The Meteorological Device:

Literary Modernism, the Daily Weather Forecast and the Productions of Anxiety

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Abstract:

The focus of this article is the world's first mathematical weather forecast by Lewis Fry Richardson, published in 1922. In a counter-archival and anti-historical move, Richardson's work argues for the 'disaggregation' of the future from the past. The paradox which results from this disaggregation, namely that the future must be framed as unprecedented in order to be subject to prediction, is viewed as a disciplinary bind which afflicts literary modernism and meteorology equally. Through a reading of James Joyce's *Ulysses* alongside the meteorological data for Dublin on June 16, 1904, the article considers the interaction between the future and the archive as a problem of literary writing.

Keywords: Weather forecasting, Lewis Fry Richardson, literary prediction, literary weather, James Joyce

“On the double meaning of the term *temps* in French.“

Walter Benjamin

“Above all, we surely don’t know how to think about the relations between time and weather, temps and temps: a single French word for two seemingly disparate realities.”

Michel Serres[1]

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If we were to attempt a history of the end of history, of how the conceptualization of the modern state produced the now familiarly assembled phenomena of governmentality, globalization, and climate change, then we would do well to look at the history of the modern weather forecast. There are several good reasons for this.

First, most generally, any such history of science returns the epistemological foundations of the present to the anthropology of modern scientific culture, enabling a comparative perspective on how environmental knowledge is gathered and used. Second, modern weather science represents a systematic understanding of force and flow which even as it has always depended upon state infrastructure for establishing its surveillance outposts, measuring instruments, and the now planetary scale of its experimental scene, describes an air economy *up there* dangerously supplemental to that which exists on an earth divided into sovereign territories *down here*.[2] Third, modern forecasting marks a caesura between climate and weather, and, correspondingly, the shift from a scene in which differentiated climates (European states) unfolded their destinies in line with nineteenth-century historiography, to the enigmatically global scene of the present time, which is to say, “our” time and “our” modernity. A history of the weather forecast, then, would necessarily be a history of the

present, indeed, a history of the present's usurpation of official nation-based histories. *Temps*, as this article's epigraphs suggest, has long been noted as the French term both for time passing, and for what it happens to be doing outside. But in the modern meteorological age such a commonsense register of the changing appearance of place opens onto a set of exacting ontological demands: for a singular instantaneity, for the simultaneous representation of multiple spaces beyond the horizon of common perception, and for the ordering and reordering of grammatical tense.

A fourth reason for coupling the weather forecast and *posthistoire* modernity is to be found in the question of the archive. The development of the scientific weather forecast in the late-nineteenth and early-twentieth centuries demonstrated perhaps the primary means of embedding the excitement of cataclysm within the structure of the everyday. In the same gesture of claiming to know the future (and in a sense, therefore, *to be* the future) the forecast deferred it, all such predictions carrying the cultural memory of oracular prohibition: *don't seek to know too much*. This is one reason why weather has always been accorded a special place in the magical thinking of literature: the wind that allowed Agamemnon to sail for Troy is inseparable from the incestuous trespass that facilitated it. The modern age of meteorological prediction could not do away entirely with this thrill of oracular prohibition, but it did inevitably change its manifestation, most significantly through how future weather events were mediated, their potential crises dispersed, and their charge reactivated on a daily basis. In other words, through the production of a daily archive.

I would like to claim that modernist studies as the institutionalization of avant-garde culture—a repository for exciting futures—has a peculiar and self-conscious affinity to the mechanism of the modern weather forecast in this respect. Consider its structuring paradox: on the one hand, there is rupture, the opening-up of commonsense perceptions of time and space, most famously exemplified by Mallarmé's words scattered across a page in *Un coup*

de dés; on the other hand, an increased focus on everydayness, standardized life, the *homme moyen sensuel* and so on. A language of breakdown and the new coinciding with sciences of social normality, including statistics and probability, means that the shock of avant-garde aesthetics is eternally bound up with the anesthetic and institutional dimensions of disciplinary power.[3] This article argues that a focus on the science of meteorology can help resituate this predicament and evaluate its consequences for the intersecting histories of ecology and literary criticism. Indeed, if there is to be a distinctive "Anthropocene" criticism today, taking seriously political determinations on a planetary scale, the ordinances of deep time, the exhaustion of natural resources and geopolitical unevenness, then, clearly, it will necessitate a full reckoning with the obdurate fantasies which continue to attach us to the modernist every day.

Amitav Ghosh has recently argued that the changing relation between the mundane and the exceptional is at stake in histories of modern literature. He suggests that, since Flaubert, the literary novel has banished the improbable event, including "unusual weather events," in order to foreground the regularity of everyday life. In this way, so-called "serious fiction" remains guilty of covering over ecological reality with an ethos of gradualism that scales and stylizes experience in accordance with European bourgeois normality. Literary realism is "actually a concealment of the real."[4] Indeed, it is hard to argue with the fact that nineteenth-century realism belongs to a different discursive paradigm from that which underlies contemporary representations of climate change. Yet Ghosh's advocacy for new forms of literature, mixing genre elements with scientific nonfiction, rather skips over the episteme of early twentieth-century modernism. In this light, I propose a return to the canon of high-modernist writing in order to show that its implicit investment in probability is not quite the same as an investment in the historically routine; rather, it is a way of incorporating anxiety into our understanding of everyday experience. I argue that the mathematization of

probability in the modernist period and its cultural deployment through the weather forecast produced an organized sensitivity to the exceptional event.

In part one, I explore the archival paradox which modern meteorology and modernist literature share, namely the institutional registration of temporality itself. Significantly, both have employed the unit of the single day to mediate the catastrophic. Here it will be important to recognize how the drive to know the future remains shrouded in everyday attachments, such that the catastrophe to come is repeatedly disassembled and reassembled in writing and communicated as anxiety. In part two, I show how this institutional registration of temporality was accentuated by the development of numerical weather forecasting during World War I. The War has long been a prominent reference for thinking about how rupture is embedded within literary narratives of the everyday. By focusing on wartime meteorological developments, including mathematical modelling and the introduction of what became known as "occlusion zones" between "Weather Fronts" (where storms are born and die), we can further consider how anticipation and retrospection collude in modernist constructions of the everyday in ways that implicate but never reveal an exceptional event. In part three, I identify what I will call the meteorological device in a series of "high"-modernist novels, though focusing on Joyce's *Ulysses*. The numerical weather forecast with its dream of perfect prediction is conjured in these works, but also withheld. Importantly, their enduring commitment to describing the passing of ordinary time does not indicate a formal investment in the basic predictability of social life, as Ghosh's argument suggests, but signals a complex appreciation for the cultural practices and affective consequences of everyday prediction.

Anxiety and the Weather Archive

Histories of meteorology usually emphasize its origin in the Aristotelian doctrine of meteora, the movement of sublunary bodies, and thereafter its reconfiguration through the instruments

of renaissance science and new modes of structured observation. Vladimir Jankovic locates this modern development in the eighteenth century when: "[q]uantification displaced the narratives of meteoric tradition, averages were more relevant than extremes, and recurring phenomena more telling than singularities. The sublunary region, the ontological crucible of meteors, was remade into a fluid of predictable behavior."[5] Alongside this move to empirical and institutional science came a cultural move away from rural praxes—the felt realities of peasant life, and the pastoral imaginary which gilded it—toward the metropolitan centers of data collection and writing. "Metropolitan specialists—doctors, chemists, professors or instrument makers—represented a community extending beyond the limits of parish, region, and even capital itself," writes Jankovic (*Reading the Skies*, 143). Jankovic's narrative ends as early as 1820, still a pre-reformation moment as far as meteorology is concerned, yet already weather is presented as a kind of writing from the future. It was across nineteenth-century Europe and America that infrastructural and cartographical developments, principally the telegraph and the synoptic chart, made sure that meteorological institutionalization continued apace. Most significantly, the single day as the standardization of labor time in the period of industrial capital became also the primary unit of meteorological reportage. Thus, the atomization of time and its organization into units which existed separately from the unfolding of history, meant that time could itself became an exchangeable abstraction, valorized as a commodity in a speculative economy.[6] In this context, the link between newly established scientific societies for meteorology and the Chicago Stock Exchange in the mid-nineteenth century was more than adventitious. Markets functioning to insure against potential futures (e.g., a failed harvest) which had already, imaginatively speaking, taken place, promulgated a profoundly meteorological sensibility. Not only did this signal the financialization of nature, but it also laid the groundwork for a modernity in which fluctuations in expectation caused by serial daily predictions—each successive prediction

evaluated and exchanged—began to replace broad seasonal variation as the orienting dimension of quotidian life.

As Katherine Anderson has shown, by the late-nineteenth century the scale and instability of this meteorological modernity had raised anxiety around the question of political control, with one UK journalist reflecting in 1875 on the state of the science in the following revealing terms: "Climate is a great stately sovereign, whose will determines the whole character of the lives and habits of his retainers, and is therefore so little felt that it seems like liberty; but weather is a cruel, capricious tyrant, who changes his decrees each day and who forces us, by his ever varying whim, to remember that we are slaves."[7] This passage dramatizes the scientific rift between climate discourse which had emphasized predictable variations within given representational spaces (historical nations), and a new meteorological discourse emphasizing volatility and dailiness.[8] Weather in this view is conspicuously out of control, its everydayness dispersed, its intermittencies overdetermined by the specter of a general crisis of experience which must be managed and deferred.

Coincident upon this everyday reflexivity, the trend in meteorological science away from the exceptional weather event towards the administrative record noted by Jankovic was further contorted in the early time-conscious years of the twentieth century by a renewed interest in the instantaneous. No longer simply an empirical phenomenon to be aggregated, the weather event became a question best addressed through mathematical models and imagined vortices which referred to, but did not figuratively resemble, the everyday world. As we shall see, mathematically-minded meteorologists like Lewis Fry Richardson and Vilhem Bjerknes were especially concerned with the birth of storms and were therefore determined to push towards an abstract point of origin that the weather archivists of the eighteenth and nineteenth centuries had not fully uncovered. Disputing longstanding methodological assumptions based on the periodic repetition of weather patterns, these new

meteorologists insisted that the future had to be disaggregated from the present in order to be compatible with the terms of scientific experiment: paradoxically, only once abstracted and valorized as unprecedented could the weather be subject to a truly scientific mode of prediction.

But how could the consistency and value of the archive survive the incursion of so many such disaggregated futures? This was an epistemological question, which also became a question for literature. Paul Saint-Amour has recognized it through his characterization of modernism as exhibiting an "anticipatory syndrome' as an ironic encylopedism.[9] For Saint-Amour, interwar modernism provides us with an archive of futures yet to be lived, which may in fact be unlivable, hence the Joycean dream of a book which outlives not only its author but also the city it describes. Saint-Amour's discussion of interwar literature as redress to the political mobilization of everyday life (the ideology of "Total War") relies upon literature's already established capacity to occupy the space between the future that will have been the case and the futures that will not. The future anterior tense is a now familiar way of describing this coincidence of prescience and retrospection in modernist narrative. It is a tense of institutional survival that indicates modernism's anticipation of its own belatedness as an archival formation.[10] Mallarmé, for instance, anticipates a future that will have been determined by a throw of the dice, while Joyce has Stephen Dedalus remind himself when surrounded by books in the National Library to "[h]old to the now, the here, through which all future plunges to the past."[11] The archive of the future demands of the present that it preserve its formal emptiness as a frame for ecstatic temporality. This is a characteristically modernist demand. It is also a profoundly meteorological one. Weather, too, indicates the empty moment of transmissibility, both phenomenologically as an object constantly changing in relation to itself, and linguistically through its phatic function in everyday discourse.[12] Indeed, it remained a formative challenge to meteorological modernity—one encoded in

modernist literature—that the world of weather talk insisted on treating the future as both unprecedented and archaic.

Literary modernism and modern meteorology availed of archival imaginaries to register the future as it plunged into the past. However, this was a register significantly punctuated by futures that didn't come to pass, which instead came to mark temporal discontinuity and counterfactual speculation. The fact that late-nineteenth and early-twentieth-century weather archives increasingly comprised a compost of virtual futures testified to the adventure of a renewed science, but also to its persistent failure to translate a record of successive events into predictable narrative forms.[13] Later we will consider how literary writers put this failure to use. First, however, it is worth establishing how the valorization of future weather, once disaggregated from climactic expectation, came to express the compatibility of everyday experience with the radically discontinuous—or the new. Indeed, in its early twentieth-century movement towards mathematic prediction, weather science helped model what Ulrich Beck has since called the "globalization of doubt," a feature of modern risk societies where the discontinuities of chance operates outside of, but also within, those insurable futures already imagined and accounted for: modern economy depends upon the catastrophe it makes the most effort to predict and avoid.[14] Which is to say, the future imagined becoming the past will not abolish the perils of chance (to paraphrase Mallarmé), where chance is that unpredictable event which animates historically predictable extensions of time and space.

Key to the daily archive of the future, then, is the catastrophe which is conspicuously missing from it. In this regard, Beck's influential perspective on the reflexive embedding of risk within the everyday has an important genealogical relation to anxiety, whose status as a modernist affect is well known.[15] Sianne Ngai, for instance, has defined anxiety as a projectile freedom associated with the avant garde.[16] Not only is the anxious subject

"knowledge-seeking" but, after Heidegger's development of the theme in *Being and Time*, their self-understanding as projectile—that which is *thrown* into the world and subject to chance—necessarily intersects with the "fallenness" of the everyday (Ngai, *Ugly Feelings*, 215, 236). Once more we can discern a connection to the weather, since weather exemplifies temporal ecstasy while at the same time providing a basis for "idle talk" and banal interpretation (229). Importantly for Ngai, Heidegger's anxiety facilitates the capacity to cross from familiar idleness into the authenticity of "being possible." She writes that "the image of thrownness guarantees the subject an auratic distance from worldly or feminine sites of asignificance or negativity" (233, 236). Thus, anxiety transcends the negativity which attaches to other affects, such as fear; and, by the light of its disorienting projections into an unknown future, it accrues to itself a hermeneutic authority, which includes a heroic and individualizing aspect.

Ngai's gendering of anxiety is clearly derived from psychoanalysis, specifically from Freud's notion of a little boy's castration anxiety. Yet, if developed in a different direction, the psychoanalysis of anxiety can also serve to correct the *sapere aude* masculinity implicit in the existential tradition. Jacques Lacan, for instance, reverses the convention (established by Kierkegaard and intermittently endorsed by Freud) that anxiety is objectless.[17] "The objects areen't missing," Lacan avers, showing himself especially keen to separate anxiety from simple doubt. It is not because someone doesn't know what is going to happen that they feel anxious; in fact, it is closer to being the other way round. By raising an epistemological problem expressed in terms of anticipation, the anxious subject partially relieves themselves of the problem of their imaginary self-identification, including their everyday relation to others and the question of what it might mean to act. In other words, what is often pitched as a subject's vulnerability before an unknown future is recast by psychoanalysis as the registration of a problematically discontinuous self-image.[18]

This version of anxiety revises our understanding of prediction as a social practice. As well as being about what it is possible to know about the future, prediction makes conspicuous the problem of what one desires to know and, indeed, what one can bear to know. When a lack is produced through an act of prediction, the subject orients themselves towards an object in front of them, but also disturbs an object behind them, which has already placed them in the world, and which draws them back to the fundamental question of "home." Instead of the residual idealism which Ngai detects in the existential understanding of anxiety, Lacan presents anxiety as an ongoing crisis of distance: the unfathomable distance from something to come which serves to occlude an unbearable proximity to something already here, which is recorded through disturbances to the visual field or by the object's fragmentation into uncanny relics.

This Lacanian complex remains useful because it views anxiety as an enigmatic archive, a precarious means of recording present experience which forestalls a catastrophic collapse into non-linguistic helplessness. Anxiety is a cultural form that toggles between the futural and the archaic and it is filtered through everyday relations. I would suggest that a similar movement and sense of interpretative relation characterizes the field of literary modernism. Modernist literature remains a composite of anxious prospect and institutional retrospection; meteorology is likewise characteristically split between prediction and the retrospective account. Of course, it is fairly easy to acknowledge that scientific meteorology is an important part of modernist culture. It will prove more difficult in the remainder of this essay to identify exactly how its disciplinary formation underwrites anxious temporality as the single most privileged dimension of modernist literature as it has come to be received.

Modernist Simultaneity and its Discontents

May 20, 1910 was the date of Edward VII's funeral in London, by most accounts a valedictory hurray for greater Europe's Royal pedigree. It was also the date when the Norwegian meteorologist Vilhelm Bjerknes oversaw a simultaneous recording of atmospheric conditions across Western Europe.[19] The "world" was recorded in a single instant: temperature, air pressure, air density, cloud cover, wind velocity, the valences of the upper atmosphere. By virtue of Bjerknes's industry, this date would go on to be chosen retrospectively by British mathematician Lewis Fry Richardson in 1916 as the site for the world's first numerical weather forecast. We might say, then, that May 20, 1910, became a key date once it was over, its contemporaneity was belatedly realized and put to use, its futurity was remembered, even as it was also a day of remembrance in the old-fashioned sense as Edward's funeral provided the definitive spectacle of the old world passing away.

Bjerknes's demand for the simultaneous recording of weather data as the primary precondition for a properly scientific meteorology presages the most persistent conceit of modernism: namely that the changed world is also always the whole world imaginatively frozen into the same moment. The modern world is the world *now*—or, rather, *then*. Most famously perhaps, Virginia Woolf dated the emergence of modern character to December 1910, "on or about"; for D. H. Lawrence it was in 1915 that "the old world ended"; for W. B. Yeats, the 1890s was the decade in which the tragic generation of Parnell, Wilde, Verlaine, and others had expended itself so that a 'Savage God' was on its way.[20] Thus, we have the paradoxical tradition of "the new." Critics have long been fated to announce shocks that have already been parried as a way to conjure the trick of modernity. Henri Lefebvre, for example, claims that "around 1910 a certain space was shattered . . . . of common sense, of knowledge (*savoir*), of social practice."[21] Some critics have nominated whole years in which "our" modernity first took hold: for Jean Michel Rabaté, 1913; for Michael North, 1922; for others, it took just a single day, or even an hour for the world to change. For Peter Sloterdijk, it was

6:00 p.m. exactly on April 22, 1915.[22] The stopwatch of modernist historiography arrests time in order to say "GO!" But such punctuations bear the weight of their temporal over-determination. As retrospective markers of the future they are bound to originality, yet they are also too late, symptoms of another deeper past that remains, perhaps even today, unacknowledged. Belatedness and prescience are caught up in the very same act.

Sloterdijk writes of the exact moment in the Ypres Salient when German troops first released a cloud of chlorine gas towards the line of their French-Canadian adversaries. This is our primal scene, he suggests, because it introduced the question of "environment," including weather, to the battle between adversarial subjects (Sloterdijk, *Terror*, 13). Ypres signaled a qualitatively different kind of warfare from that which had preceded it, one based not on killing or capturing the enemy but on taking away the conditions for the enemy's life; entirely asymmetric warfare, in other words, a terroristic method which required a special kind of environmental knowledge. "The discovery of the 'environment' took place in the trenches of World War I," writes Sloterdijk: it was there that *Umwelt* was re-invented as a discursive procedure and producer of cultural meaning, as something more than a passive background (18).

But can this "discovery" of the environment in Europe in 1915 continue to be considered truly original once we have dispersed the prestige of history across the whole world? Wasn't the event that ushered in the new already old? Whatever we may say of Europe's martial traditions and the promise inscribed in Kant's version of cosmopolitanism to respect the dignity of the enemy's reasons, these did nothing to prevent the systematic exploitation of the non-European. Indeed, asymmetric warfare, terroristic methods, and the utilization of environmental knowledge were hallmarks of European expansionism throughout the preceding centuries. Not only did the Imperial European subject employ his weaponry against less technologically-invested cultures, he also made strategic, and

strategically inhuman, use of deforestation, plantation, and slave labor to destroy the conditions for life.

Kathryn Yusoff's recent work on the anthropocene is relevant here, since it demonstrates how the discourse of historical crisis—the tradition of the modernist tipping point—also homogenizes historical experience. In particular, Yusoff takes to task anthropocene stratigraphy, how the ecological deep time of the earth gets archived and turned into writing by contemporary climate science. The three "Golden Spikes"—those moments of encounter through which the ecosystem of the planet is said to have fundamentally changed—also cover over historical difference. Narrating the transplantation of flora and fauna to the New World in 1610 overwrites the arrival of Europeans in the Caribbean in 1492 (and overlooks the fact that indigenous populations were given the same status as flora and fauna); the emphasis upon industrial modernity in the 1800s belies a continuity between European industry and "pre-capitalist" slave economies operating beyond Europe before the nineteenth century; while a concern for the Nuclear Fallout of the 1950s expressed in globalist terms ignores the extent to which indigenous populations from New Mexico, Australia, and the Marshall Islands were not only disproportionately affected but systematically persecuted by this geological crisis.[23] Yusoff's substantial point is that we cannot think the non-human without also thinking race: ecology is an essentially racialized mode of thought. But she also points us to a certain methodological verity inherited from modernism, namely that when we nominate a crisis, we also have to come up with an origin myth. *When did this crisis begin? How are we going to archive it?* By designating origins in this fashion, Yusoff suggests, we are also anxiously covering something over.

Already then, well before April 1915, we can say that European man was systematically attacking the conditions for life. Sloterdijk's timekeeping follows a disciplinary norm in this regard. The object of his concern, modernist culture, also establishes

his method of apprehension, such that by nominating a date on which everything changed, and thereby disavowing what was already different, he redoubles the paradox of primitivism. Basically defined, primitivism is enacted when a modern European artist identifies a *timeless* pastoral scene in a non-European locale and simultaneously charges that scene with eroticized difference.[24] As Woolf pondered what was fundamentally "new" to the human character in 1910 she was almost certainly gazing, for some of her days at least, at Gauguin's paintings of Tahitian women.[25] Picasso's *Guernica* (1937) is an extended manifestation of the same modern fold: a representation of the *first* aerial destruction of a city (a new completest mode of terroristic warfare) and also a definitively modernist invocation of "primitive" art. Yet, as Sven Lindqvist has pointed out, "the destruction of Guernica became a symbol because Guernica was a symbol already."[26] The Basque municipality of Durango, bombed earlier in the same year on the same scale, was more industrial and less lamented. Yet even Durango mattered more than those Afghani towns, or large parts of Baghdad, or the whole of Chefchaouen in Morocco which had already been bombed by European powers. Lindqvist offers us a catalogue of aerial bombardment before Guernica: "the Italians did it in Libya, the French did it in Morocco, and the British did it throughout the Middle East, in India, and East Africa while the South Africans did it in Southwest Africa" (Lindqvist, *A History of Bombing*, section 160). Guernica, then, was the reprisal of an already performed European savagery. The savage god of the modernist new was also a plagiarist. Evidently it remains a question of reading to discern in the force field of modernist shock its hidden repetitions; it is also, I want to claim, a question of the weather.

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It was while working in the Friends' Ambulance Unit on the Western Front in 1916, that Lewis Fry Richardson addressed the historical futures of May 20, 1910. Ballistics, aeronautics, and aerostatics were all subject to the vicissitudes of weather, yet Richardson framed his project, narrated in his book *Weather Prediction by Numerical Process* (1922), as a purely academic frustration with the state of the science. Although advances in telegraphy, especially across the American landmass, meant that messages could be communicated more quickly than the weather traveled, constituting a forecast of sorts (by turning time into space), the idea that, given precise conditions at a certain time, *new* weather could be scientifically predicted was far from realized. Bjerknes had formulated promising hydrodynamic theories for the movement of weather, but meteorologists were yet to determine how one state of atmosphere necessarily develops from another. In other words, at the time of World War I, weather was yet to be understood systematically. Richardson's book opens with a discussion of this shortfall, focusing on the common practice of using an archive of weather maps collected by various institutions of meteorology in order to aid prediction. The faulty assumption, as far as Richardson was concerned, was that the past was taken for a model of the future. It is worth quoting this passage at length:

> The process of forecasting, which has been carried on in London for many years, may be typified by one of its latest developments, namely Col. E. Gold's *Index of Weather Maps*. It would be difficult to imagine anything more immediately practical. The observing stations telegraph the elements of present weather. At the head office these particulars are set in their place upon a large-scale map. The index then enables the forecaster to find a number of previous maps which resemble the present one. The forecast is based on the supposition that what the atmosphere did then, it will do again now. There is no troublesome calculation, with its possibilities of theoretical or arithmetical error. The past history of the atmosphere is used, so to speak, as a full-

scale working model of its present self.

> But—one may reflect— . . . . that the marvel of accurate forecasting, is not based on the principle that astronomical history repeats itself in the aggregate. It would be safe to say that a particular disposition of stars, planets and satellites never occurs twice. Why then should we expect a present weather map to be exactly represented in a catalogue of past weather?[27]

Richardson demands of the archive that it intersect with mathematical means of prediction. Developing Bjerknes's ambition to *deduce* weather from present conditions, he insists that we reconsider the present record as open to a future that might not resemble it. For Richardson, we should disaggregate the future, posit it as having exceptional status, in order then to assert a numerical means of calculating it.

Richardson's first numerical weather forecast was significantly split between prescience and belatedness. Imposing a grid over the space of Europe, he attempted to demonstrate a six-hour mathematical forecast for May 20, 1910. Each cell on the map had recorded air pressure, temperature, air moisture and density, wind velocity, as well as further locational variables such as cloud cover, and the extent of open water which would affect evaporation. Richardson also divided his atmosphere into five vertical layers, taking cognizance of divisions in the upper air. Such an extent of data resulted in a complex calculation. Employing differential calculus, he focused on instantaneous (rather than average) rates of change, stipulating how each instant of weather—each point in time—was inflected differently from its predecessor. Thus, he was determining the future in discontinuous and nonlinear terms. By his word, it took him six weeks to calculate a six-hour forecast for one single location on the map. Critics have disputed the veracity of this claim,

wondering if even six weeks was enough time. In any case, remembering that this six-hour prediction was already six years old, his forecast was woefully out of sync with what actually happened. One reviewer observed that "the wildest guess . . . would not have been wider of the mark."[28] According to historian of meteorology Peter Lynch, two factors stood out in Richardson's failure: first, he lacked the resources to "advance his computations faster than the weather advances."[29] This was Richardson's dream of a computationally advanced future, in which the ability to amass present data and calculate it instantaneously in accordance with hydrodynamic laws would obliterate a vague reliance on the patterns of the past as the basis of prediction—in this sense, Richardson lacked the technical resources to verify the terms of his scientific realism.

Second, Richardson had failed to account for discontinuities in airflow caused by vertical waves interrupting the movement of air laterally across the grids on his map, which came to be known as zones of "occlusion." This points to something other than a lack of technical capacity, a problem more akin to a hermeneutic aporia. In Bjerknes's Bergen school, there had emerged a new conception of weather fronts, which addressed the question of what took place when cold air from the polar region met warm air from the south. It is now well known that the language of "fronts" is a direct borrowing from the wartime lexicon; indeed, in the early days of its theorization in 1917–18, weather fronts were called "'battle line[s]'" or "'battlefront[s]'" ("*Kamplinje*" or "*Kampfront*" in Norwegian) considered to be like military trenches in the air. A "front" refers to a boundary between air currents of different temperatures and marks what the Bergen school termed "a zone of occlusion" (a no-man's land), a space of force and counterforce where different timelines overlapped and within which cyclonic weather patterns died and were born.[30] This was the most up-to-date attempt to account for the emergence of storms. However, as Richardson had little knowledge of this conceptual innovation at the time of his calculation in 1916, he had no way of

accounting for its results. Nor, therefore, had he fully accounted for a meteorological complexity that could not be read according to linear cause and effect. By disaggregating the future from the past, he had opened up a proliferating archive of virtual futures which no realistic and retrospective account of what happened could satisfactorily close. Within the complexity of this instant of prediction, I argue, resides literary modernism's meteorological device.

Fine Days, Canonical Anxieties

Notwithstanding Richardson's initial failure, his scientific ambition, allied to that of Bjerknes, presented a challenge to traditional aesthetically-founded notions of weather experience. Modern meteorology was rendering weather a largely anesthetic abstraction, its object emerging from atomic substructures, invisible hydrodynamic forces in the upper air, and the determining horizon of the future. Weather was to be constantly mapped and remapped according to the anticipation of its restructuring event, an elusive event whose apprehension was framed by the single day. Indeed, the archive of this meteorological modernity was punctuated by single days (daily weather reports); but dailiness was also a structure whose manifestation as the present belied further complexities of prescience and belatedness. It is worth reconsidering in this light that the loci classici of literary modernism, Woolf's *To the Lighthouse*, Proust's *In Search of Lost Time*, Robert Musil's *The Man Without Qualities*, and Joyce's *Ulysses*, were all written largely during or just after the War but are all set (at least in part) before the War. All these texts say in various ironic modes of displacement and occlusion: *it will have been* the case that the war took place. I want to suggest that this retro avant-garde sensibility establishes an archival self-consciousness which comes to bind the literary and the meteorological together. It is not that these works stand alone or that their canonicity should be simply endorsed, but they all use weather forecasting

to establish the enigma of their historical placement and to convey a sense of the meteorological everyday. This remains significant to the terms of their reception.

Indeed, we might distinguish these texts from genre works of the same period whose literariness remains less secure. For example, the satisfactions of finding so-called invasion literature to have predicted the catastrophe of the War is another familiar disciplinary move.[31] Yet a literary history that plays on the satisfaction of prediction can only end disappointed if the work is celebrated as a cultural forewarning device only once the catastrophe has taken place. Put another way, if a text doesn't diagnose its own impossible desire for prescience—to be first, or foundational—then it lacks the formal self-reflection which typifies modernist textuality. Those works enshrined as high modernist perform a mirroring of the split in our cultural conception of, and anxious desire for, the future. Specifically, they return to a point in the past where old futures which did not materialize, which were foreclosed by history, are reanimated, even as the structure of realism—the strict prohibitive line drawn between the imagined and the unimaginable—remains intact. As the following repetitions begin to demonstrate, modernist literature relied on this meteorological device.

The Day of Marcel's Death

Eve Sedgwick has already shown that a central question in Proust's work, "how open systems relate to closed ones . . . . how systems themselves move between functioning as open and closed," is consistently expressed in meteorological terms.[32] The complexity of actual weather, its "unpredictable contingency" in the face of calculative ambition, becomes, through the shared barometric interests and identifications of Marcel and his father, an autobiographical concern (*The Weather in Proust*, 4). The barometric imaginary returns prediction to certain moments from Marcel's past, but it is also projected into the future as the means by which Marcel might exceed the parameters of his own life. He imagines how this "barometric aptitude" inherited from his father will live through and beyond his personal

biography such that, as he draws his last breath, he fully expects, having noticed a ray of sunshine enter the room, to throw back his head to sing: "Ah fine weather at last!"[33] At once banal and supernatural, this weather speech conveys a scripted closure to life which in the same moment opens Marcel to the task of writing literature. The instability of the time of writing in Proust has been extensively discussed—the analepses which drift from their circuit, refusing return or point of closure. Yet the connection between the sensuously felt "ray of sunshine," potential trigger for *memoire involuntaire* (here the anticipation of a memory at some point in the future), and the technologies of atmosphere and temporality (the barometer) is especially significant to the modernist everyday as a scene of prediction and desire. It is only by opening what realist time prohibits—old futures, future pasts—that Proust arrives, anxiously, at his literary task.

A Fine Day in August 1913

Consonantly, Robert Musil opens his comic masterpiece *The Man Without Qualities* with the following weather-inflected passage:

> <EXT>A barometric low hung over the Atlantic. It moved eastward toward a high-pressure area over Russia without as yet showing any inclination to bypass this high in a northerly direction. The isotherms [*Isothermen*] and isotheres [*Isotheren*] were functioning as they should. The air temperature was appropriate relative to the annual mean temperature and to the aperiodic monthly fluctuations of the temperature. . . . The water vapor in the air was at its maximal state of tension, while the humidity was minimal. In a word that characterizes the facts fairly accurately, even if it is a bit old-fashioned: it was a fine day in August 1913.[34]<EXT>

Musil's terminology is appropriate here to pre-war weather maps: barometric readings, isotherms, and isotheres. What is conspicuously lacking from this worldview however, is a

general expectation—as that prepared for by the systematic approach of the new meteorology—for an atmospheric future that bears no resemblance to its past, that is disaggregated from the climatological assumptions of the average. More specifically, there is no apprehension in Musil's passage of those discontinuities or occlusions which would become commonplace through the post-war language of the "weather front." The novel begins in a formative irony, then. First, the sense of things being as they should, of there being nothing unexpected on the horizon, belies what the reader knows will take place ten months hence in Sarajevo in June 1914, namely the assassination of Archduke Ferdinand and the beginning of the War.

And second, the passage demonstrates, through its concluding old-fashionedness, the temporal enclosure of 1913: it is not simply wrong about the future, it is sealed off from the future—not linguistically able for it. Musil's whole comedy unspools from this ironic enclosure: a retrospective prolepsis that remains always misleading. The enduring unavailability of the meteorological language which might have enabled the prediction of a discontinuity to come—namely the exceptional event of the War—establishes the sense of the virtual which rules Musil's novel. This is a virtuality which can never converge upon what actually happened; indeed, one of the novel's chapters is entitled, "Psuedoreality Prevails; or, Why don't we make history up as we go along." The novel depicts the protagonist Ulrich's (the man without qualities) involvement with a cultural movement called "the Parallel Campaign," which seeks to revive the cultural spirits of early twentieth-century Kakania (Vienna). In other words, it ironically performs its own exile from realism. Its exaggerated metaphorical economy refers retrospectively to the catastrophic event of the War to come which it can only fail to represent.

Tomorrow

An even more famous "fine day" in modernist literature is the unit of speculation disputed by Mr. and Mrs. Ramsay at the beginning of *To the Lighthouse*. The piquancy of their conflicted forecast from the perspective of the novel's post-war composition is hard to miss, though its oedipalization is also worth noting given that the future all but promised by Mrs. Ramsay ("I expect it will [be fine]") is also focalized through their son James as a site of forbidden desire.[35] Scientific weather forecasting and familial prohibition intertwine. As John Brannigan has pointed out, pre-war meteorological catalogues would have been the means by which Mr. Ramsay and Mr. Tansley authorized the realism of their prohibitions: "*it won't be fine*."[36] This validation interacts with literary canonicity. The authority of Shakespeare and that of the weather reports are complementary insofar as together they inform the patrician rituals of the day—indicating mastery over time in both directions, past and future. The fact that this patriarchal authority is beset by an anxious volatility it cannot afford to acknowledge is the novel's inaugurating irony. The question of how this novel (written by a woman) will be read as literature in the future is enfolded within the question of how it depicts the past's view of the future: what people imagine will survive, and what has, in fact, survived. This question is established through a meteorological lens: that future which coheres with established patterns and that other future which is disaggregated from the past. If the first confirms the predictable realism of the men, the latter is aligned strangely with Mrs. Ramsay's consolatory optimism. Clearly, however, the novel cannot only endorse Mrs. Ramsay's view, since it is the erasure of her future (and character) that introduces the novel's own zone of occlusion, the "Time Passes" segment, in which prior continuities are shattered. Whatever realist convictions are expressed in part 1 are unbound through "Time Passes" and then rebound in part 3, though without eradicating the profound disconnection between the beginning and the end. Hence the novel ends twice, as close to simultaneously as Woolf could manage, picking up the thread with the family's arrival at the lighthouse and marking

the difference with their guest Lily Briscoe's painting.[37] The novel says both yes *and* no to its proposed transgression of realist time through the indeterminate "now" of its conclusion.

June 16, 1904

Joyce's *Ulysses* presents a similar occlusion by passing from the stamp of authenticity, "Trieste-Zuriche-Paris 1914–1921," backwards in time towards the virtual dimensions of June 16, 1904, in the same breath as passing over real historical events, including the Irish revolution and World War I. Saint-Amour has argued convincingly that Joyce's novel manifests a proleptic symptom: a symptom of an event which has not yet happened. The exalted ordinariness of the Ulyssean day carries the burden of what has not yet taken place: it is a present paradoxically overdetermined by the future—by what *will have been* the case at the time of its archivization as literature. This future is traced in the text through various irruptions of violence: the thud of Blake's wings of excess which accompanies Stephen's history lesson in "Nestor"; the mock news report of an Earthquake or meteor strike in the "Cyclops" episode as the Citizen throws a Jacob's biscuit tin; the images of Dublin burning in "Circe."[38] The most obvious future referent for these irruptions is the destruction of parts of Dublin during the 1916 Rising. But Saint-Amour develops his point beyond the Irish national context to World War I, implicating the structure of modernity itself:

> *Ulysses* might be said . . . . to embody a kind of traumatic earliness . . . . thanks to its anxious depictions and expectations of disaster and, above all, to the privileged retrospective vantage of its author. . . . In the face of such past and future disasters, Joyce's novel manifested a new motivation, even compulsion, in cultural production: to archive the city against the growing likelihood of its erasure. (Saint-Amour, "Bombing and the Symptom," 70–71)

The archived city is saved for posterity. Yet it seems important to acknowledge the double perspective of reading this *both* prospectively and retrospectively. The characteristically modernist fascination is not strictly antiquarian, nor is it with 1904 Dublin itself; rather it focuses on the form of a single day pressed against a future it continually imagines, yet, in an important sense, cannot conceive. This is why the weather archive is again exemplary.

In 1904, the year in which Joyce's novel is set, newspaper weather forecasts were often exiguous, hidden between advertisements, market reports and "arrangements" for the day. Forecasts were also often seen to be wrong. On Bloomsday, the Dublin weather was given by the *Irish Times* as "north to south gales, moderating . . . . rain generally, some fair intervals." *The Freemans' Journal* had a similar prediction: "southerly fresh or strong winds, later veering westerly and moderating; unsettled, with rain generally. Some fair intervals." Interestingly, the *Evening Telegraph* uses its retrospective vantage to print the morning's weather "forecast" from the MET office alongside lunchtime weather "reports" from the instruments of "Messrs Chancellors and Sons on Grafton Street." A discrepancy is apparent: the forecast had predicted, as with the *Irish Times* and *Freemans'*, "strong winds," "squall[s]" and "some rain." Whereas the report demonstrates a fair temperature, an unremarked upon wind velocity and an average barometric reading of 29.70'. A fine day in June 1904.[39]

The important thing to say about the representation of weather in *Ulysses*, then, notwithstanding Joyce's reputation for verisimilitude, is that it does not simply adhere to the weather reports just cited. Indeed, on the face of it, the novel takes a climatological rather than a modern meteorological approach to the day's weather, conforming to our impression of the season, and of Dublin as both modern city and small town, cohered through networks of modern institutions—the press, the hospital, the sewage works—and by quasi-geological accretions of idle talk and community gossip. When characters meet, they speak climatologically, affirming that it is indeed "'a fine day,'" consoling themselves with the

thought that they share the same perceptual landscape (Joyce, *Ulysses*, 185). Indeed, Joyce has a lot of fun with climatological assumptions, especially with the sun: a sun which is not verified by the actual weather reports of the day but which stands-in variously and contradictorily for the rising sun of Home Rule, the emergent national space of Ireland, and the "garish sunshine" that never sets on the British Empire (24). The sun is a navigation tool. People cross the road to get out of it, or they turn their back on it so they can see something more clearly: it plays a significant role in curating the space and time of the city. Both Stephen and Bloom notice at different points in the novel when the sun is occluded by a cloud, a simultaneous feat of perception which helps describe terrestrial distance—the distance between the characters—as well as inscribe time (*le temps*) in terms of space: the novel becomes a map recording the reality of matter as it moves (8, 50). Yet this moment of occlusion also expresses, in a way that returns us both to Richardson's numerical forecast and to Lacan's anxiety archive, the enigma of temporal disaggregation: how one moment emerges from another without assumed likeness to the past. We have an atmospheric detail that seems to thicken the realism of the novel, providing two accounts of the same objective phenomenon. But we also have a doubled instant which emphasizes the differentiation of an everyday moment as it becomes a record of the past and offers a presentiment of an unprecedented future. Indeed, for both Stephen and Bloom, the cloud's occlusive movement situates them on the lip of the future as it becomes the present , also plunging them deep into an unspeakable past: for Stephen towards the memory of his mother's deathbed; for Bloom towards biblical and archaic desolation.

It is conventional to characterize Bloom as the *homme moyen sensuel*, capable of a whole host of pragmatic and realist accommodations of commonplace language, including the language of climate. It must also be said, however, that he is a man of modern science. Certainly, he can allow for systematic and invisible determinations of sense phenomena, a

disposition which finds articulation in the "Ithaca" chapter with its scientific catechism. Accordingly, as well as engaging in idle talk, he is hyper-sensitized to what is to come; he is a man, we learn, who prefers hats to umbrellas, and he is immediately anxious when he has forgotten his hat despite the evident heat and secure sun in the sky (56). When it begins to spit rain at Dignam's funeral Bloom has been expecting it:

> A raindrop spat on his hat. He drew back and saw an instant of shower spray dots over the grey flags. Apart. Curious. Like through a colander. I thought it would. My boots were creaking I remember now.
>
> —The weather is changing, he said quietly.
>
> —A pity it did not keep up fine, Martin Cunningham said.
>
> —Wanted for the country, Mr Power said. There's the sun again coming out.
>
> Mr Dedalus, peering through his glasses towards the veiled sun, hurled a mute curse at the sky.
>
> —It's as uncertain as a child's bottom, he said (75).<EXT>

Interestingly, Bloom's speech act "The weather is changing" can also be found in the *Irish Times* on June 16, 1904 as part of an advertisement for "new, improved barometers and weather glasses."[40] Here we have another repetition which pushes ironically against the realistic meaning of the phrase. In addition to being an atmospheric fact momentarily perceived by the mourners, the changing weather is an overly familiar cliché, remediated by commerce. It is part of the archival structure of everyday anxiety in which the instant is motivated by an occluded future, the novelty of which may, in fact, implicate an unacknowledged past.

After the funeral, the rain holds off, and it's a sunny—climatological—day once more, conspicuously so in "Wandering Rocks" and "Sirens" which take place "in sun in heat" (Joyce, *Ulysses*, 222). But Bloom remains unusually open to the difference of the future:

"[l]ook out for squalls," he reminds himself in the face of the temperamental editor Myles Crawford in the "Aeolus" chapter (120). The telegraphic infrastructure which allows weather to be archived in increasingly local detail is temporalized through the daily papers. But weather also draws us towards the vanishing point of journalism, where expected repetitions give way to something else.

It is not until the "Oxen of the Sun" episode that the heavens finally open:

> But by and by, as said, this evening after sundown, the wind sitting in the west, biggish swollen clouds to be seen as the night increased and the weatherwise poring up at them and some sheet lightnings at first and after, past ten of the clock, one great stroke with a long thunder and in a brace of shakes all scamper pellmell within door for the smoking shower, the men making shelter for their straws with a clout or kerchief, womenfolk skipping off with kirtles catched up soon as the pour came (324–25).

Most striking in this passage is the term "weatherwise," a term belonging to the historical convention of peasants or laborers having it in their power, through their senses, to predict the weather for harvest. But in this quotation the "weatherwise" are "poring up" (while the rain pours down) as they 'scamper pellmell' at a storm already in process. The traditional prediction arrives too late. This marks a useful distinction between the weatherwise member of a community and Bloom. Bloom is not, strictly speaking, weatherwise; he is proleptic in Saint-Amour's sense, anticipating a future beyond routine time. Indeed, the question of *when* it rains in *Ulysses* is not insignificant: it rains, for a moment at least, at Paddy Dignam's funeral, and then again in the anteroom of a maternity ward, at scenes of death and birth, in other words, both zones of occlusion, of cyclonic provenance and disappearance within which the mystery of the modern weather system lies. For all its vaunted specificity, *Ulysses*, like Richardson's forecast, is temporally occluded and displaced, gesturing at a future that

exists to be predicted, and which at the same time remains, at the horizon of difference, unpredictable: it both portends and withholds the unimaginable. As Bloom unintentionally records a "Mr M'Intosh" at the funeral, so the thirteenth man continues to be counted twice, a weather-ready figure of textual indeterminacy: "always [at every reading] someone turns up you never dreamt of" (90).

Conclusion

The paradox of meteorological science, which still today helps structure the distinctively modern relationship between environmental knowledge and cultural habit, is this: new meteorology proposes an unprecedented future in order to valorize its capacity for prediction. It proposes a future which might be perfectly calculable according to hydrodynamic laws and at the same time demands we are cut off from the ordinary expectations of climate. To get a stronger sense of how this scientific and technological futurism ends up embedded within the anxious fantasies of the modernist everyday, we might end by considering the following passage from Richardson's book, written in 1922, in which he frames the past future from 1910 he couldn't successfully predict in 1916. After lamenting the failure of his project, he permits himself a dream of a forecasting theatre where accurate calculations could be transmitted instantaneously:

> After so much hard reasoning, may one play with a fantasy? Imagine a large hall like a theatre, ... The walls of this chamber are painted to form a map of the globe. The ceiling represents the north polar regions, England is in the gallery, the tropics in the upper circle, Australia on the dress circle and the Antarctic in the pit. A myriad computers are at work upon the weather of the part of the map where each sits, but each computer attends only to one equation or part of an equation. . . . [T]he man in charge of the whole theatre . . . . is surrounded by

> several assistants and messengers. One of his duties is to maintain a uniform speed of progress in all parts of the globe. . . .
>
> Four senior clerks in the central pulpit are collecting the future weather as fast as it is being computed, and dispatching it by pneumatic carrier to a quiet room. There it will be coded and telephoned to the radio transmitting station. Messengers carry piles of used computing forms down to a storehouse in the cellar. . . .
>
> In another building are all the usual financial, correspondence and administrative offices. Outside are playing fields, houses, mountains and lakes, for it was thought that those who compute the weather should breathe it freely (Richardson, *Weather Prediction*, 219–20).

This one-world fantasy of disciplinary orchestration, collecting and processing the future, also resembles the collective imaginary of the stock exchange. Indeed, what is central to Richardson's new computing theater is how contingency (Mallarmé's "chance") is obviated by processes of control. The calculations and symbolic virtuality of forecasting are designed to ensure that weather itself doesn't really have to take place: it is abducted from experience so it can be encoded and exchanged, its archive transformed into a scene of automation. In this way, Richardson's prediction treads a line between event and its foreclosure, hence the pastoral imaginary which surrounds and supports his knowledge economy. Outside the observatory there is only the scenery of recreation: playing fields, houses, mountains, and lakes. A world without history.

This is also where new meteorology and literary modernism find their final interrelation: in the image of a futurism contained we also have the catastrophe held in abeyance, structured in banal terms as dailiness. Significantly, Richardson's bureaucratic dream is designed to console the reader with a version of the future that would, at least

partially, come to pass: the invention of the first computers or "probability machines" in the 1940s ensured that his mathematical method was recuperated with some success. Yet his fantasy also communicates an aura of dystopian calm, characteristic of a genre of scientific writing where disciplinary power almost always operates with a life-suppressing knowingness. Modernism's meteorological device, I argue, was one means of refusing the dead weight of such knowingness. By supplementing the straight epistemological question—*can we know the future?*—with an investment in the anxious pleasures and prohibitions of everyday prediction, it established a specific preoccupation with meteorological science, while also marking an early twentieth-century shift in the discursive history of ecology. High modernist literature helped establish a mode of writing about a European world that was enduringly agitated by the force of a disaggregated future. And yet, at the same time, modernist writing continued to disguise other futures that elsewhere, in non-European worlds, had already arrived.

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[1] Walter Benjamin, *The Arcades Project*, trans. Howard Eiland and Kevin McLaughlin (Cambridge, MA: Harvard University Press, 1999), 106; Michel Serres, *The Natural Contract*, trans. Elizabeth MacArthur and William Paulson (1990; rpt., Ann Arbor: University of Michigan Press, 1998), 27.

[2] The *Convention Relating to the Regulation of Aerial Navigation*, signed at the Paris Convention in 1919, established that each contracted nation had "complete and exclusive sovereignty over the air space above its territory." This convention was part of a more general cultural acknowledgement that movement in and of air constituted a potential risk to political sovereignty. Etats-Unis d'Amerique, Belgique, Bolivie, Empire Britannique, etc. "Convention portant réglementation de la Navigation aérienne, signée à Paris le 13 octobre

1919, avec Protocole additionnel signée à Paris le 1er mai 1920." *League of Nations Treaty Series: Publication of Treaties and International Engagements Registered with the Secretariat of the League of Nations* (Volume XI, 1922), 173-311. https://treaties.un.org/Pages/showDetails.aspx?objid=0800000280168604 [date accessed: Tuesday June 4, 2024]

[3] For an account of the "probabilization" of the modern world, focusing on the institutions of the nineteenth century, see Ian Hacking, *The Taming of Chance* (Cambridge, UK: Cambridge University Press, 1990).

[4] Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago, IL: The University of Chicago Press, 2016), 20–24, 23.

[5] Vladimir Jankovic, *Reading the Skies: A Cultural History of English Weather 1650–1820* (Manchester, UK: Manchester University Press, 2000), 143.

[6] See E. P. Thompson's classic account of labor time, "Time, Work-discipline, and Industrial Capitalism," *Past and Present* 38 (1967): 56–97.

[7] The author is Frederic Marshall writing in *Blackwood's Edinburgh Magazine*, 1875. Quoted in Katherine Anderson, *Predicting the Weather: Victorians and the Science of Meteorology* (Chicago, IL: University of Chicago Press 2005), 235.

[8] Climatology's dependence on averages and cycles depended on a temporal and spatial frame for its consistency: *how far back in time do we go when trying to establish the norm? Where in space does this place begin and end?* One of the aims of the new meteorology was to expose the basic unreliability of historical averages. One of its side-effects was to undermine the climatological world picture which had long associated climate and human character, as well as attributed the political capacity to govern to environmental causes such as a nation's average temperature. In 1915, Ellsworth Huntington's *Civilisation and Climate*

(New Haven, CT: Yale University Press, 1915) prolonged this tradition of thought, though it was out of step with new meteorological thinking that aimed to use probability and hydrodynamics, rather than historical averages, as the basis of prediction.

[9] Paul K. Saint-Amour, *Tense Future: Modernism, Total War, Encyclopedic Form* (Oxford, UK: Oxford University Press, 2015), 10. Saint-Amour draws from Jacques Derrida's work, most specifically: "No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives)," *Diacritics* 14, no. 2 (1984): 20–31; and Jacques Derrida, "Archive Fever: a Freudian Impression," *Diacritics* 25, no. 2 (1995): 9–63.

[10] In a broad consideration of the future anterior tense, Mark Currie suggests that literary narrative might be a form of predicting the future by casting it in retrospect. See Mark Currie, *The Unexpected: Narrative Temporality and the Philosophy of Surprise* (Edinburgh: Edignburgh University Press, 2013), 55–66.

[11] Stéphane Mallarmé, *"Un coup de dés jamais n'abolira le hasard" Collected Poems and Other Verse*, trans. E. H. and A. Blackmore (Oxford, UK: Oxford University Press, 2006), 139–60; James Joyce, *Ulysses*, ed. Hans W. Gabler (New York: Vintage, 1986), 153.

[12] "[T]he weather . . . . not only has a phatic function but also an *existential* charge; it brings the subject's *feeling-being* into play, the pure and mysterious sensation of life" (Roland Barthes, *The Preparation of the Novel: Lecture Courses and Seminars at the Collège de France (1978–1979 and 1979–1980)*, trans. Kate Briggs [New York: Columbia University Press, 2011], 38). See also Urs Büttner, "Talking about the Weather. Roland Barthes on Climate, Everydayness, the Feeling of Being, and Poetics," *Ecozon@* 11, no. 1 (2020): 27–42.

[13] The history of meteorology, as distinct from climatology—a science of instantaneity and prediction as distinct from one of historical averages—possesses the following landmark

dates: 1851, the first same day weather map; 1854, the establishment of a meteorological office in the United Kingdom; 1861, the first collaborations between the Smithsonian Institution and the telegraph service in the United States to produce daily weather warnings. See Mark Momonier, *Air Apparent: How Meteorologists Learned to Map, Predict and Dramatize Weather* (Chicago, IL: University of Chicago Press, 1999), 39–56.

[14] Ulrich Beck, *Risk Society: Towards a New Modernity*, trans. Mark Ritter (London: Sage Publications, 1992) 21.

[15] See Frederic Jameson, *Postmodernism; or, The Cultural Logic of Late Capitalism* (London: Verso, 1991), 11.

[16] Sianne Ngai, *Ugly Feelings* (Cambridge, MA: Harvard University Press, 2007), 215, 236; Martin Heidegger, *Being and Time*, trans. J. Macquarrie and E. Robinson (Oxford, UK: Blackwell, 1962), 230–32.

[17] The key Freud text is "Inhibitions, Symptoms and Anxiety," in *The Standard Edition of the Complete Psychological Works of Sigmund Freud* (London: The Hogarth Press, 1959), 20:75–176. Here, having been influenced by Otto Rank's *The Trauma of Birth* (1929), Freud revises an earlier view of anxiety as a symptom of sexual repression. He comes to think of it as more fundamentally bound up with ego formation and the infant's primary environment of care. Still, he remains careful to distinguish between anxiety as the simple memory of one's original helplessness in the world and anxiety as an ongoing work of symbolization, which is also a process of adaptation.

[18] Jacques Lacan, *Anxiety* [*L'angoisse*], ed. J.A. Miller, trans. A.R. Price, book 10 (London: Polity, 2014), 54, 75, 120.

[19] Bjerknes worked out of Leipzig until 1917 and from Bergen after that. His work on dynamic meteorology, using aerology and thermo- and hydro-dynamics to model weather

phenomena, was groundbreaking. His own account of his innovations emphasizes how practical telegraphic coverage of the earth—recording weather phenomena across and between national spaces—had to be supplemented with new theories of interpretation. See Vilhelm Bjerknes, "Jubilee address on the 25th anniversary of the Geophysical Institute of the University of Leipzig" (1938), trans. Lisa Shields, in *Met Éireann* (Dublin: Irish Meteorological Service, 1997).

[20] Virginia Woolf, *Mr. Bennett and Mrs. Brown* (London: The Hogarth Press, 1924), 4; D. H. Lawrence, *Kangaroo* (London: Martin Secker, 1923), 242; W. B. Yeats, *The Collected Works of W. B. Yeats* (New York: Scribner, 1993), 3:266.

[21] Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith (Oxford, UK: Blackwell Publishing, 1991), 25.

[22] Jean Michel Rabaté, *1913: The Cradle of Modernism* (Oxford, UK: Blackwell Publishing, 2007); Michael North, *Reading 1922: A Return to the Scene of The Modern* (Oxford, UK: Oxford University Press, 1999); Peter Sloterdijk, *Terror from the Air*, trans. A. Patton and S. Corcoran (Los Angeles, CA: Semiotext(e), 2009), 9–13.

[23] Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018), 23–64, 36.

[24] See Hal Foster's argument in *Prosthetic Gods* (Cambridge, MA: The MIT Press, 2004), 8.

[25] Both "Tahitian Family" and "Type Tahitiennes" are listed in the Grafton Galleries catalogue for Roger Fry's famous 1910 post-impressionism exhibition in London. See Grafton Galleries, London, "Manet and the post-impressionists; Nov 8th to Jan 15th 1910–11," (London: Bantyre, 1910). For an account of Woolf's *Gauguinism*, indulged to the extent of her dressing up as "a South Sea Savage," see Jane Goldman, *The Feminist Aesthetics of*

Virginia Woolf: Modernism, Post-Impressionism and the Politics of the Visual (Cambridge, UK: Cambridge University Press, 1998), 120.

[26] Sven Lindqvist, *A History of Bombing*, trans. Linda Haverty Rugg (London: Granta, 2001), section 156.

[27] Lewis Fry Richardson, *Weather Prediction by Numerical Forecast* (Cambridge, UK: Cambridge University Press, 1922), vii.

[28] Quoted in Peter Lynch, *The Emergence of Numerical Weather Prediction: Richardson's Dream* (Cambridge, UK: Cambridge University Press, 2006), 17.

[29] Quoted in Peter Lynch, *The Emergence of Numerical Weather Prediction: Richardson's Dream* (Cambridge: Cambridge University Press, 2006), 1.

[30] Robert Marc Friedman, *Appropriating the Weather: Vilhelm Bjerknes and the Construction of a Modern Meteorology* (Ithaca, NY: Cornell University Press, 1989), 188.

[31] See I. F. Clarke, "Future-war Fiction: the first main phase, 1871–1900," *Science Fiction Studies* 2, no. 3 (1997): www.depauw.edu/sfs/clarkeess.htm.

[32] Eve Kosofsky Sedgwick, *The Weather in Proust*, ed. Jonathan Goldberg and Michael Moon (Durham, NC: Duke University Press, 2011), 3.

[33] Sedgwick, *The Weather in Proust*, 9; See Gérard Genette, *Narrative Discourse: an Essay on Method*, trans. J. E. Lewin (1972; rpt., Ithaca, NY: Cornell University Press, 1980), 77–80.

[34] Robert Musil, *The Man Without Qualities*, trans. S. Williams and B. Pike (London: Picador, 1997), 4.

[35] Virginia Woolf, *To the Lighthouse* (London: Vintage Classics, 2002), 3.

[36] John Brannigan, *Archipelagic Modernism: Literature in the Irish and British Isles*, *1890–1970* (Edinburgh: Edinburgh University Press, 2015), 112–16.

[37] Virginia Woolf, *The Diary of Virginia Woolf*, ed. Anne Oliver Bell and Andrew McNeillie (London: Chatto and Windus, 1980), 3:208.

[38] Paul K. Saint-Amour, "Bombing and the Symptom: Traumatic Earliness and the Nuclear Uncanny," *Diacritics* 30, no. 4 (2000): 59–82.

[39] "Weather report," *Irish Times*, June 16, 1904; *The Freeman's Journal*, June 16, 1904; *Evening Telegraph*, June 16, 1904.

[40] "19 Nassau St Dublin," advertisement, *Irish Times*, June 16, 1904, 2.