Drazin, 12 August 1985 (RMS DVA), 46:42.

²⁹ Meteorological Office Discussion: Numerical Forecasting at Dunstable, *The Meteorological Magazine* 90 (1961), 86.

³⁰ 1961: Meteorological Office Discussion: Numerical Forecasting at Dunstable, *The Meteorological Magazine* 90 (1961), 77. 1965: Meteorological Committee: Changes in Assistant Directorates, 1 January 1965 (Document MC/P62, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 1.

³¹ The Meteorological Research Committee, founded in 1941 by then-director of the Meteorological Office Nelson K. Johnson, consisted of a chairman and other non-official scientific members invited to serve by the Secretary of State for Air, as well as the director and two senior staff members of the Meteorological Office, and officers from the Admiralty, Air Staff, Ministry of Aviation and War Office. (Notes for the Information of Members of the Meteorological Research Committee and Its Sub-Committees, Air Ministry – Meteorological Office, July 1961 (Document M.20001/61, File BJ5/321, Meteorological Research Committee: Minutes, KEW); Meteorological Research Committee: Constitution and Terms of Reference, Approved by the Secretary of State for Air on 17th March 1961 (Document G.42288(a)/HVC/6/61/100, File BJ5/321, Meteorological Research Committee: Minutes, KEW).) For more on the history of the committee, see F.J. Scrase, ‘The History of the Meteorological Research Committee’, *The Meteorological Magazine* 91 (1962), 310-314.

³² ‘Press Conference’, *Meteorological Magazine* 95 (1966), 29-30.

Galison note that the pursuit of objectivity first became associated with scientific practice in the nineteenth century, an age when techniques of mechanical reproduction spawned new faith in representation untainted by the subjectivity of its human creators.³³ This conceptualisation of objectivity subsequently bifurcated into the chasing of fixed and universal laws, and the exercise of trained expert judgment. Weather forecasting, Phaedra Daipha argues,³⁴ has always oscillated somewhere in between these two poles, never settling on either, despite what some forecasters may claim.³⁵ Appealing to a popular understanding of objectivity as mechanical reproduction, early proponents of numerical weather forecasting had to engage in what Shapin calls the ‘credibility economy’, by which expert claims are publicly sorted according to their reliability as descriptors of the world.³⁶ By carefully stage-managing the public performance of a new, computer-driven meteorology, new claims of objectivity could be made, with public credibility and social authority at stake.³⁷ Thus, on the same day as the inauguration of numerical forecasts, Mason presided over the Office’s first-ever press conference, where he proclaimed a new dawn in weather forecasting – a move which his deputy, A.C. Best, thought to be a “great risk” for the office’s reputation.³⁸ While much of the credibility economy which Shapin describes concerns scientific claims where virtual witnesses have no direct access themselves to the phenomena in question, the success and credibility of weather forecasting is easily adjudicated on by anybody who cares to look out of the window. Standing before more than 100 journalists and cameramen from the BBC, national newspapers and the technical press, Mason marked the introduction of numerical weather forecasting in the UK with great confidence: “Today is a landmark in the history of forecasting in the Office”, he declared, “because this afternoon you will see the production of our first routine numerical weather forecast by the computer”.³⁹ Britain, he continued in his first push to build social authority in the Meteorological Office, could now look forward to increasingly accurate weather forecasts underpinned by modern, objective technologies. As the press gallery watched the Meteorological Office’s line printer slowly produce the UK’s first routine numerical forecasting chart, Mason patiently answered questions for nearly an hour and then distributed souvenir copies of the chart to all attendees. The formalities over, the press gallery toured the Central Forecasting Office at Bracknell and chatted over coffee with senior members of Mason’s staff. The next day, the event was featured

³³ Lorraine Daston and Peter Galison, *Objectivity* (New York, NY: Zone Books, 2007)

³⁴ Phaedra Daipha, *Masters of Uncertainty: Weather Forecasters and the Quest for Ground Truth* (Chicago, IL: University of Chicago Press, 2015)

³⁵ Mark Monmonier, *Air Apparent: How Meteorologists Learned to Map, Predict, and Dramatize Weather* (Chicago, IL: University of Chicago Press, 1999); James R. Fleming, *Inventing Atmospheric Science: Bjerknes, Rossby, Wexler, and the Foundations of Modern Meteorology* (Cambridge, MA: MIT Press, 2016)

³⁶ Steven Shapin, ‘Cordelia’s Love: Credibility and the Social Studies of Science’, *Perspectives on Science*, 3 (1995), 255–75

³⁷ Compare with the accounts given in Stephen Hilgartner, *Science on Stage: Expert Advice as Public Drama* (Stanford, CA: Stanford University Press, 2000).

³⁸ Quoted in Anders Persson, ‘Early Operational Numerical Weather Prediction Outside the USA: An Historical Introduction, Part III: Endurance and Mathematics – British NWP, 1948-1965’, *Meteorological Applications* 12 (2005), 403.

³⁹ ‘Press Conference’, *Meteorological Magazine* 95 (1966), p.28.

prominently in newspapers including the *Guardian* and *Daily Telegraph*, as well as the *Daily Express*, which devoted its highly-coveted centre spread to the forecast – and, much to Best’s relief, this coverage was approving as the computer had correctly predicted cold winds and frost across the British Isles.

Mason’s decision to make numerical weather forecasting operational and the way in which he announced this decision – in the public eye at the Meteorological Office’s first-ever press conference, designed to be “a big show for radio and television” – are representative of the self-assured, bold and even brash leadership style he brought to the office.⁴⁰ Indeed, many aspects of Mason’s vision for the Meteorological Office – the principles which guided his tenure as director – are visible in this story. This vision includes fostering a ‘hard science’ culture, taking a commercial approach to the Meteorological Office’s services and information, pursuing objectivity to build epistemic and social authority in face of complaints, and maintaining the Meteorological Office’s standing in comparison to its main counterpart, the US Weather Bureau. Mason’s vision, it is important to emphasize, was a product of the times and culture in which he found himself, shaped and influenced by the rise of numerical computers and computing power as well as by domestic and international political currents and events.

What makes a science?

Mason’s embrace of numerical weather prediction, and computers in meteorology more broadly, went hand-in-hand with his belief that physics and mathematics (what I will call the ‘hard sciences’) represented the epitome of objective scientific practices. Mason believed along with a growing segment of the UK and US scientific communities that computers were the path to the future. This sentiment was also growing in public spheres at the same time, as witness by events such as IBM’s popular demonstrations of computer translation and handwriting recognition at the 1964 World’s Fair.⁴¹ With Mason’s appointment as director, ‘hard science’ became a leading mantra at the Meteorological Office: physics and mathematics enjoyed a privileged status within the office’s research branches, whilst other approaches to weather were de-emphasized. To Mason, a cloud physicist by training, the discipline of meteorology lacked the prestige which physics and mathematics enjoyed – a disparity he wanted to rectify first by bringing numerical modelling techniques to the Meteorological Office, and then by using these techniques to raise the prestige of meteorology, and finally to build social authority in the office itself.

To Mason, numerical modelling constituted a paradigm shift in meteorology, a technique that promised to radically change the landscape of that discipline. Computers, he wrote in 1967,

⁴⁰ John Mason, Interview conducted by Hessam Taba, November 1994 (WMO Bulletin Interviews, Vol. 44, Issue 4), p.320.

⁴¹ See, f.ex., Jon Agar, ‘What difference did computers make?’, *Social Studies of Science* 36 (2006), 869-907 and Paul N. Edwards, *The Closed World: Computers and the politics of discourse in Cold War America* (MIT Press, 1997).

represented the end of “a long period of steady but unspectacular development in meteorology”; with numerical techniques, he continued, the Meteorological Office stood on “the threshold of a new era, with unprecedented opportunities for increasing our *scientific* understanding of the atmosphere”.⁴² “Traditional and rather subjective methods of forecasting do not seem capable of much further development and improvement”, he wrote in *Contemporary Physics* in the same year: “The need for more detail, accuracy and reliability over longer periods, involving the handling and assimilation of even vaster quantities of data in very limited periods of time, has led to the use of computers for producing objective forecasts with a minimum of human intervention”.⁴³ The Meteorological Office’s ability to routinely generate 36-hour forecasts, he emphasized, was an accomplishment which could never have been achieved with human power alone.

This language, teeming with references to subjectivity and objectivity, is important for understanding Mason’s thinking, and likewise the attitudes he instilled at the Meteorological Office early in his tenure.⁴⁴ For Mason, the role of objectively-implemented physical theory in meteorology was critical to the future of that discipline: numerical methods, he argued “are objective, logical, mathematical exercises based on a firm structure of physical theory”, whilst traditional weather forecasting “depend[s] heavily on the experience, skill and judgement of the individual human”.⁴⁵ The time was ripe, Mason continued, to move away from “traditional, empirical and largely subjective methods” and to devote energy and resources to numerical techniques — a situation made possible by technological development as well as by a growing desire in political circles for scientific solutions.

Mason’s ‘hard science’ approach brought a shift in recruitment strategies at the Meteorological Office, as well as a change in what type of scientist was valued. Physicists and mathematicians were actively recruited and highly respected, whilst the status of geographers, historical climatologists, and their kin declined. On Mason’s command, recruitment was steered towards the ‘hard sciences’ and, within a year of his appointment, only candidates with a first or second-class honours degree in mathematics or physics could be considered for Scientific Officer positions at the office.⁴⁶ This was a change from the Meteorological Office’s educational

⁴² John Mason, ‘The Meteorological Office – Today and Tomorrow’, *Contemporary Physics* 8 (1967), 63. Emphasis added.

⁴³ John Mason, ‘The Meteorological Office – Today and Tomorrow’, *Contemporary Physics* 8 (1967), 67. The same quote appears in John Mason, *The New Age of Weather Forecasting*, London, 1967 (NMA, Met Office, P134(MASO), Item ID 794728-1001), 4.

⁴⁴ Here, an ‘objective’ method of forecasting can be defined as “one which depends only on the initial data and will produce the same answer whoever prepares it; the method will not call for any judgement on the part of the forecaster” (Meteorological Office Discussion: Objective Methods of Local Forecasting, 16 March 1959, *The Meteorological Magazine* 88: 207). Note the importance of the forecaster’s judgement being removed from the forecast – this was precisely Mason’s aim.

⁴⁵ John Mason, ‘The Application of Computers to Weather Forecasting’, *Physics in Technology* 4 (1973), 63.

⁴⁶ John Mason, Meteorological Committee: Recruitment Into the Meteorological Office, December 1971 (Document MC/P88, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 1. For post-WWII UK civil service rankings, including for scientists, see E.N. Gladden, *Civil Services of the United Kingdom* (London: Frank Cass, 1967).

standards and recruitment strategies of the previous decades, which had recruited from a wider variety of educational backgrounds.

Part of Mason's focus on 'hard science' was a deliberate effort to raise the perceived scientific status, or prestige, of meteorology – and thereby to attract strong young scientists to the Meteorological Office. “High-quality graduates in mathematics and physics tended to be more attracted to subjects considered ‘modern’, such as nuclear physics and radio astronomy, than to meteorology, which was popularly thought to be a branch of geography with a veneer of classical physics”, writes historian Malcolm Walker, and Mason took it upon himself to change this perception and build meteorology into a subject which could viably compete for the attention of young scientists.⁴⁷ By lecturing at universities across the UK, engaging with the press, writing editorials for academic journals and popular magazines, and hosting high-level visits to the Meteorological Office (including by the Duke of Edinburgh and British Prime Minister Edward Heath), Mason aimed to portray and publicize meteorology as a discipline with interesting questions and a bright future. Mason used similar arguments to try to counteract the post-war brain drain and entice British scientists back home from the United States – a campaign that saw, among others, physicist Keith Browning come back from the US National Center for Atmospheric Research to lead the Meteorological Office's Radar Research Unit in 1966 and physicist Raymond Hide return from his position as a full professor at MIT to head the office's Geophysical Fluid Dynamics Section in 1967. By 1971, Mason felt that his recruitment policies were paying off. “The Calibre of the Scientific Officer entry has improved steadily over the past five years and strength is up to complement”, he reported with satisfaction to the Meteorological Committee in that year.⁴⁸ Now, he continued, we are “able to pick and choose some of the very brightest young mathematicians and physicists in the country”.⁴⁹ Indeed, within a half-decade of Mason's appointment, the office had built “a reputation of drawing in the best scientists”, in the words of a young recruit of the era, Julia Walker — a situation which also met with strong disapproval from other quarters, where geographically-, culturally- and historically-based approaches to weather and climate were held in high esteem.⁵⁰

⁴⁷ Malcolm Walker, *History of the Meteorological Office* (Cambridge: Cambridge University Press, 2011), 384.

⁴⁸ John Mason, Meteorological Committee: Recruitment Into the Meteorological Office, December 1971 (Document MC/P88, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 8.

⁴⁹ John Mason, Interview conducted by R.J. Ogden, 4 June 1985 (RMS DVA), Part 2, 11:18.

⁵⁰ Julia Slingo, Oral history conducted by Paul Merchant, 11 February 2011 (British Library, National Life Stories: An Oral History of British Science, Shelf Mark C1379/61), p. 42-47. For a discussion of dissenting views, see Janet Martin-Nielsen, A new climate: Hubert H. Lamb and boundary work at the UK Meteorological Office, in Matthias Heymann, Gabriele Gramelsberger and Martin Mahony, eds., *Cultures of Prediction in Atmospheric Science and Climate Science: Epistemic and cultural shifts in computer-based modelling and simulation* (Routledge: London & New York, 2017), 85-99.

Service first

Any significant increase in expenditure on meteorology, however well merited, is unlikely to be regarded sympathetically in the context of a shrinking Defence Budget: meteorology is bound to suffer.⁵¹

- Meteorological Office memorandum, April 1967

To Mason, the Meteorological Office was first and foremost a service organization. Its mandate was to provide meteorological services to the public, the military, and paying customers in a high-quality and cost-effective manner: “to improve the observation, understanding and prediction of the behaviour of the atmosphere, to disseminate this knowledge quickly and widely, and to guide the community in its use so that the great number of weather-sensitive decisions arising daily in all walks of life can be made in the best interests of the economic and social welfare of the country”, as he said in the summer of 1966.⁵² This is not to say that Mason was uncommitted to research, but rather that the Meteorological Office’s service agenda, and all it implied in terms of budgets, planning, and revenue maximization, dominated his vision for the organization – and that, under his directorship, the office’s research agenda was driven by and towards service needs.⁵³ Gaining customers, increasing revenue, and expanding the Meteorological Office’s service repertoire to meet national needs were all integral to Mason’s vision. This service focus provides another lens for understanding the culture Mason instilled at the Meteorological Office.

The dual tasks of service and research had long been important to the Meteorological Office’s identity. When it was first established under the Board of Trade in 1854 to provide weather information and gale warnings to mariners, the office was entirely a service organization. Following World War I, the office was incorporated into the Air Ministry and the focus of its observation stations shifted to Royal Air Force airfields and the provision of weather data for military and civilian aviation, as well as for the other branches of the UK military. The Meteorological Office maintained this service agenda in the interwar years, conducting no formal organized research. Under George Simpson, director of the Meteorological Office from 1920 to 1938, the policy on research was, simply, that “research was not the Met Office’s business” – a view underscored by his belief that research was “a matter for the universities and not a matter for a public service; the rate-payer, the tax-payer oughtn’t to be paying for people to

⁵¹ Memorandum: Meteorology and the Defence Budget, DG Met O, 4 April 1967 (Document Sec Met O/62/II, File AIR19/1088, Meteorological Office: Department Responsibility and Costs, 1962-1971, KEW).

⁵² John Mason, ‘The Role of Meteorology in the National Economy (Based on a lecture given at the Summer Meeting of the Royal Meteorological Society in Brighton, 26 July 1966)’, *Weather* 21 (1966), 382.

⁵³ For further discussions, see Alexander Hall, ‘From the Airfield to the High Street: The Met Office’s Role in the Emergence of Commercial Weather Services’, *Weather, Climate and Society* 7 (2015), 211-223. Hall makes the point that the Meteorological Office’s development of applied weather services in the postwar period was part of a broader ‘agentification’ of the UK’s scientific civil service.

do research”.⁵⁴ After World War II, however, this began to change.⁵⁵ The new director, Nelson K. Johnson, made implementing a research culture a condition of accepting his appointment in the autumn of 1938, and, after the interruption of the war, “meteorological research was at last to be a recognized function of the Office, no longer left to the insufficient efforts of enthusiastic members of its staff at their postprandial dining tables”.⁵⁶ The first formal research division, the Forecasting Research Division, was established in 1948 in a new building near the Meteorological Office’s Central Forecasting Office in Dunstable.

Upon taking over the directorship in 1954, Sutton aimed to continue on the course pioneered by Johnson; that is, to break free from the Meteorological Office’s traditional service mentality and to develop stronger research traditions. Sutton re-organized the office to give service and research equal status and equal scientific resources. Soon, the office had active research programs in areas ranging from artificial satellites to atmospheric electricity to aircraft turbulence. As part of his vision, Sutton also insisted on a new centralized building for the Meteorological Office’s Greater London facilities, which were at the time scattered across five locations.⁵⁷ “For a research-based scientific institution”, Sutton insisted in the late 1950s, “physical segregation was intolerably damaging”.⁵⁸ In 1961, Sutton’s new headquarters were opened at Bracknell in Berkshire, 48 kilometres west of central London. The Bracknell headquarters boasted specially designed research facilities including laboratories, cold chambers, and wind tunnels, as well as a 30-acre outdoor experimental site, providing the Meteorological Office with a comprehensive set of scientific facilities and installations “fitted with all modern conveniences” for the first time.⁵⁹ The following spring, Queen Elizabeth II and the Duke of Edinburgh visited Bracknell, giving the new facility a royal flavour.

For Mason, who took over the directorship in 1965, Sutton had shifted the Meteorological Office’s service-research balance too far in favour of research. Upon Mason’s appointment, the editor of *Weather* – the Royal Meteorological Society’s monthly magazine – asked Mason to give his thoughts. “I am very conscious that the first duty of the Meteorological

⁵⁴ First quote: Reginald C. Sutcliffe, Interview conducted by Hessam Taba, 25 February 1981 (WMO Bulletin Interviews, Vol. 30, Issue 3). Second quote: Reginald C. Sutcliffe, Interview conducted by J.M.C. Burton, 1981-1983 (RMS DVA), 47:19. On the lack of research at the Met Office in these years, and indeed Simpson’s opposition to formal organized research, also see J.S. Sawyer, Interview conducted by Phil Drazin, 12 August 1985 (RMS DVA), 12: 25.

⁵⁵ See, for example, the Meteorological Office’s annual report for year ending March 31, 1949. Also, for two overviews of research at the Met Office in this era, see A.H.R. Goldie, ‘Organization of Research in the Meteorological Office’, *Meteorological Magazine* 78 (1949), 93-98 and Reginald C. Sutcliffe, ‘The Meteorological Office Faces the Future: Scientific Research and Development’, *Meteorological Magazine* 84 (1955), 183-187. See also Hall, *Risk, Blame and Expertise*.

⁵⁶ P.A. Sheppard, ‘Notes by the Chairman of the Meteorological Research Committee’, *Meteorological Magazine* 91 (1962), 335-337.

⁵⁷ These locations were Victory House, Harrow, Dunstable, Stanmore, and the London Airport Forecasting Office. Staff from the first four locations were united at the new Meteorological Office headquarters, and the *Meteor* computer was also moved from Dunstable to Bracknell.

⁵⁸ F. Pasquill, P.A. Sheppard and R.C. Sutcliffe, ‘Oliver Graham Sutton, 4 February 1903 – 26 May 1977’, *Biographical Memoirs of Fellows of the Royal Society* 24 (1978), 539.

⁵⁹ Reginald C. Sutcliffe, ‘Research Organization and Facilities’, *Meteorological Magazine* 91 (1962), 317.

Office is to provide a first-class public service”, Mason emphasized in his commentary: “its value to the community and its proper financial support will be judged largely by the quality and range of its services”.⁶⁰ Improving the office’s economic and social authority, as well as building its prestige as a provider of weather services, was integral to Mason’s directorship. “Every day, millions of decisions are based upon, or influenced by, the weather forecast”, he wrote: “They range in importance from whether to hang out the washing, to the cancellation or diversion of the flight of an airliner, to the imposition of a major power cut. The Meteorological Office tries to cater for them all”.⁶¹ And Mason’s masters constantly reminded him of the importance of the Meteorological Office’s service mandate: “the acid test for a meteorological organization costing some £4M or £5M a year must clearly be the measure of success achieved in improving the technique of forecasting and applying the data obtained for the benefit of the various users”, emphasized the Brabazon Committee, a powerful government review board, during its 1956 evaluation of the office.⁶²

Whilst the Meteorological Office was required to provide free access to weather information for the public, Mason saw potential in offering customized, paid services to industrial and commercial clients — and thereby extending the office’s epistemic and social authority into new realms of British life. As part of his ‘service first’ approach, Mason continually evaluated the markets for meteorological and climatological information and honed the office to best serve them, aiming to expand the office’s customer base and bring in new revenue. In this sense, he took a business-oriented, and even aggressively commercial, approach to running the Meteorological Office. In 1966, for example, Mason called for market research to establish a baseline understanding of the office’s markets in connection to computer resources.⁶³ He then commissioned a market survey and hired a management consultancy firm, Messrs. Peter Ward Associates, to “examine the prospects of increasing revenue from the Meteorological Office public services”.⁶⁴ Mason also promoted the office’s services personally, writing articles for the trade press, giving talks to industrial and professional bodies, engaging with the media, and instructing his Public Services Branch to produce brochures to advertise the Meteorological Office’s service offerings.⁶⁵ Front and centre in Mason’s sights was the provision of customized weather information for new clients. Speaking in 1966 about the role of meteorology in the national economy, Mason enthusiastically described his efforts to “convince individual industries

⁶⁰ John Mason, ‘Some Thoughts on the Future’, *Weather* 20 (1965), 274.

⁶¹ John Mason, ‘The Meteorological Office – Today and Tomorrow’, *Contemporary Physics* 8 (1967), 73.

⁶² For the Brabazon Committee, see File AIR20/9417, Brabazon Committee on Meteorological Office, KEW. The committee’s influential report is Brabazon (1956), ‘Report of a Committee to review the organization of the Meteorological Office, August, 1956’ (AIR 2/1239, KEW).

⁶³ John Mason, ‘The Role of Meteorology in the National Economy (Based on a lecture given at the Summer Meeting of the Royal Meteorological Society in Brighton, 26 July 1966)’, *Weather* 21 (1966), 382.

⁶⁴ Meteorological Committee: Meteorological Office Services to the Public – Report by Management Consultants Messrs Peter Ward Associates (Document MC/P89, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 1. For the survey, see Survey of Market for Meteorological Services (File BJ5/302, KEW).

⁶⁵ The Expansion of Revenue-Producing Services in the Meteorological Office and the Growth of Income (Document MC/P 106 Annex, File AIR2/18819, Meteorological Committee: Papers, KEW), p. 2.

and firms that they may profit from [the Meteorological Office's information]" by approaching large industries at the board-room level "and offer[ing] to discuss how we might help".⁶⁶

Critical to these goals was the oil and gas industry, which began drilling in the North Sea in the mid-1960s. Soon, the Meteorological Office was offering meteorological information relevant to the towing and operation of rigs and supply vessels.⁶⁷ A decade later, by the mid-1970s, the office's offshore industry services – including twice-daily forecasts for individual oil rigs, platforms and pipe-laying barges; additional targeted services for critical operations such as jacking up, diving and towing; a 24-hour on-call telephone and Telex advice line; and even a new office in Sumburgh to provide tailored forecasts for helicopter flights serving oil rigs – represented a critical revenue source.⁶⁸ Ship routing services, introduced by Mason in 1967 for Atlantic crossings and extended in 1972 to the Pacific, designed to inform mariners about safe crossing routes, also quickly gained a large customer base and saw steadily rising profits.⁶⁹ Due in large part to Mason's efforts at seeking out new avenues for service, enquiries rose steadily during his tenure: non-aviation enquiries nearly doubled from 1.16 million in 1965-1966 to 1.97 million in 1977-1978, and climatological enquiries tripled in the same period, from 10,000 in 1965-1966 to nearly 30,000 in 1977-1978. And the rise in revenue was even more dramatic: whilst the office pulled in £1.7 million in service revenue in 1965-1966, a decade later its services brought in £8.7 million.⁷⁰

For Mason, increasing the Meteorological Office's revenue through service provision took on new importance as the office faced budgetary cutbacks in the late 1960s. The Meteorological Office fell under the Ministry of Defence, and Mason himself was responsible to the Secretary of State for Defence through the Royal Air Force's Parliamentary Undersecretary of State for Defence.⁷¹ In the late 1960s, the UK struggled with low growth, falling trade, a sickly economy, strict monetary exchange controls, and, in 1967, under Prime Minister Harold Wilson, a de-valuation of the pound – all of which meant declining budgets for government departments, including the Ministry of Defence. For Mason, the reductions in the defence budget represented a threat to his realm. With tight finances, wrote the Ministry of Defence's L.H. Curzon early in 1968, there was "a real problem of priorities which in all circumstances is almost bound to be settled in favour of Defence requirements" – a thinly veiled notice to Mason that the

⁶⁶ John Mason, 'The Role of Meteorology in the National Economy (Based on a lecture given at the Summer Meeting of the Royal Meteorological Society in Brighton, 26 July 1966)', *Weather* 21 (1966), 384.

⁶⁷ R.J. Ogden, 'Forecasting for North Sea Oil and Gas Rigs', *Weather* 27 (1972).

⁶⁸ For services for the offshore industry, see Meteorological Committee: Meteorology and Natural Resources (Document MC/P97, File AIR2/18819, Meteorological Committee: Papers, KEW), p. 4.

⁶⁹ The Expansion of Revenue-Producing Services in the Meteorological Office and the Growth of Income (Document MC/P 106 Annex, File AIR2/18819, Meteorological Committee: Papers, KEW), p. 2.

⁷⁰ John Mason, 'The Future Development of the Meteorological Office', *The Meteorological Magazine* 107 (1978), 129-130. Both figures are in 1966 pounds.

⁷¹ Only property and stationary did not come from the Ministry of Defence (The Meteorological Office: Overview, 1 September 1977 (File CAB 164/1379, Meteorological Office and Climatology, 1974-1978, KEW), p. 1).

Meteorological Office faced a combative atmosphere in the ministry's internal fight for funds.⁷² Curzon's words were echoed bluntly by ranking officials in the Royal Air Force: faced with "the distressing nature of the sort of measures we are having to contemplate to reduce the total Defence Budget", the Armed Forces were preparing "to launch an attack on the cost of Meteorological Services on the grounds that [...] it means the sacrifice of a battalion", wrote the Deputy Undersecretary and Permanent Undersecretary for the Royal Air Force in 1967.⁷³ Acutely aware that, in the wake of the grim budgetary situation, "the Armed Forces genuinely felt that many Defence projects were of greater value than improved meteorology", Mason was forced to pursue a policy of revenue maximization – a policy which also aimed to boost the office's importance and authority in many aspects of British life.⁷⁴

Political imperatives from across the ocean

Keeping up with the USA, or at least not being left far behind the dominant country in meteorology, was another constant, overriding pressure affecting how Mason made decisions, distributed resources, and assigned value throughout his tenure as director of the Meteorological Office. Closely related was Mason's desire to remain at the forefront of European weather forecasting and research, as well as his desire for the UK's national weather service to be seen as superior to its Soviet counterpart. For Mason, these pressures pushed him to move forwards, and quickly, with numerical modelling – an area in which the US was strong, and an area which Mason saw as critical to the future of meteorology.

The pressure to keep up with the USA did not originate in Mason's term of office; rather, it stemmed from the end of World War II.⁷⁵ Building on computer advances from wartime codebreaking work, mathematician John von Neumann and meteorologist Jule Charney produced the world's first numerical weather forecast on the ENIAC computer in Maryland's Aberdeen Proving Grounds in 1950. Five years later, the US began operational numerical weather prediction as a joint project between the US Weather Bureau, Air Force and Navy.⁷⁶ And the next year, at Princeton, Norman Phillips developed the first true general circulation

⁷² L.H. Curzon, Ministry of Defence, to M.G.F. Hall, Treasure Chambers, 25 January 1968: Civil Meteorology and the Defence Budget (Document AUS(F)(Air)/3727, PUS no. Q521, File AIR19/1088, Meteorological Office: Department Responsibility and Costs, 1962-1971, KEW).

⁷³ A.D. Peck, DUS(P&B) to PUS(Air), 15 March 1967: Civil Meteorology and the Defence Budget (Document ADP.182/67, File AIR19/1088, Meteorological Office: Department Responsibility and Costs, 1962-1971, KEW); PUS(RAF) to US of S(RAF), 16 March 1967 (Document PUS no. P1692, File AIR19/1088, Meteorological Office: Department Responsibility and Costs, 1962-1971, KEW).

⁷⁴ AUS(F)(Air), 14 March 1967: Civil Meteorology and the Defence Budget (Document AUS(F)(Air)/1530, File AIR19/1088, Meteorological Office: Department Responsibility and Costs, 1962-1971, KEW).

⁷⁵ Prior to World War II, UK meteorology had been largely internally focused, with not much attention paid to other countries, especially not the USA. This changed with the war. For discussion see J.S. Sawyer, Interview conducted by Phil Drazin, 12 August 1985 (RMS DVA), 26:20.

⁷⁶ See Kristine C. Harper, *Weather by the Numbers: The Genesis of Modern Meteorology* (Cambridge MA: MIT Press, 2012).

model, sparking publicity, winning government funding, and inspiring a concerted US effort in the field. There was no question in the mind of the Meteorological Office's leaders that the US was far ahead of the UK in weather matters, and this translated into a constant source of pressure on and within the office.

In 1967, Mason reported to the Meteorological Committee about the Meteorological Office's relative position: "the United States [is] rather ahead" in terms of numerical weather prediction, he said, noting also that the Soviets were well advanced, but reassured his masters that the UK remained ahead of their main European counterparts, Sweden and the Federal Republic of Germany.⁷⁷ To not fall further behind "our rivals" (as he referred to the US Weather Bureau), he continued in his 1967 annual report, there is an "urgent need" to expand the Meteorological Office's computing resources and facilities.⁷⁸

Mason's words met their mark, and in the same year (1967) the Meteorological Committee explicitly described the replacement of the present KDF9 computer, acquired in 1965, as a pressing need essential "to enable the Office to maintain its position as the leading centre of meteorological practice and research outside the United States".⁷⁹ "We see this powerful new computer as the keystone of a modernized, efficient national weather service able to take full advantage of the recent remarkable advances in research and technology", the committee continued. The new computer, they concluded, "will enhance our undisputed leadership in meteorology in Europe and make Bracknell the only centre in the world to compare with Washington for many years to come". This machine, an IBM 360/195, was installed at Bracknell in 1971-1972 at a cost of over half a million pounds, and soon the entire Meteorological Office was "extensively modernized and re-organized around the very powerful [new] computer".⁸⁰ The IBM was more than simply a computing machine; it was a concrete symbol of the UK's determination to keep up with the USA in meteorological matters: a symbol of national status and a method of enhancing political authority just as much as scientific capacity. Indeed, if the Meteorological Office had a *raison d'être* apart from its explicit mandate in the post-war period, it was a political one. Driven by this mandate, Mason's large investments in computing hardware, techniques and personnel spoke simultaneously to matters of science, vision, politics and prestige. This reminds us that the changes driven by Mason at the Meteorological Office were the result of ambitions shaped by the times; namely, the rise of computers, a growing desire for 'hard scientific' approaches in the UK government, and the Meteorological Office's situation vis-a-vis the United States.

⁷⁷ Meteorological Committee: Director-General's Annual Report, 31 January 1967 (Document MC/P72, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 5.

⁷⁸ Our rivals: John Mason, Interview conducted by R.J. Ogden, 4 June 1985 (RMS DVA), Part 2, 9:15. Urgent need: Meteorological Committee: Director-General's Annual Report, 31 January 1967 (Document MC/P72, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 3.

⁷⁹ Meteorological Committee: A New Computer for the Meteorological Office, September 1967 (Document MC/P75, File BJ5/302, Meteorological Office: Administrative Records, KEW), p. 1.

⁸⁰ John Mason, 'The Future Development of the Meteorological Office', *The Meteorological Magazine* 107 (1978), 129.

Complaints and challenges

As a senior civil servant, Mason was often grilled by politicians, the public and the media about the accuracy of the Meteorological Office's forecasts. Soon after assuming the directorship of the office, Mason was met with strong – and embarrassing – complaints about the office's abilities. He reacted to this criticism by intensifying his push towards 'objective' methods (namely, numerical modelling), convinced that the objectivity he saw as inherent in computer models of weather would both improve the Meteorological Office's forecasting accuracy and boost its social authority.

In 1966, only months after Mason's arrival at the Meteorological Office, a commotion erupted in the House of Lords over weather forecasting when Lord Erroll of Hale, president of the London Chamber of Commerce and former Minister of Power in Sir Alec Douglas-Home's Conservative government, interrogated Lord Shackleton, Minister of Defence for the Royal Air Force with responsibility for the Meteorological Office: "What steps [are] the Government [...] going to take to correct the deterioration in the standard of forecasts issued by the Meteorological Office?", asked Lord Erroll in a biting tone.⁸¹ The office, he continued, ought to "make an apology when they were wrong, and to issue no forecast when conditions were very variable, instead of allowing the public to be hoodwinked by dogmatic forecasts". *The Times* picked up on the exchange and, on August 2, 1966, ran an article critical of the Meteorological Office, including comments from Captain C.C. Jackson, secretary-general of the International Federation of Airline Pilots Associations, who suggested that the office was providing poor service to pilots: "The forecasting service has not improved since the war", Jackson complained.⁸² And the reliability of the office's forecasts was again called into question two years later, in September 1968, when heavy rain caused severe flooding in southeast England, washing away bridges, inundating low-lying areas, and flash flooding rivers, eventually requiring the Army to provide emergency help to thousands. In the House of Commons, members of parliament John Ellis (Bristol North-West) and Roger Gresham Cooke (Twickenham) demanded to know why the Meteorological Office had provided no advance warning of the catastrophic rains. Two days after the storm, Ellis appeared in person at Mason's Bracknell office to discuss the office's failure: how, he demanded of Mason, was the Meteorological Office unable to make critical forecasts, even with a new computer which had cost the government nearly half a million pounds?⁸³

⁸¹ 'Sunnier Outlook for Weather Forecasts', *The Times* (London), 2 August 1966, p. 10.

⁸² 'Sunnier Outlook for Weather Forecasts', *The Times* (London), 2 August 1966, p. 10.

⁸³ *The Times* (London), 17 September 1968.



Fig. 1. The Met Office computer, console operator's desk. KDF-9 tape unit behind, Met Office Headquarters, Bracknell. Scanned from the original 35 mm slide, image no. 2306, item ID 962305-1001. ©Crown copyright.

Forced to defend himself and his organization, Mason pointed to the Meteorological Office's growing use of computers for numerical modelling, highlighting the future dividends to be reaped from the objective nature of this technique. This argument had three parts: first, Mason argued that models were imbued with epistemic authority due to their objective (that is, numerical, or mathematical) interpretation of physical theories. He then used this epistemic authority to build social authority in models – to make them be seen as trustworthy testifiers and adjudicators – and, finally, to build social authority in the Meteorological Office itself. In publicity reminiscent of his first push for social authority in weather models – the 1965 press conference at which Meteorological Office's inaugural operational numerical weather forecast was printed live in front of a crowd of journalists – Mason demonstrated the success of the Meteorological Office's models to politicians, students, and the press at the office's Bracknell headquarters and at venues across the UK.⁸⁴ The authority and objectivity of the Meteorological Office's models was represented in a much-circulated photo (Figure 1) of the office's KDF9 computer, showing a large room filled with elegantly designed blue-and-silver computer cabinets, tape units and line printers, personified by men in sharp suits and horn-rimmed glasses sitting attentively at the consoles, light pouring in through large windows.⁸⁵ As has been

⁸⁴ It is beyond the scope of this paper to discuss the public reception of computerized forecasting, the advent of television forecasts, and the changing public status of meteorology in the UK. The reader is referred to section 5.4 of Alexander Hall, *Risk, Blame and Expertise*.

⁸⁵ This image, and others like it, are now kept in the Meteorological Office's archives. See, for example, Image no. 2306, Met Office Computers: Console Operator's Desk, KDF-9 Tape Unit Behind, Met Office Headquarters, Bracknell (NMA, Shelf Mark Computers no. 017, Item ID 962305-1001).

extensively discussed in the history of science community, the production and projection of objectivity and authority through models, data and technology are particularly important during the emergence of new scientific practices.⁸⁶ They are as affected by scientific argumentation as they are by social processes, cultural traditions and political contexts. As we have seen in this paper, they are often construed differently in the scientific and non-scientific communities, whether it be by different validation standards or by the desire for practical applications.⁸⁷ The standards by which objectivity and authority are measured are furthermore, as Mike Hulme argues, socially constructed: the epistemic power of computer models in 1960s Britain is rooted in broader social and cultural changes.⁸⁸ In the KDF9 photo, for example, the computers themselves are front and centre, clean and gleaming in the light, whilst the scientists are there to ensure the proper functioning of the machines but not to do the forecast calculations themselves. Whilst earlier Meteorological Office publicity photos show forecasters in the foreground, leaning over detailed maps, the sole interpreters of weather data, this photograph underlines the new status of machines in the forecasting equation. Indeed, with the numerical production of weather knowledge, human forecasters found themselves in both partnership and competition with the computers. The modernity of the computer, went the message, was a reason to trust in the information it produced. And that output itself – in the form of weather charts, complete with thick black isobars and international weather symbols overlaid on an outline map of the British Isles – inhabited a public venue on BBC television, where the charts appeared daily before millions of viewers.⁸⁹ As these charts entered British homes as ‘serious scientific’ representations of the weather, the Meteorological Office scientists who, crucially, doubled as BBC weather presenters quickly became household names and even celebrities. And as the models performed in the public arena, Mason hoped they would build credibility in the Meteorological Office itself.

Mason’s push to build social authority in models was ultimately largely successful — part of a broader cultural shift in which computers and computer modelling became hegemonic in certain fields. The Ministry of Defence, for example, asserted in 1968 that weather data “produced by numerical means were consistently more reliable than those produced by traditional subjective methods” – precisely the attitude Mason wanted to instil in his masters and in government and the public more broadly.⁹⁰ Mason, it can be argued, succeeded in ‘relocating’ the perception of meteorology from a subjective discipline to an objective, scientific discipline

⁸⁶ See for example Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (University of Chicago Press, 1994); Ted Porter, *Trust in Numbers: The Pursuit of Objectivity I Science and Public Life* (Princeton, NJ: Princeton University Press, 1995); Daston, and Galison, *Objectivity*.

⁸⁷ See also Matthias Heymann, ‘Constructing Evidence and Trust: How Did Climate Scientists’ Trust in Their Models and Simulations Emerge?’, in *The Social Life of Climate Change Models: Anticipating Nature*, ed. by Kirsten Hastrup and Martin Skrydstrup (Abingdon: Routledge, 2013), 203–24

⁸⁸ Mike Hulme, ‘How Climate Models Gain and Exercise Authority’, p.41.

⁸⁹ In 1967, the daily viewership for the BBC’s televised weather forecast was five million viewers. John Mason, ‘The Meteorological Office – Today and Tomorrow’, *Contemporary Physics* 8 (1967), 75. On the public consumption of television weather forecasts more generally, see Mark Monmonier, *Air Apparent*.

⁹⁰ Malcolm Walker, *History of the Meteorological Office* (Cambridge: Cambridge University Press, 2011), 364.

with epistemic authority. And this was achieved by carefully and deliberately relocating meteorology into British homes, businesses and government circles, through orchestrated performances of the new power of numerical weather prediction. His early tenure at the Meteorological Office saw the development of new audiences, new clients and new markets as the office commercialized its offerings. But Mason's third aim – to build social authority in the Meteorological Office itself, to improve the organization's reputation and status – was a harder battle, set back by every major failed forecast, which in a country enamoured with the weather invariably made the front pages of the newspapers. Even as the office's forecasting models improved and weather forecasts became more accurate and reliable, still weather prediction was inherently difficult. It was a battle that Mason fought throughout his nearly two-decade tenure at the Meteorological Office.

Acknowledgements

With thanks to Matthias Heymann, Andrew Watt, Martin Mahony, and Cultures of Prediction colleagues.