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Climate, cartography, and the life and death of the 'natural region' in British geography

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ABSTRACT

During the first fifteen years of the twentieth century, Oxford-based Scottish geographer Andrew Herbertson constructed a framework for comprehending and categorising climate and its interrelations: natural regions. Along with a large circle of students and collaborators, Herbertson promoted natural regions as the conceptual keystone for geographical teaching and research. This article shows how natural regions theory conceived of climate as an object that was differently defined in different academic disciplines. Geography's climate, according to Herbertson and his supporters, was defined by its relations with other spatially distributed phenomena rather than being the quantifiable and isolable entity of modern climatology. Building on recent work in the history of cartography foregrounding map use and reception, the article also argues that natural regions were products of particular modes of map reading, comparison, and synthesis. Although maps were arguably the most influential medium for communicating natural regions, they also proved limited as bearers of the multiscalar version of climate that Herbertson and his successors sought to convey. Finally, the article explains how natural regions and associated conceptions of climate came to be sidelined in the mid-twentieth century as geographers foregrounded human agency in region formation and adopted climatology's definitions and analytical tools. Revisiting the life and death of theories of natural regions illuminates the contested significance of climate in the discipline of geography, and contributes to ongoing efforts to pluralise the history of climate sciences.

What climate is and what climate does have long been matters of interest far beyond elite scientific communities. In Britain during the first half of the twentieth century, surely no resource was more influential in defining and explaining climate to a mass audience than the 1.4 million copies of textbooks written by the Scottish geographer Andrew Herbertson (1865–1915).[1] These books, along with others authored by Herbertson's large circle of students and collaborators, constructed an enduring if controversial framework for comprehending and categorising climate and its interrelations: natural regions. The natural region became arguably *the* key concept in British geography through the first half of the twentieth century, the era when the discipline became widely established in schools and universities. Its influence was such that detractors and supporters alike used religious terminology — 'the Regional Catechism', 'the new gospel' — to describe the hold it had on British academic geographers, schoolteachers, and their pupils.[2] As this article will discuss, however, what exactly made regions 'natural' was fiercely debated throughout this period, as were questions of how these units should be identified, analysed, and represented. If we accept the metaphor of the natural region as scripture within the religion of Geography, then we must also acknowledge that hermeneutic dissensus was an ever-present feature that pointed to a host of schisms and sects within what was a very broad church.

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[1] E.W. Gilbert, Andrew John Herbertson 1865–1915: An Appreciation of His Life and Work, *Geography* 50, 4 (1965), 321—322; L. Dudley Stamp, Major Natural Regions: Herbertson after Fifty Years, *Geography* 42, 4 (1957), 201. The most widely distributed of Herbertson's textbooks were his *Oxford Geographies* series: A.J. Herbertson, *The Oxford Geographies Vol. I: The Preliminary Geography*, Oxford, 1906; A.J. Herbertson, *The Oxford Geographies Vol. II: The Junior Geography*, Oxford, 1905; A.J. Herbertson and F.D. Herbertson, *The Oxford Geographies Vol. III: The Senior Geography*, Oxford, 1907.

[2] P. Bryan, Geography in Schools, in: R.J. Chorley and P. Haggett (Eds), *Frontiers in Geographical Thinking*, London, 1965, 328; Stamp, Major Natural Regions, 204—5.

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Herbertson's natural regions continue to matter, we argue in this article, for two main reasons. From a history of geography perspective, they illuminate the contested significance of climate during a crucial period of disciplinary reformation and consolidation. Herbertson's shifting influences, ideas, and representations — and the multiple receptions of his work — suggest that British geography in the early twentieth century encompassed much more diversity than reductive labels such as 'the New Geography' and 'determinism' imply.[3] From a history of climate sciences perspective, Herbertson's regions demonstrate that claims across many disciplines to possess privileged means of conceptualising, comprehending, and communicating climate are critical to elite and public perceptions of what exactly climate consists of, and why it matters. As the historian of science Deborah Coen recently pointed out, the 'standard narrative' of the history of climate science 'focus[es] on the disciplines of atmospheric chemistry and atmospheric physics' and works by anachronistically projecting concerns and techniques of the late twentieth century back into the past.[4] This narrative must be supplemented by 'recaptur[ing] the role of other fields of knowledge … from geology and geography to botany and balneology'.[5] Doing so means following historians of meteorology Meredith McKittrick and Martin Mahony in 'attending to intellectual dead ends' that were influential in their own time if not in ours.[6]

As part of the effort to pluralise past sciences of climate, this article develops recent claims regarding the particular significance of images and visual practices in making and contesting concepts of climate.[7] Within this broader field, work on maps as conduits of climate knowledge and theories is at a nascent stage, with the focus still largely on a narrow cast of cartographers whose work directly informs currently dominant representations.[8] Herbertson's thinking on climate was firmly rooted in cartography and his maps of climate and associated phenomena (for example, Fig. 1) were widely distributed for decades after his death. Yet the canon of climate cartography finds space for only a single figure of Herbertson's era: Wladimir Köppen and his 'climate regions', which provide the basis of many maps that appear in recent IPCC reports and other agenda-setting publications.[9] Herbertson's maps and cartographic pedagogy constitute a significant example of an often-overlooked type of climate representation — created by institutionally powerful figures and highly influential for a time, but discarded in the process of creating histories of climate knowledge that serve to bolster the narrowly defined climate science of recent decades.

The remainder of this article is split into three sections, which focus in turn on each of the key themes highlighted in the title. The first examines Herbertson's changing notion of climate and its roles in various iterations of his natural regions. Through this analysis, we locate geography within a wider field of climatic disciplines.[10] We also go beyond existing histories of geography in showing the importance in the early twentieth century of framings of climate — and dynamics between geography and empire — beyond simple determinism.[11] The second section demonstrates that teaching and maps played major roles in shaping regional theory, rather than merely reflecting fundamental research. Our analysis in this section builds on recent work in the history of cartography foregrounding pedagogical practices within nuanced analyses of map use and reception.[12] The third section explores the lives and deaths of natural regions in British geography after Herbertson's own death in 1915. Killed off by geographers in his immediate wake for its privileging of climate, Herbertson's region met another end during the mid-twentieth century in the maps and formulae of geographers who valorised statistical techniques and aligned their practices with climatologists.[13] We discuss these critiques not to repeat the already well-told story of the emergence of a '*new* "New Geography"' in the 1960s.[14] Instead, we suggest that they provide a window onto clashing accounts of what climate is and does, and how it is best represented —vitally relevant topics in the age of anthropogenic climate change.

The climate of Herbertson's natural regions

When Andrew Herbertson arrived in Oxford in 1899, one of his most substantial tasks was to define the substantive meaning of 'Regional Geography', the field in which he had been appointed lecturer. Halford Mackinder, his institutional superior, had toyed with the concept of natural regions in his agenda-setting 1887 paper 'On the Scope and Methods of Geography', pronouncing that the 'division of the world into natural regions [is] based on vegetation', itself a product of 'soil and climate'.[15] But Mackinder left this idea vague, and Herbertson's past experience and training gave him his own ideas about what regions were and why they mattered. Herbertson's time studying sciences at Edinburgh University in the late 1880s and early 1890s did not result in a degree but, crucially, introduced him to the botanist and urban theorist Patrick Geddes.

[3] On the political diversity of British geography around this time, see G. Kearns, The political pivot of geography, *The Geographical Journal* 170, 4 (2004), 337—46.

[4] H. Le Treut, R. Somerville, U. Cubasch, Y. Ding, C. Mauritzen, A. Mokssit, T. Peterson, and M. Prather, Historical Overview of Climate Change Science, in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller (Eds), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* Cambridge, 2007, 93—127.

[5] Coen, Advent, n.p. See also J.R. Fleming and V. Jankovic (Eds), 'Klima', *Osiris* 26, 1 (2011).

[6] 'Dead ends' originally in M. McKittrick, Theories of 'Reprecipitation' and Climate Change in the Settler Colonial World, *History of Meteorology* 8 (2017), 75; full quotation in M. Mahony, Meteorology and Empire, in: A. Goss (Ed), *The Routledge Handbook of Science and Empire*, London, 2021, 50.

[7] M. Mahony and S. Randalls (Eds), *Weather, Climate, and the Geographical Imagination: Placing Atmospheric Knowledges*, Pittsburgh, 2020, 15—16.

[8] M.T. Greene, Climate Map, in M. Monmonier (Ed), *The History of Cartography. Volume Six: Cartography in the Twentieth Century*, Chicago, 2015, 227—232; S.V. Grevsmühl, Visualising Climate and Climate Change: A *Longue Durée* Perspective, in: G. Feola, H. Geoghegan, and A. Arnell (Eds), *Climate and Culture: Interdisciplinary Perspectives on a Warming World*, Cambridge, 2019, 46—67. The related but distinct history of meteorological cartography has a richer historiography, with key contributions including: M. Monmonier, *Air Apparent: How Meteorologists Learned to Map, Predict, and Dramatize Weather*, Chicago, 2019; K. Anderson, *Predicting the Weather: Victorians and the Science of Meteorology*, Chicago, 2005, 171—208.

[9] M. Iturbide, J.M. Gutiérrez, L.M. Alves, J. Bedia, E. Cimadevilla, A.S. Cofiño, R. Cerozo-Mota, A. Di Luca, S.H. Faria, I. Gorodetskaya, M. Hauser, S. Herrera, H.T. Hewitt, K.J. Hennessy, R.G. Jones, S. Krakovskaya, R. Manzanas, D. Martínez-Castro, G.T. Narisma, I.S. Nurhati, I. Pinto, S.I. Seneviratna, B. van der Hurk, and C.S. Vera, An update of IPCC climate reference regions for subcontinental analysis of climate model data: Definitions and aggregated datasets, *Earth System Science Data* (2020).

[10] For an overview of contemporary geography's framings of climate and climate change, see M. Hulme, *Climate Change*, London, 2022.

[11] D.N. Livingstone, *The Geographical Tradition: Episodes in the History of a Contested Enterprise*, Oxford, 1992, 221—238, 280—281.

[12] On cartography and pedagogy, see: M. Brückner, *The Social Life of Maps in America, 1750–1860*, Chapel Hill, 2017; S. Ramaswamy, *Terrestrial lessons: The conquest of the world as globe*, Chicago, 2017; M. Edney, *Cartography: The Ideal and Its History*, Chicago, 2019, 151—153; T. Simpson, *The Frontier in British India: Space, Science, and Power in the Nineteenth Century*, Cambridge, 2021, 70—115. On map use and reception, see: W. Rankin, *After the Map: Cartography, Navigation, and the Transformation of Territory in the Twentieth Century*, Chicago, 2016, 102—16; Edney, *Cartography*, 31—49.

[13] Stamp, Major Natural Regions, 215; K.C. Edwards, Sixty Years after Herbertson: The Advance of Geography as a Spatial Science, *Geography* 59, 1 (1974), 4—5; Chorley and Haggett (Eds), *Frontiers*.

[14] R.C. Powell, I. Klinke, T. Jazeel, P. Daley, N. Kamata, M. Heffernan, A. Swain, F. McConnell, A. Barry, and R. Phillips, Interventions in the political geography of 'area', *Political Geography*, 57 (2017), 96.

[15] H.J. Mackinder, On the Scope and Methods of Geography, *Proceedings of the Royal Geographical Society and Monthly Record of Geography* 9, 3 (1887), 156.

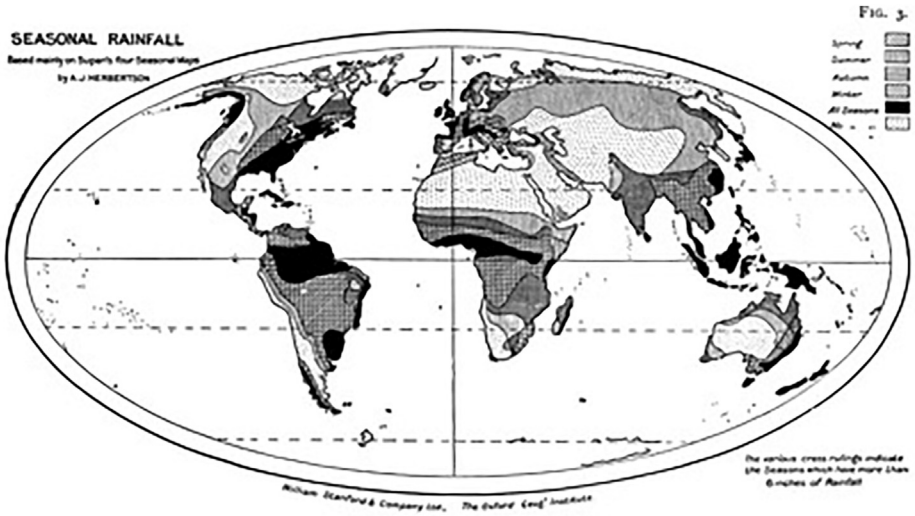


Fig. 1. 'Seasonal Rainfall. Based mainly on Supan's four Seasonal Maps'. Source: A. J. Herbertson, 'The Natural Regions of the World', *The Geographical Teacher* 3, 3 (1905), 109.

Following a period in the early 1890s working under Geddes as a demonstrator in Botany at University College, Dundee, Herbertson undertook meteorological research and wrote his doctoral dissertation on global rainfall distribution, graduating from the University of Freiburg im Breisgau in 1898. He remained at Oxford for the rest of his life, succeeding Mackinder as Reader in Geography in 1905 and being promoted to Professor in 1910.[16]

The range of Herbertson's interests acquired during his career before Oxford is apparent when we consider his PhD dissertation alongside *Man and His Work*, a book co-authored with his wife, Fanny, and published in 1899.[17] Both of these studies made claims about climate's regional features and workings — but profoundly different ones. *Man and His Work* evinced little interest in going beyond climate as an expression of latitude and a force that determined the characteristics of human communities on a large scale. Among its core contentions was that 'the natives of the tropics … degenerate into improvidence. The natives of the Arctic north … relapse into spiritless and mechanical endurance …. The countries best adapted to support sturdy and prolific races are those lying in middle latitudes'.[18] Here, Herbertson espoused a form of moralised climatic determinism prevalent in an age of high imperialism and its attendant racial ideologies.[19] By contrast, his dissertation emphasised the crucial role of localised variations and warned against generalising on the basis of the uneven coverage offered by the 25,000 rainfall measurement stations operating across the world.[20] Although he ultimately looked past his own note of caution, identifying 'seven well-marked bands of high and low rainfall girdling the earth … [that] move north and south with the sun', these works from around the time of his arrival at Oxford demonstrate two key tensions that would remain influential in his regional theorising over the rest of his career. First, despite his awareness of variability on smaller scales, Herbertson was convinced of the importance of delineating large-scale regions. Second, two divergent methodologies and intellectual genealogies shaped Herbertson's regional thinking.

Man and His Work acknowledged the crucial role of Patrick Geddes and 'through him … the school of Le Play' in shaping Andrew and Fanny Herbertson's outlook.[21] Existing historical scholarship outlines in detail these influences, with the significance of French social theorists evidenced by Fanny Herbertson's decision to write a biography of Frédéric Le Play.[22] A major part of Geddes's impact on British geography was his insistence on the significance of undertaking regional surveys as a means of understanding the interplay between people and their environs. For Geddes and many of the geographers who, like Herbertson, attended his summer schools in Edinburgh, the region was the prime holistic unit, synthesising the natural and the social.[23] Following his immersion in Geddes's synthesising perspective during his twenties, Herbertson remained convinced of the basic idea of the region as *the* fundamental holistic category throughout his career.

In contrast to the well-established role of Geddes in shaping Herbertson's regional thinking, the impact of European imperial meteorology and climatology has been largely overlooked. As will be discussed shortly, scholarship rooted in British imperial networks such as Alexander Buchan's monumental 1889 '*Challenger* Report' was important to Herbertson.[24] At least as significant was pioneering German-language work. Herbertson's doctoral work in southwestern Germany drew heavily on the work of scientists in the nearby Habsburg Empire, including Julius von Hann and Alexander

[16] E. Baigent, 'Herbertson, Andrew John', *Oxford Dictionary of National Biography*, Online, 2011.

[17] A.J. Herbertson and F.D. Herbertson, *Man and His Work: An Introduction to Human Geography*, London, 1899; A.J. Herbertson, *The Distribution of Rainfall Over the Land*, London, 1901. On Fanny Herbertson, see A. Maddrell, *Complex Locations: Women's Geographical Work in the UK 1850–1970*, Oxford, 2009, 127—129.

[18] Herbertson and Herbertson, *Man*, 2—4.

[19] M. Hulme, Reducing the Future to Climate: A Story of Climate Determinism and Reductionism, *Osiris* 26, 1 (2011), 246; D.N. Livingstone, Tropical hermeneutics and the climatic imagination, *Geographische Zeitschrift* 90, 2 (2002), 65—88.

[20] Herbertson, *Distribution*, 2—3.

[21] Herbertson and Herbertson, *Man*, v.

[22] On Geddes's influence on Andrew Herbertson and other British geographers, see Livingstone, *Geographical Tradition*, 271—83; D. Matless, Regional Surveys and Local Knowledges: The Geographical Imagination in Britain, 1918—39, *Transactions of the Institute of British Geographers* 17, 4 (1992), 464—480; R.N. Rudmose Brown, Scotland and Some Trends in Geography: John Murray, Patrick Geddes and Andrew Herbertson', *Geography* 33, 3 (1948), 110—113. On Fanny Herbertson's biography of Le Play, see Gilbert, Andrew John Herbertson, 316.

[23] Matless, Regional Surveys, 467—468.

[24] A. Buchan, Report on Atmospheric Circulation based on the Observations made on board H.M.S. Challenger during the years 1873-1876, and other Meteorological Observations, in *Report on the Scientific Results of the Voyage of the H.M.S. Challenger during the years 1873-76: Physics and Chemistry—Vol. II* (London: Her Majesty's Stationery Office, 1889), 48.

Supan.[25] In addition to rainfall data, Austrian climatologists' conceptual framework became crucial to Herbertson's regional theorising.[26] Hann defined the aim of climatology as describing 'the way in which all the atmospheric phenomena work together at any place on the earth's surface' by distinguishing 'the different climates of the world' while also 'grouping together climates which are naturally related'.[27] This interplay of difference and similarity — which Deborah Coen demonstrates was a manifestation of the Habsburg imperial theme of 'unity in diversity' — almost certainly informed Herbertson's division of the world into regional types that repeated across continents rather than being individually unique.

In addition, Herbertson adapted the Austrians' configuration of climate as a system of circulation and movement rather than one that should be reduced to a series of static quantitative measurements.[28] Contending in his doctoral work that meteorologists focused excessively on temperature and barometric pressure, he claimed that atmospheric moisture 'plays no small part in the economy of the world … [and] is a sort of life-blood of the atmosphere'.[29] Like the Habsburg scientists, he sub-divided this globally extensive system to enable description and analysis. When choosing a basis for the delineation of 'several large areas' through which to comprehend the distribution of rainfall, Herbertson squarely relied on Alexander Buchan's imperial-global data sets.[30] Herbertson's ostensibly dispassionate claim that cyclonic regions were simply 'the most convenient morphological element' of the circulatory system derived from Buchan's insistence that 'isobaric maps may be considered as furnishing the key to the climatologies [sic.] of the globe'.[31] In turn, Buchan's world-spanning isobaric maps were possible only because of the vast expansion of European technologies of atmospheric and oceanic surveillance during the later nineteenth century. The emergence of the concept of 'cyclonic regions' in the imperial working worlds of Indian-Ocean maritime insurance and sugar cane plantations during the mid-nineteenth century was occluded in Herbertson's analysis.[32] Here is a clear instance of the tendency, manifest in much European climate theorising during Herbertson's era and still persistent in recent influential genealogies of climate science, to understate the imperial roots and purviews of supposedly universal data and visions.[33]

Combining the circulatory lexicon of high imperial climatology with the vitalistic metaphors of Geddes and French scholars including the geographer Paul Vidal de la Blache enabled Herbertson to envisage his foundational object of geography.[34] As he put it in 1908,

> 'If we liken the Earth to a great organism we may see in its solid crust the relatively stable skeleton, in its mobile air and water the circulating fluids, and in its web of life its fleshy covering. Each of these three elements is of fundamental importance in geography. No study of the subject is complete which neglects any one of them or the relationship of the three to each other'.[35]

The conception of Earth-as-organism remained present across the iterations of natural regions that Herbertson elucidated throughout the last decade of his life.[36] There was, however, an important slippage between his earlier and later regional schemes. In 1904-5, Herbertson couched regions as a useful heuristic device located between the Earth-organism and the mutually related phenomena — including topographical configuration, climate, and vegetation — considered in disaggregated fashion by earlier British geographers.[37] By 1913, however, it was 'the geographical region' itself that he considered 'a macro-organism'; instead of a single planetary entity he now envisaged multiple 'huge regional creatures'.[38] For Herbertson, regions went from being a privileged means of geographical synthesis to the primary end of geographical analysis.

This redefinition was entangled with an equally significant shift in his understanding of the role of climate in constituting regions. Herbertson's initial formulation of natural regions placed climate first among equals — or rather, first among inseparables. The residue of his earlier work on atmospheric moisture was evident in his claim that, relative to temperature maps, 'rainfall maps are of even greater significance'.[39] This also aligned with Halford Mackinder's emphasis on water as a potent agent across a vast range of organic and inorganic processes.[40] In defining climate, Herbertson was relatively uninterested in quantification. He delineated rainfall regions primarily by seasonal distribution, with the amount of rain a secondary consideration (Fig. 1, above). His insistence on disaggregating by season rather than calculating an annual mean also structured his identification of 'temperature belts' around the

[25] A.J. Herbertson, Prof. Supan on the Rainfall of the Globe, *The Geographical Journal* 13, 1 (1899), 61—64; Gilbert, Andrew John Herbertson, 323.

[26] Herbertson, *Distribution*, 3 and 8.

[27] J. Hann, *Handbook of Climatology*, trans. R. de C. Ward, New York, 1903, 2.

[28] D.R. Coen, *Climate in motion: Science, empire, and the problem of scale*, Chicago, 2018.

[29] Herbertson, *Distribution*, 1.

[30] Herbertson, *Distribution*, 9; Buchan, Report,

[31] Herbertson, *Distribution*, 9.

[32] The term 'cyclone' was coined by Calcutta-based museum curator and President of the Marine Court Henry Piddington, in his *The Sailor's Horn-Book for the Law of Storms: being a practical exposition of the theory of the law of storms, and its uses to mariners of all classes, in all parts of the world, shewn by transparent storm cards and useful lessons*, London, 1848. For the concept of 'working worlds' of geosciences, see P. Anthony, Mining as the Working World of Alexander von Humboldt's Plant Geography and Vertical Cartography, *Isis*, 109, 1 (2019), 28—55. On the imperial working worlds of Piddington and his successors, see: R.M. Rouphail, Cyclonic Ecology: Sugar, Cyclone Science, and the Limits of Empire in Mauritius and the Indian Ocean World, 1870s-1930s, *Isis*, 110, 1 (2019), pp. 48-67; D. Bhattacharyya, Climate Future's Past: Law and Weather Knowledge in the Indian Ocean World, oral presentation at the Centre of South Asian Studies Seminar, University of Cambridge, 7 October 2020.

[33] P. Lehmann, *Desert Edens: Colonial Climate Engineering in the Age of Anxiety*, Princeton, 2022, 5; J.-B. Fressoz and F. Locher, *Les révoltes du ciel: Une histoire du changement climatique XV^e—XX^e siècle*, Paris, 2020, 11. Recent examples of the persistence of this oversight include: Le Treut et al, Historical Overview; D. Chen, M. Rojas, B.H. Samset, K. Cobb, A. Diongue Niang, P. Edwards, S. Emori, S.H. Faria, E. Hawkins, P. Hope, P. Huybrechts, M. Meinshausen, S.K. Mustafa, G.-K. Plattner and A.-M. Tréguier, Framing, Context and Methods, in V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (Eds), Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, 2021, 174 -181.

[34] Herbertson approved of Vidal de la Blache's notion that 'complex unities composed of rock, water, air, and living creatures' should be considered geographical 'organisms': A.J.H., Three Books on France, *The Geographical Journal* 23, 1 (1904), 112. On Vidal de la Blache's influence on Herbertson, see G.R. Crone, British Geography in the Twentieth Century, *The Geographical Journal* 130, 2 (1964), 202.

[35] A.J. Herbertson, Orographical Maps and Geographical Lessons, *The Geographical Teacher* 4, 6 (1908), 271. On vitalistic metaphors by Geddes and his followers, see Livingstone, *Geographical Tradition*, 280; Matless, Regional Surveys, 467.

[36] For example, A.J. Herbertson, The Major Natural Regions: An Essay in Systematic Geography, *Geographical Journal* 25, 3 (1905), 301; A.J. Herbertson, The Higher Units: A Geographical Essay, *Geography* 50, 4 (1965), 336 (originally published in *Scientia* 14 (1913), 199—212).

[37] Herbertson, Major Natural Regions, 301; Herbertson, Higher Units, 332—333.

[38] Herbertson, Higher Units, 341. See also A.J. Herbertson, Natural Regions, *The Geographical Teacher* 7, 3 (1913), 158—159.

[39] Herbertson, Major Natural Regions, 304; A.J. Herbertson, The Natural Regions of the World, *The Geographical Teacher* 3, 3 (1905), 108.

[40] See E. Hayes, Fashioned in the light of physics: the scope and methods of Halford Mackinder's geography, *British Journal of the History of Science* 52, 4 (2019), 582—583.

world (Fig. 2). He was at pains to justify his choice of isotherms at 0°, 10°, and 20° Celsius as significant temperatures for vegetation growth rather than arbitrary values.[41] In addition, he distinguished his geographical version of climate from that of meteorologists and climatologists by emphasising the inadequacy of temperatures reduced to sea level.

This moisture-centred, outcome-oriented version of climate had a greater effect than topographical configuration and largely dictated vegetation, Herbertson argued. 'The great barriers of the lands are climatic — wastes of arid desert or ice mountains', he wrote, while 'the vegetation map may be looked upon as a commentary on and a summary of the climatic ones'.[42] Least relevant of all the major types of spatial distribution in influencing Herbertson's initial version of natural regions was 'human conditions'.[43] In his textbooks published over the subsequent few years, humans appeared as products of regions determined — and primarily labelled — by climate (Fig. 3).[44] Such was the all-encompassing role Herbertson assigned climate in condition life and landforms that he seemed intermittently to revert to an older sense of the term, prevalent prior to the use of 'environment' in English from the mid-nineteenth century, as 'the external conditions of life' in general rather than a more specifically defined object.[45] In this respect, Herbertson returned to the Geddesian tradition, which sometimes deployed 'climate' in a circumscribed atmospheric sense, and sometimes to denote an organism's total external conditions.[46]

Climate, then, mattered in Herbertson's geography because of its effects on other spatial distributions to the point that it sometimes seemed completely inseparable from them. However — and despite lack of quantification being a major point of criticism of his work among geographers in the second half of the twentieth century — some of his most influential students and contemporary British geographers took him to task for what they saw as his excessively abstract notion of climate. In a private letter in 1913, Herbertson complained, 'I am constantly criticized [in Oxford] by one set of people for making geography too mathematical and by another set for not making it mathematical enough …. I have to fight people who can see nothing in maps and people who can see nothing but maps'.[47] John Unstead, arguably the most significant theorist of natural regions during the decades after Herbertson's death, was firmly in the former camp. He believed that Herbertson's delineation in 1912 of 'thermal regions' according to seasonal average temperatures had 'value as an inquiry into the best methods of expressing the temperature conditions of regions *per se*', but did little for 'determining the natural or geographical regions of the Globe'.[48] In other words, it was a task for meteorology, not geography. This reproach provides an important reminder that many British geographers of Herbertson's generation and the one that followed felt that quantification was not just unnecessary, but potentially antithetical to what they saw as their discipline's particular form of scientific rigour. Isolating a specific phenomenon and reducing it to numerical data and cartographic visualisations may be the job of other scientists, but 'the geographer', Herbertson insisted, 'deals with the distribution of all'.[49] Geography's disciplinary credentials lay in synthesising the quantitative distributions that were the final products of other sciences and the bequest of data gathering during geography's 'militant' phase in the nineteenth century.[50] These, Herbertson wrote, were 'the raw material for our own fabrications'.[51] To him and his acolytes, reducing the climate to numbers risked rendering the geographer an underqualified meteorologist — a far cry from their paragon of someone pursuing the higher calling of discerning holistic 'higher units'.[52]

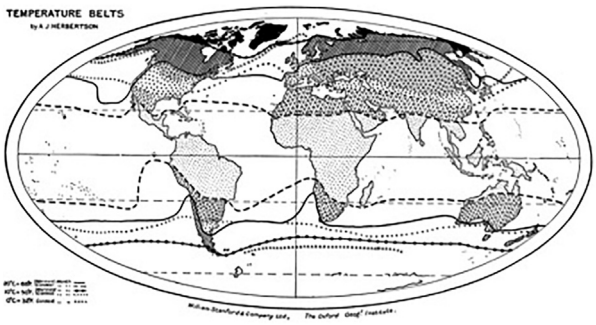
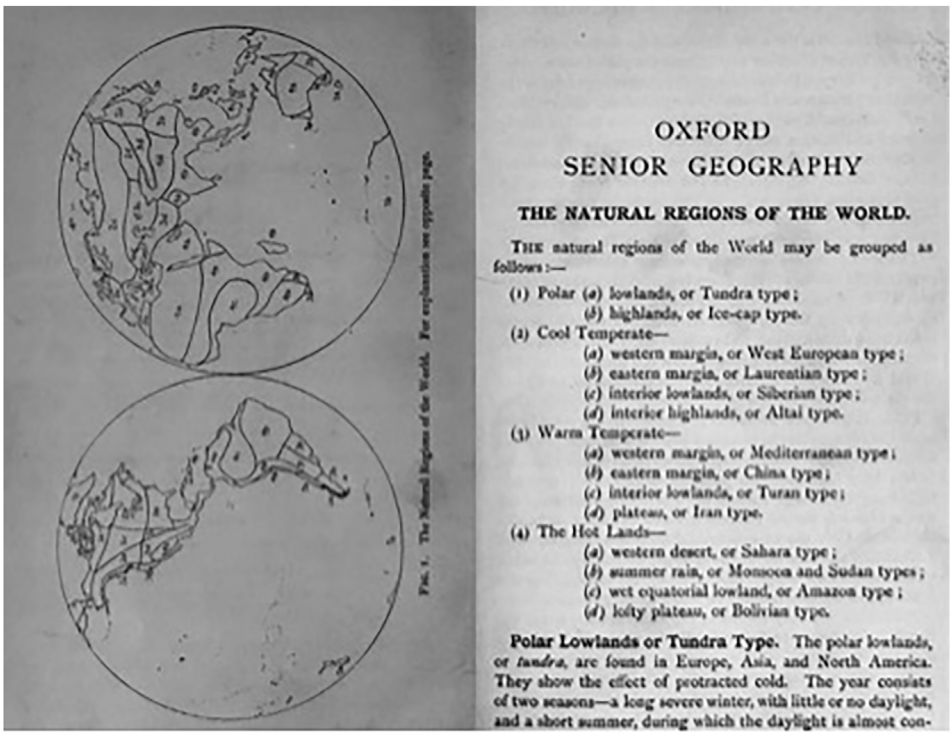


Fig. 2. 'Temperature Belts'. Source: A. J. Herbertson, 'The Natural Regions of the World', *The Geographical Teacher* 3, 3 (1905), 107.

Herbertson's controversial thermal regions were out of kilter with the general shift in revised versions of natural regions during the 1910s away from climate. Indeed, in responding to comments on the paper, he insisted that temperature was merely a 'preliminary study' and just one of many pertinent distributions for comprehending the 'qualities' of natural regions.[53] He took a growing interest in Russian-German geographer and climatologist Wladimir Köppen's 'admirable' classification of climate according to prevailing vegetation.[54] The continued use of updated versions of Köppen's classification as the primary tool for visualising model-based climate futures has led historian of science Mott T. Greene recently to extol it for giving a 'quantitative basis' to hitherto 'qualitative' climatic zones.[55] Köppen's impact on Herbertson's regional scheme is an instance of how climate categories and representations could have diverse receptions that complicate the notion of a simple shift to quantification. Under Köppen's influence, Herbertson's claim of 1904–5 that vegetation distribution is subsidiary to climate morphed into the subtly different principle that 'vegetation is a visible synthesis of the climatic and edaphic elements'.[56] This change was not solely about soil: it was an expression of Herbertson's growing conviction that 'the Natural Region is a vital unit as well as a physical one'. Accordingly, although he continued to characterise regions as 'associations of inorganic and

[41] A.J. Herbertson, The Thermal Regions of the Globe, *The Geographical Journal* 40, 5 (1912), 519.
[42] Herbertson, Major Natural Regions, 306, 309; Herbertson, Natural Regions (1905), 110.
[43] Herbertson, Natural Regions (1905), 110.
[44] Herbertson, *Preliminary Geography*, 146—149.
[45] On this use of 'climate' in the British context, see P. Warde, L. Robin, and S. Sörlin, *The Environment: A History of the Idea*, Baltimore, 2018, 27—30.
[46] For example, see the variably specific valences of 'climate' in P. Geddes and J.A. Thompson, *The Evolution of Sex*, London, 1889.
[47] Herbertson to J.S. Keltie, August 1913, quoted in D.I. Scargill, The RGS and the Foundations of Geography at Oxford, *The Geographical Journal* 142, 3 (1976), 456.
[48] J.F. Unstead, A Synthetic Method of Determining Geographical Regions, *The Geographical Journal* 48, 3 (1916), 234.
[49] A.J. Herbertson, Recent Discussions on the Scope and Educational Applications of Geography, *The Geographical Journal* 24, 4 (1904), 422.
[50] F. Driver, *Geography Militant: Cultures of Exploration and Empire*, Oxford, 2001.
[51] Quotation from Herbertson, Higher Units, 333. On geography as a synthesising discipline, see for example: J.B. Reynolds, The Regional Method of Teaching Geography, *The Geographical Teacher* 2, 5 (1904), 226; H. Mackinder, Geography as a Pivotal Subject in Education, *The Geographical Journal* 57, 5 (1921), 379.
[52] Herbertson, Higher Units, 336.
[53] Herbertson, Thermal Regions, 532.
[54] Herbertson, Natural Regions (1913). 162.
[55] Greene, Climate Map, 228. See also Grevsmühl, Visualising Climate, 60—61.
[56] A.J. Herbertson, Geography and Some of Its Present Needs, *The Geographical Journal* 36, 4 (1910), 473—474.



OXFORD
SENIOR GEOGRAPHY

THE NATURAL REGIONS OF THE WORLD.

THE natural regions of the World may be grouped as follows :—

(1) Polar (*a*) lowlands, or Tundra type ;
(*b*) highlands, or Ice-cap type.
(2) Cool Temperate—
(*a*) western margin, or West European type ;
(*b*) eastern margin, or Laurentian type ;
(*c*) interior lowlands, or Siberian type ;
(*d*) interior highlands, or Altai type.
(3) Warm Temperate—
(*a*) western margin, or Mediterranean type ;
(*b*) eastern margin, or China type ;
(*c*) interior lowlands, or Turan type ;
(*d*) plateau, or Iran type.
(4) The Hot Lands—
(*a*) western desert, or Sahara type ;
(*b*) summer rain, or Monsoon and Sudan types ;
(*c*) wet equatorial lowland, or Amazon type ;
(*d*) lofty plateau, or Bolivian type.

Polar Lowlands or Tundra Type. The polar lowlands, or *tundra*, are found in Europe, Asia, and North America. They show the effect of protracted cold. The year consists of two seasons—a long severe winter, with little or no daylight, and a short summer, during which the daylight is almost con-

Fig. 3. The opening pages of Herbertson's *Senior Geography*, with a map and list of 'The Natural Regions of the World'. Source: A.J. Herbertson and F.D. Herbertson, *The Oxford Geographies Vol. III: The Senior Geography*, Oxford, 1907, 1.

living matter', it was the latter that now took the lead. The various aspects comprising the former — including climate — were relegated to a supporting role.[57] This could hardly be further removed from today's use of Köppen's classification in diachronic animated maps, which imply that atmospheric greenhouse gas concentrations determine future vegetation patterns.[58]

There was greater space for human agency within Herbertson's newly vital natural regions. No longer necessarily captive to climate, people functioned as 'nerve cells' within each regional 'macro-organism'. Through this analogy, Herbertson distinguished between regions in which human influence was limited — 'a scattered mass of undifferentiated nerve cells, an unimportant part of the whole' — and others in which it was profound — 'a sort of higher nervous system'.[59] Although as his pupil and influential geographer H. J. Fleure put it, Herbertson 'became more biological', this did not mean that he undertook a belated turn to natural-selection theory.[60] In fact, Emily Hayes's contention that Darwinism's impact on British geography around the turn of the twentieth century has been often overstated is especially applicable to Herbertson.[61] In an extraordinary article published incomplete after his death in 1915, he classed Darwinian 'struggle for existence' along with 'the so-called conquest of nature' as tending to encourage humans to become 'parasites … tak[ing] the goods the gods provide without any return'.[62] Perhaps influenced by news of the ongoing destruction of humans and nature on the Western Front (where his son would be killed two years later), Herbertson infused holistic regions with not only a spiritual but also an ethical significance: 'the separation of the whole into man and his environment', he wrote in this last piece, 'is such a murderous act'.[63] His exhortation for a 'more and more intimate association of man and earth, man giving more and more of himself', constituted the fullest expression of his move away from prioritising climatic agency in his framing of regions.[64]

Although this shift presaged key developments in British geographical theorising during the interwar period (discussed below), it had little impact on what most geographers and students understood to be Herbertson's model of natural regions. Accordingly, one memorial lecturer in the 1960s could state without qualification that 'these regions of Herbertson were really climatic in basis'.[65] Herbertson's most widely read works were his textbooks, which retained his older paradigm and the established order of describing inorganic phenomena ahead of 'living matter'. Textbooks written by his students that were first published in his lifetime and remained influential throughout (and sometimes beyond) the interwar period repeated these basic tenets.[66] Also significant was that geophysical and deterministic versions of Herbertson's regions proved more amenable to imperial and colonial thinking than his growing emphasis on human influence. On the few occasions that regions or 'divisions' appeared in the six-volume *Oxford Survey of the British Empire* (1914) that Herbertson co-edited, they were products exclusively of inorganic influences.[67] The sole

[57] Herbertson, Natural Regions (1913), 158—159.
[58] Grevsmühl, Visualising, 60—61.
[59] Herbertson, Natural Regions (1913), 163; Herbertson, Higher Units, 341.
[60] H.J. Fleure, The Later Developments in Herbertson's Thought: A Study in the Application of Darwin's Ideas, *Geography* 37, 2 (1952), 98.
[61] Hayes, Fashioned, 572. Among those who discerned a Darwinian influence on Herbertson is Gilbert, Andrew John Herbertson, 326.
[62] A.J. Herbertson, Regional Environment, Heredity and Consciousness, *The Geographical Teacher* 8, 3 (1915), 150.
[63] Herbertson, Regional Environment, 149.
[64] Herbertson, Regional Environment, 150—151.
[65] F.K. Hare, The Concept of Climate, *Geography* 51, 2 (1966), 99.
[66] J.F. Unstead and E.G.R. Taylor, *General & Regional Geography for Students*, London, 1910; J.B. Reynolds, *Regional Geography: The World*, London, 1912.
[67] A.J. Herbertson and O.J.R. Howarth (Eds), *The Oxford Survey of the British Empire*, Oxford, 1914, Vol. I, pp. 16, 519; Vol. II, pp. 52-8; Vol. III, xvi;

contributor to this collection who directly developed Herbertson's theory was the Australian arch-determinist Griffith Taylor, who declared it 'preferable to consider the geography of Australia in terms of its chief natural regions and not in terms of the various States and territories'. Taylor essentially transferred the areas of Australia that Herbertson's 1905 scheme categorised as 'tropical' rather than 'temperate' into a map designed to bolster his claim that a large swathe of territory in the north, west, and centre was unfit for White settlement (Fig. 4).[68]

As well as proving a useful resource for geographical determinism in colonial settings, Herbertson himself prioritised the geophysical components of natural regions in the relatively rare instances that he explicitly addressed empire. A prime example was his 1910 proposal to the Royal Geographical Society (RGS) that geography could tackle 'Imperial Problems' in an era in which European rivalry had reached an intensity that amounted to a 'struggle for existence' — the very 'thoughtless phrase' he decried only five years later.[69] Here, Herbertson contended that natural regions theory gave geographers the expertise to 'estimate potential geographical values'. Adopting a persona of 'the geographical prospector', they could guide the economic exploitation of colonies just as mining prospectors guided the exploitation of mineral resources. Herbertson also called for 'an Imperial Intelligence Department', a geographer-led institutional network spanning the British Empire that would consider economic and administrative data within the framework of natural regions.[70] He therefore envisaged an empire in which human labour mattered, but was contained within a powerful structure of nonhuman features and processes.

Herbertson's own work was, then, complicit in the occlusion of his late turn to human agency in shaping regions. By contrast to widely distributed textbooks and influential imperial themes, his reappraisal of what exactly made regions natural appeared only in partially developed forms in less widely read publications.[71] Significantly, he did not develop either a pedagogical apparatus or an iconographic repertoire for these revised regions. Given the fundamental significance of these in the conception and communication of his original version (as discussed in the next section), this absence was important. For at least a generation after his death, students and academic geographers tended to associate Herbertson's natural regions with the powerful influence of climate — or more precisely, a descriptive, moisture-focused version of climate and its pervasive effects.

Fig. 4. 'Relation of Natural to Political Divisions'. Source: G. Taylor, Physical Features and their Effect on Settlement, in: A.J. Herbertson and O.J.R. Howarth (Eds), *The Oxford Survey of the British Empire*, *Vol. V: Australasia*, 38.

Representing natural regions

As he developed his concept of natural regions around the turn of the twentieth century, Herbertson paid particular attention to visual perception and child psychology. Alongside extensive teaching responsibilities in Oxford, which included establishing and leading a summer vacation course aimed at schoolteachers, in 1901 Herbertson was a founding editor of *The Geographical Teacher*, the journal of the pedagogy-focused Geographical Association.[72] The communication and teaching of natural regions was not merely a secondary consideration that followed their definition and delineation. In fact, the reverse was true: representation tended to precede theorising. Outlining his initial version of natural regions to an audience of educators in *The Geographical Teacher* in 1905, Herbertson argued that a regional system was 'almost indispensable, if geography is to become as efficient an instrument of intellectual discipline as possible'.[73] Natural regions responded to an educational imperative for 'some method which will both economise [teaching] time and cultivate in a higher degree the pupils' powers of comparison and judgment'. *Discipline* was the key term for Herbertson in this respect. To become 'an instrument of intellectual discipline', geography itself had to be disciplined — that is, given clear objects and methodologies, and positioned relative to other academic fields.[74] Natural regions fitted the bill, he avowed, disciplining both 'easily diverted' students and the previously haphazard methods of geography. They promised to make both the science and its practitioners fit for a twentieth-century imperial nation.[75]

The primary tool for this multivalent disciplining was a very specific type of map. 'The old geography,' Herbertson proclaimed around the time he first formulated natural regions, 'was a list of names, the old map a graphic gazetteer, the old geographer … a walking dictionary of topography'. 'Reconsider[ing] our conception of the scope of geography and its application to education' necessarily entailed 'revis[ing] our ideas about maps'.[76] What made maps fit for the new geography was a question that Herbertson was already asking prior to his arrival in Oxford. Both of the major influences on his geographical thinking — Geddes and French *science sociale* on the one hand, and European imperial meteorology and climatology on the other — insisted on the importance of cartography. For the former, maps instituted order over otherwise

[68] On Taylor's determinism and its political ramifications in this period, see C. Strange and A. Bashford, *Griffith Taylor: Visionary, Environmentalist, Explorer*, Canberra, 2008, 79—113.

[69] Herbertson, Present Needs.

[70] Herbertson, Present Needs, 477—478.

[71] In particular, The Higher Units was originally published in an Italian journal, *Scientia*, in 1913, and didn't appear in a British journal until reprinted in *Geography* in 1965 to mark Herbertson's centenary.

[72] Anon., Geography Courses in the Long Vacation, *The Geographical Teacher* 2, 5 (1904), 228.

[73] Herbertson, Natural Regions (1905), 104 and 113.

[74] Herbertson, Natural Regions (1905), 104. On the interplay between academic disciplines and disciplined students and practitioners, see S. Schaffer, Scientific Discoveries and the End of Natural Philosophy, *Social Studies of Science* 16, 3 (1986), 387—420; S. Schaffer, 'How Disciplines Look', in: A. Barry and G. Born (Eds), *Interdisciplinarity: Reconfigurations of the social and natural sciences*, Abingdon, 2013, 57—81.

[75] A.J. Herbertson, Notes on the Teaching of the Geography of the World, *The Geographical Teacher* 1, 1 (1901), 23.

[76] A.J. Herbertson, Studies of Large-Scale Maps, *The Geographical Teacher* 2, 6 (1904), 245.

sprawling data sets and observations, allowing for the emergence of complex patterns between various spatially distributed phenomena.[77] For the latter, fastidious attention to colour schemes and representational techniques was deemed crucial to portraying both localised diversity and region-spanning connections within the same image.[78]

Herbertson developed these concerns, deeming the quantity, iconography, colouring, and projection of maps especially important. He often took established geographers to task for perceived inadequacies in these areas. Leading British school atlases published in the late nineteenth century were castigated for the 'astonishing defect' of lacking sufficient maps to 'permit the teacher to deal adequately with the Geography of the World as a whole'.[79] Alexander Supan's rainfall maps were criticised for doing disservice to his 'valuable data' by employing a distorting Mercator projection (Herbertson preferred elliptical projections) and an illogical colour scheme to denote different quantities of precipitation ('a dull brown comes disconcertingly between greens and blues').[80] According to Herbertson, existing geography textbooks also tended to represent the wrong type of climate, placing insufficient emphasis on the seasonal distribution of rainfall that Supan's work revealed.[81] In keeping with his insistence that the geographer's climate was not the same as the meteorologist's, he emphasised that while atlases such as Heinrich Berghaus's *Physikalischer Atlas* (1836–48) and J. G. Bartholomew's *Atlas of Meteorology* (1899) provided 'the raw material for systematic geography', their maps required adaptations to enable the form of synthesising analysis that lay at the heart of geography.[82]

Issues of representation had added significance, Herbertson thought, when the primary audience was children. Recent work by historians Sumathi Ramaswamy and Martin Brückner shows how the nineteenth century saw the 'transformation' of cartographic objects including globes, atlases, and pocket maps from what Ramaswamy terms 'a thing of distinction, whose possession was the prerogative of elite (European) men, into a mass-produced commodity … primarily associated with the learning child and related beings like woman and native'.[83] With the spread of these representations came the potential for disorder and, accordingly, a slew of pedagogical texts on how to read, make, and teach with maps.[84] Herbertson grappled with this tension, working from the assumption that maps were uniquely valuable but peculiarly difficult objects. For instance, he believed that simplicity and well-spaced information was essential in child-centred cartography, but bemoaned that world maps in 'present school-atlases … [are] usually blurred by excessive detail'.[85] (Some schoolteachers levelled exactly the same criticism at Herbertson's own maps, especially those printed on the confined pages of small-format textbooks.[86]) To Herbertson and his contemporaries, the stakes of training proficient map-users through the production and distribution of appropriate maps were high because of the crucial importance of map literacy in an era of imperial militarism.[87] The inaugural issue of *The Geographical Teacher* in 1901, which Herbertson coedited, opened by expressing concern that at a time when 'our next war' was a present threat, 'most Englishmen are brought up' in 'crass ignorance of cartographical methods'.[88]

As well as representational exigencies, Herbertson was aware of potential material impediments to his cartographic pedagogy. In the absence of manufactured globes displaying 'all distributions' that he deemed foundational to geography, 'the teacher will have to make [them] for himself'. After outlining how to shade a slate globe using chalk to represent these distributions, he admitted that 'if possible the teacher should have something more permanent than a chalk drawing', which meant that 'every school should possess at least half a dozen globes' to display major distributions with greater permanence.[89] Maps and globes were sufficiently costly to provoke cautious responses from teachers. An attendee of the Oxford vacation course who commended Herbertson's map demonstrations nonetheless felt that 'few schools, if any, would likely under present conditions to spend money on such a [cartographic] collection'.[90] Despite these quotidian difficulties, Herbertson was convinced that maps and globes of varying sizes, formats, and colors were essential to what, following Ramaswamy, we might call his 'pedagogic modernity' — making children fit for geography and geography fit for children.[91]

Considerations of cartographic education spilled out into Herbertson's theoretical work. Three core features of Herbertson's initial and most influential iteration of natural regions emerged partly or primarily from his use of maps as pedagogical devices. First, his preference for rainfall over other components of climate was conditioned not only by his earlier research on atmospheric moisture, but also his conviction that 'the rainfall map is easiest to tackle' for school pupils, 'as the methods of measuring rainfall are simple and easily understood, and the results are immediately transferred to their proper place on the map'.[92] Since more convoluted techniques of reduction to sea level were a feature of most temperature and pressure maps, these should be taught at a later stage. Thinking with Lynda Walsh's analysis of the 'visual rhetoric' of the 'hockey stick' graph of global temperature around the turn of the twenty-first century, we might say that Herbertson prioritised rainfall in part because it better sustained 'the myth of natural inscription'. In other words, he believed that in the case of precipitation the journey from physical phenomenon, to an instrument, and finally to a map would be comprehensible to schoolchildren. Teachers and pupils did not universally share this opinion. Temperature maps tended to come first in the classroom, although these too had their limitations, with one teacher noting that 'owing to the quantity of information on [Herbertson's temperature] map, it has to be separated into at least four maps before much definite teaching can be done from it'.[93]

Second, Herbertson initially identified the four 'fundamental distributions' that he later synthesised into natural regions —

[77] Matless, Regional Surveys, 471–472.
[78] Coen, *Climate in Motion*, 121–143.
[79] Herbertson, Teaching of the Geography of the World, 22. The atlases he criticised are: H. O. Arnold-Forster (Ed), *The London School Atlas: An Atlas of General Geography*, London, 1900; G. Philip Jr. (Ed), *Philips' London School Board Atlas*, London, 1900. On school atlases around this time, see J. McDougall-Waters, British School Atlases, 1880–1930: Questions of Relevance, Credibility, and Authorship in the Production of Geographical Knowledge, *Imago Mundi*, 66, 1 (2014), 82–94.
[80] A.J. Herbertson, Notes on the Teaching of Climate, *The Geographical Teacher* 5, 5 (1910), 241–242; Herbertson, Prof. Supan, 64.
[81] Herbertson, Natural Regions (1905), 107–108.
[82] Herbertson, Major Natural Regions, 301.
[83] Ramaswamy, *Terrestrial lessons*, xv; Brückner, *Social life*, 247–276.
[84] Ramaswamy, *Terrestrial lessons*, 15–18; Brückner, *Social life*, 277–310.
[85] Herbertson, Teaching of the Geography of the World, 22–23.
[86] For example, F. G. A., Review of The Preliminary Geography. By A. J. Herbertson, *The Geographical Teacher*, 4, 1 (1907), 46.
[87] On cartography in the scouting movement, see Matless, Regional Surveys, 475
[88] D.W. Freshfield, Introduction, *The Geographical Teacher* 1, 1 (1901), 2–3.
[89] Herbertson, Teaching of the Geography of the World, 23.
[90] C. C. Carter and C. McGregor, Long Vacation Course at the Schools of Geography, Oxford, *The Geographical Teacher*, 1, 4 (1902), 173.
[91] Ramaswamy, *Terrestrial lessons*, 29–30.
[92] A.J. Herbertson, The Making of Maps, *The Geographical Teacher*, 2, 4 (1904), 162–163.
[93] H. R. Sweeting, The Teaching of Regional Geography, *The Geographical Teacher*, 3, 4 (1906), 159–160. See also J. W. Page, The Teaching of Geography, in Central Schools, *The Geographical Teacher*, 7, 1 (1913), 32–33.

configuration, climate, vegetation, and human occupations — in a 1901 article on teaching 'the Geography of the World'. Before suggesting that synthesising the spatial arrays of these phenomena should form the primary aim of geographical research, Herbertson considered them a matter of cartographic literacy for primary schoolchildren: 'the maps of these distributions in their broadest outlines should be as familiar to every boy and girl of twelve as the map of England or Scotland or Ireland, edited for children of that age'.[94]

Finally, just as the phenomena themselves had to be reduced to the bare essentials, so did their depiction on world maps. Herbertson advised that these 'must be carefully drawn so as to show general facts and to omit minor divergencies [*sic.*]' in order to avoid distracting pupils.[95] As with the choice of 'fundamental distributions', Herbertson's rendering of natural regions' boundaries as linear and smoothed originated from a pedagogical rationale before becoming a crucial — and often criticised — feature of the version of his theory circulated among academic geographers.[96] In both of the 1905 articles introducing his theory of natural regions to the RGS and the Geographical Association respectively, Herbertson made clear that 'as a rule, save in the case of the shore, the boundary is not at all well marked, but the characteristics of one region melt gradually into those of another'.[97] His maps, though, displayed a different logic: crisp, linear borders separated internally homogeneous regions. Just as Sebastian Grevsmühl has shown in the case of isoline maps being crucial to the notion in the 1980s of an 'ozone hole' as opposed to a space of relative ozone depletion, in Herbertson's maps the conspicuous unbroken line proved more influential than ambiguous data or nuanced narrative explanations.[98]

Along with printed maps, cartographic activities in classrooms and lecture halls were also crucial aspects of Herbertson's natural regions. In keeping with many other geographers at this time, he strongly encouraged pupils to engage in 'map making instead of map copying'.[99] He and his collaborators issued a slew of instructions for cartographic renderings of spatial distributions, especially of climatic phenomena, debating the merits of various schemes of colour tinting and isolines.[100] Specific wall maps for school buildings would, Herbertson claimed, 'stimulate the interest of the more intelligent children, and the excellent colouring gives a valuable sense training'.[101] This concern may have been further encouraged by one critique of the pedagogical limitations of the most widely distributed cartographic representation of Herbertson's natural regions, the map at the start of his textbook *The Senior Geography* (Fig. 3). As well as opining that the 'rather small' image would require teachers to render their own 'enlarged copy', an otherwise warm review suggested that 'some colour scheme to bring out the main grouping, would also make the diagram more effective for school use'.[102] By 1912, Herbertson's female research assistants at Oxford — including Eva Taylor, who became a prominent academic geographer in her own right — produced 60-by-40-inch wall maps of 'thermal regions' for classrooms (Fig. 5 shows the smaller black-and-white version published in *The Geographical Journal*).[103] In these images, colour shading was a prime concern. Herbertson outlined to the RGS that

> 'the colours of the map had been purposely chosen so that it was difficult to distinguish between the reds … [since] for ordinary school use it was not important that the details indicated by tones of red should be noticed. For the higher classes of schools and for universities the careful examination of the differences of tones of various colours might profitably be undertaken'.[104]

In other words, through colour he sought to represent a climatic variable such that two communities of map viewers — differentiated by educational progress — would discern regions of distinct scales, with more advanced students noticing localised variations while their junior counterparts saw only larger areas.

Incorporating localised deviations, such as in regions of extreme altitude variation, posed a persistent problem for Herbertson (as it did for many cartographers of his era).[105] Despite attempting to allow viewers to engage at different scales according to competence and analytical purpose, even large-format wall maps required compromises like 'generalize[d]' isotherms and applying 'the temperatures of the opener valleys' uniformly across mountain regions. Depicting seasonal variations in substantive detail on a single map also proved impossible, leading Herbertson to recommend the inelegant compromise of 'supplement[ing] the map by diagrams, showing the temperature curve for a year based on mean monthly temperatures'.[106] These limits of his cartographic representations of climate ultimately became limits of Herbertson's natural regions concept. Data that were omitted, simplified, or placed in supplementary materials were likely to be relegated or overlooked altogether in favour of those incorporated into the map. The power of widely distributed and prominently displayed maps was essential to the enormous influence of Herbertson's natural regions in British geographical teaching. Simultaneously, however, it diminished the possibility of communicating localised climatic variability, which Herbertson knew full well mattered greatly in the real world. He was sharply aware that it was impossible to depict everywhere and all times of year on a single world map without overwhelming viewers.

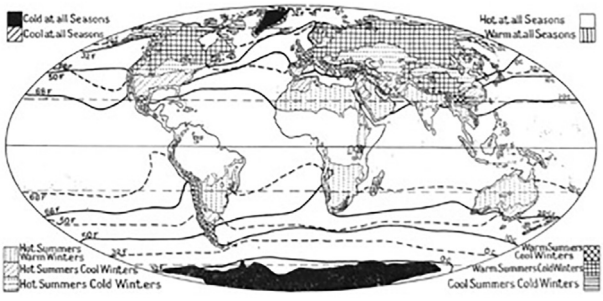


Fig. 5. 'The chief Thermal Regions of the World'. Source: A.J. Herbertson, Notes on the Teaching of Climate, *The Geographical Teacher* 5, 5 (1910), 250.

[94] Herbertson, Teaching of the Geography of the World, 22-3.
[95] Herbertson, Teaching of the Geography of the World, 23.
[96] For example, Unstead, Synthetic, 240; Crone, British Geography, 215.
[97] Herbertson, Major Natural Regions, 309; Herbertson, Natural Regions (1905), 112.
[98] S.V. Grevsmühl, The Creation of Global Imaginaries: The Antarctic Ozone Hole and the Isoline Tradition in the Atmospheric Sciences, in: B. Schneider and T. Nocke (Eds), *Image Politics of Climate Change: Visualizations, Imaginations, Documentations*, New York, 2014, 29—53.
[99] Herbertson, Making, 161. See also Reynolds, Regional Method, 227; Brückner, *Social life*, 294.
[100] For example, Herbertson, Making, 163.
[101] Herbertson, Making, 165.
[102] A. J. C., 'Review of The Senior Geography by A. J. Herbertson and F. D. Herbertson', *The Geographical Teacher*, 4, 2 (1907), 95.
[103] Herbertson, Teaching of Climate (1910), 247; Herbertson, Thermal Regions, 524. On Eva Taylor, see Maddrell, *Complex Locations*, 170—180.
[104] Herbertson, Thermal Regions, 524.
[105] Rankin, *After The Map*, 35.
[106] Herbertson, Thermal Regions, 520 and 529.

Herbertson sought to mitigate some of these issues by recommending that students not only draw and actively view maps, but also engage in more demanding forms of cartographic interaction. Relative to Halford Mackinder's visual pedagogy involving highly dramatic displays of lantern slides, Herbertson's was a more humble means of achieving broadly the same ends of stimulating students' imaginations and 'bring[ing] the distant close'.[107] In place of dazzling projected images, Herbertson's mantra was to 'compare the maps' — those depicting separate distributions over the same region, and those depicting the same distribution over different regions.[108] It is significant that his explanation of natural regions to the RGS in 1904 was largely an account of doing the very things with maps that he advocated in the classroom. Regarding climate, 'temperature and rainfall *maps*' — rather than temperature and rainfall *per se* — 'are of the greatest importance'; 'the vegetation *map* follows the climate *map*' rather than vegetation following climate; 'the density of population *map* is the most direct expression of the actual economic utilization of the natural region'.[109] Herbertson and his circle emphasised the labour of creating maps, so this mode of explanation did not reflect a simple assumption that maps were natural inscription devices.[110] Instead, it reveals that Herbertson's definition of natural regions was essentially an exercise in overlaying maps. He was following his own instruction to schoolchildren to 'compare the maps'.

In order to circumvent real-world climatic complexities and communicate his principle of natural regions more clearly, Herbertson turned to another cartographic strategy. Drawing on Wladimir Köppen's widely influential climate classification of 1900, he employed the conceit of an 'ideal continent' without topography and stretching the full latitudinal extent of the world.[111] In a 1911 article for schoolteachers, Herbertson suggested instructing pupils to construct a rainfall map of the ideal continent by averaging the latitudes of rainfall 'regions' at each of the western limit, longitudinal centre, and eastern limit of the world's actual continents, then joining these averaged lines to form isohyets and coloured rainfall bands. After what he optimistically termed this 'fascinating exercise', he suggested the pupils should be tasked with intuiting and depicting the prevailing winds necessary to bring about the distribution of rainfall depicted on their ideal continent. The final step was to represent seasonal variations in these precipitation and wind patterns by creating two copies of the rainfall map, physically entwining them by means of slits cut in the paper, and moving them up and down to replicate the northward and southward migration of rainfall regions culminating around the June and December solstices respectively. Although Herbertson advised teachers to point out 'irregularities' of configuration and their complicating effects on the real-world distribution of rainfall, his recourse to this cartographic device was an admission of the shortcomings of his decade-long effort to create maps that represented both local variations and global patterns of climate.[112] It was also in keeping with Herbertson's late turn away from climate as determinant of natural regions — a cartographic experiment confirming, as Herbertson memorial lecturer Dudley Stamp put it in the 1950s, that in actual continents, 'natural regions cannot be confined within exact lines mathematically defined'.[113]

The relatively scant evidence of how Herbertson's theories were put into practice in classrooms suggests something very different to this turn towards abstraction in order to surmount real-world complexities. If the 'ideal continent' was a framing of natural regions apparently cleansed of the imperial geopolitics that enabled their creation, teachers and pupils tended to put empire back in. Recounting his experience of instructing a group of fifteen-year-olds, one teacher in Liverpool wrote:

> 'Having now got the regions mapped out in the boys' minds as well as in paint on the blackboard, …I considered that names which meant something definite to the boys were much more useful than any system of new names however sound theoretically. Thus [what Herbertson labelled] the Polar Highlands were called the Discovery Type, as all the boys had lately heard Captain Scott lecture, and had seen his photographs.'[114]

In this case, then, natural regions were refracted through a lens of popular imaginings of imperial exploration. Another school introduced its pupils to Herbertson's work by focusing on natural regions in Africa alone. The teacher used this framing primarily to inculcate 'an appreciation of the effects of the great barrier of the Sahara, which also was chiefly responsible for the delay in opening up the southern part of the continent'.[115] Here, Herbertson's regions were adapted to bolster a theory of the migrations of 'native races'. In British classrooms, natural regions were taken away from global abstraction of Herbertson's own cartographic work and reinserted into the politicised imperialist world.

Developing and contesting Herbertson's natural regions

Across conflicting proposals among British geographers during the decades following Herbertson's death about how best to conceptualise and communicate natural regions, the belief that thinking regionally was above all a cartographic exercise held firm. In their textbook *General and Regional Geography*, which remained in print from 1910 until the 1950s, two of Herbertson's students, John Unstead and Eva Taylor, plainly stated that 'the maps are particularly important'. They instructed students that 'all suggested comparisons' between maps 'should actually be made' and recommended drawing sketch-maps so that 'the main facts [could] be visually memorized'. Comparing distinct regions was best done cartographically, while cross-reading maps of different distributions within the same area 'serves to bring out the causal connexion'. Comprehending and recalling natural regions, Unstead and Taylor concluded, was an exercise in 'constant map-work'.[116] Herbertson's cartographic iconography of smoothed boundaries, numbered region types, and an elliptical or near-elliptical projection also remained a potent influence (Fig. 6).

There were, however, some cartographic shifts corresponding with trends to develop either Herbertson's aversion to quantitatively defined regions, or his late turn away from climate. An instance of the former was Dudley Stamp's 1936 regional scheme, which persisted with a climatic basis but insisted that since 'one type [of climate] tends to fade into another, …considerable tracts

[107] Hayes, Fashioned, 585—589. On the idea of maps as a means of stimulating imagination among Herbertson's close collaborators, see J.B. Reynolds, Map Reading and Imagination, *The Geographical Teacher* 5, 2 (1909), 81—85.

[108] Exhortations to 'compare the maps' were especially prevalent in Herbertson, *Preliminary Geography*.

[109] Herbertson, Major Natural Regions, 304—306. Emphases added.

[110] On the labour of mapmaking, see Reynolds, Map Reading, 85.

[111] W. Köppen, Versuch einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt, *Geographische Zeitschrift* 6, 11 (1900), 593—611; W. Köppen, Versuch einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt (Schluss), *Geographische Zeitschrift* 6, 12 (1900), 657—679; A.J. Herbertson, Notes on the Teaching of Climate, *The Geographical Teacher* 6, 3 (1911), 124.

[112] Herbertson, Teaching of Climate (1911), 124—126.

[113] Stamp, Major Natural Regions, 206.

[114] Sweeting, Teaching, 160.

[115] Page, Teaching, 32—33.

[116] Unstead and Taylor, 2—5 and 248.

Fig. 6. 'The Natural Regions of the World'. Source: J.F. Unstead and E.G.R. Taylor, *General and Regional Geography for Students*, 15th ed., London, 1952, 239.

may best be regarded as transitional'.[117] Unstead's scheme of 'synthetic' regions was the most prominent example of the latter. Proposed as early as 1916 but more fully developed in the 1930s under the influence of German geographer Siegfried Passarge, Unstead first identified highly localised units (termed 'stows') through 'observation in the field', then agglomerated these into progressively larger-scale areas.[118] Climate was all but irrelevant until Unstead's third order of region, the 'sub-region', and only primarily significant at the fourth and fifth orders, the 'minor region' and 'major region'. Unstead employed dashed and dotted lines in his maps to denote the nested scales of natural regions and the haziness of their boundaries (Fig. 7).[119]

Like Herbertson, Unstead was against reducing climate to numbers, dismissing this practice as 'isolating particular elements such as temperate and rainfall and applying them to arbitrary limits such as a certain number of degrees and millimeters'.[120] He instead conceived of climate as a complex whole best understood and represented through its 'actual effects … on vegetation, type of drainage and soil conditions'. His entwined definition of climate and regional cartography led him to argue that both Herbertson and climatologists failed to be truly multiscalar, their world regions being 'open to considerable objection when related to local conditions'.[121] We have here an instance — one with a significant impact on a generation of geographers in Britain — of what Deborah Coen frames as 'a history of scaling … [that] disrupts the linear narrative of a push toward ever larger dimensions of thought'.[122] For Unstead, what historian of science Philipp Lehmann terms 'the appearance of globality' in Herbertson's maps was not the triumph celebrated by climatologists such as Wladimir Köppen, but a problem.[123] Climatic variations, Unstead argued, were too spatially gradual to account for many of the regional differences that impacted human society and organic distributions.

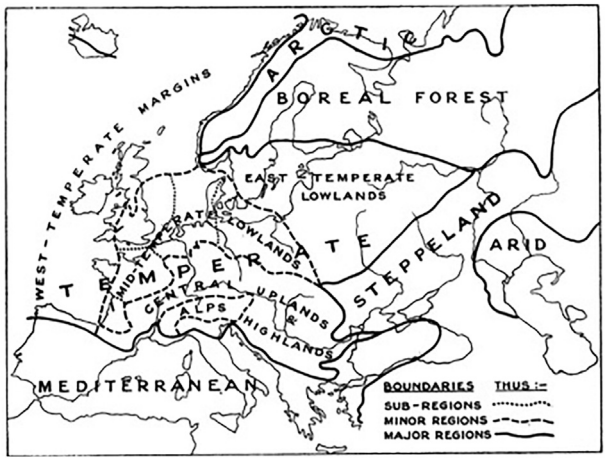


Fig. 7. Map depicting the regions of Europe. Source: J.F. Unstead, A System of Regional Geography, *Geography* 18, 3 (1933), 179.

Unstead's work was part of a wider effort among interwar British geographers to formulate a distinctive version of climate specifically fit for geography. Its key features are captured well in Marion Newbigin's 1928 comment that 'climate statistics, profoundly important to the climatologist, …have no real geographical value unless they can be interpreted in terms of organic response'.[124] Although Herbertson's scepticism towards quantification and focus on climate's effects preempted this move, his successors turned more decisively away from studies of temperature and rainfall, and studiously avoided any hint of climatic determinism. As it had been in protean form for Herbertson in the 1910s — most notably in the claim in his posthumously published article that 'the more important the human element becomes in a region, the more important that region becomes geographically' — the turn away from prioritising climate in British regional theorising of the 1920s and 1930s was often also a turn towards human agency.[125] Herbertson's Apollonian initial view of regions, the starting point of which was gazing upon the entire world encapsulated in a simple outline map, was less attentive to anthropogenic impacts than Unstead's regions, beginning with the surveyor immersed in a particular locality.[126]

Although Unstead sought to synthesise into larger units, many of his contemporaries placed less value on scaling up, prioritising specificity and close observation over generalisation and classification.[127] Among the key features of this reconceptualisation was a shift of regional metaphors from the biological to the human. As discussed above, Herbertson's regions went from being portions of a single 'world-organism' in earlier work to 'huge regional creatures' that could be grouped into species in his later work. During the decades that followed, and especially in the postwar era, most British geographers came to see smaller-scale regions as irreducibly individual. In the words of E.W. Gilbert in 1960, the region was no less defined by 'character' than 'every human'.[128] Similarly, climatologist Gordon Manley insisted in his widely read 1952 book *Climate and the British Scene* that regions had 'personalities' and an

[117] L.D. Stamp, *A Commercial Geography* (London: Longmans, 1936), quoted in Anon., Classifications of Regions of the World: Report of a Committee of the Geographical Association, *Geography* 22, 4 (1937), 266.

[118] J.F. Unstead, The Regional Geography of Siegfried Passarge, *The Geographical Journal* 78, 2 (1931), 164—166; Unstead, 'System', 176—180 and 187.

[119] On the shift to 'indefinite' regional boundaries, see Crone, British Geography, 216.

[120] Unstead, System, 182.

[121] Unstead, System, 182.

[122] D.R. Coen, Big Is a Thing of the Past: Climate Change and Methodology in the History of Ideas, *Journal of the History of Ideas* 77, 2 (2016), 312.

[123] P. Lehmann, Average rainfall and the play of colors: Colonial experience and global climate data, *Studies in History and Philosophy of Science* 70 (2018), 46.

[124] M.I. Newbigin, The Geographer and the Study of Climate, *Geography* 14, 5 (1928), 422.

[125] Herbertson, Regional Environment, 150—151; Crone, British Geography, 208—209.

[126] On the Apollonian perspective in Herbertson's era, see D. Cosgrove, *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2001), 205—234.

[127] Matless, Regional Surveys, 475.

[128] Gilbert, Idea, 174.

'identity'.[129] Particularly telling is that while Herbertson had been guided by Habsburg climatologists' imperial adage of unearthing 'unity in diversity' to categorise and connect disparate areas of the world in his regional scheme, Gilbert put forward the motto: 'diversity in unity'. This version of the 'one-worldism', which, as Jessica Lehman identifies, was especially prominent in global scientific projects during the early Cold War period, flipped Herbertson's imperial-era regional thinking on its head.[130] Rather than coalescing at an intermediate stage of differentiated types, individualised regions came together only as 'precious part[s] of the whole'.[131]

The new regionalism can be seen as the triumph of Geddes's vision and the dissipation of the climatological tradition that had acted as a counterweight in Herbertson's theorising. It also went hand-in-hand with the map representations of indeterminate regional boundaries discussed earlier. As David Livingstone puts it, 'humanized regionalism could not traffic in cartographic precision' since it prioritised units in flux with human activities.[132] The diminishing importance of Herbertson's theories was such that forty-five years after his death, Gilbert could tell the audience of a memorial lecture that 'it is now fully realized that there are very few "natural" regions …. The idea of human activity and its results is now part and parcel of the idea of a region'.[133]

While mainstream British geography had by mid-century become more Geddesian than one of Geddes's most dedicated followers, developments in American geography meant that Herbertson's other major theoretical engagement — with central European climatology — also came to seem flimsy and forgettable. If many British geographers found Herbertson too fixated on climate, their American contemporaries believed his regional scheme was insufficiently rigorous in its definition of climate and characterisation of its effects. He was outflanked on both sides of the Atlantic and on both of his methodological fronts. A highly abstracted, quantitative mode of classifying climate and its regions became prominent in American geography from the 1930s onwards. Warren Thornthwaite and Glenn Trewartha each devised an adapted version of Köppen's classification; both also represented climatic types on maps of an ideal continent (Fig. 8).[134] In a substantially revised version of his classification published in 1948, Thornthwaite moved further away from empirical observation and into the realm of abstraction. Focusing solely on producing through statistical manipulations 'definite and distinctive break points … in the climate series themselves' that would define supposedly 'rational' rather than 'arbitrary' boundaries between regions, he devised a formula quantifying 'potential evapotranspiration' — the amount of evapotranspiration that would occur in a given area if water supply were limitless. He proclaimed that this constituted a 'climatic classification … independen[t] of other geographical factors such as vegetation, soils, and land use', which then 'provide[s] the key to their geographical distribution'.[135] In other words, by defining climate as a distinct and quantitative entity, Thornthwaite believed that it was possible to demonstrate its determining effects

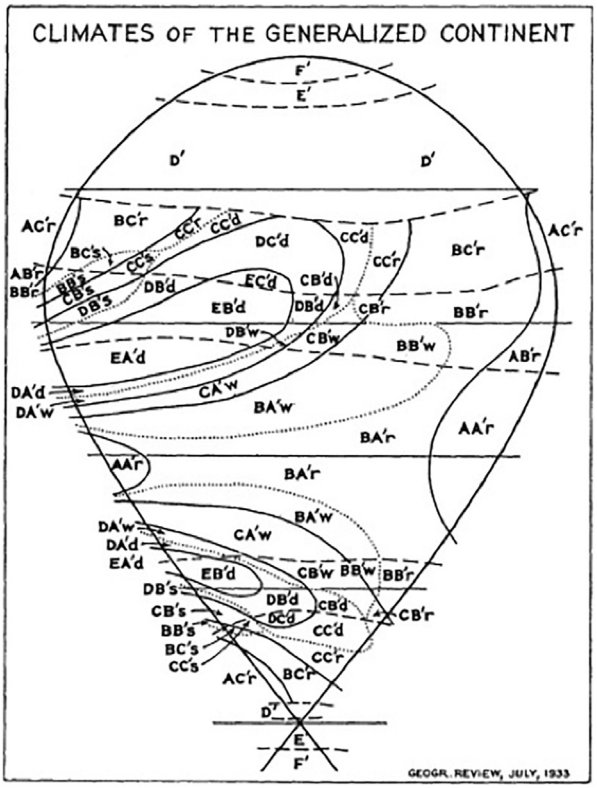


Fig. 8. 'Climates of the Generalized Continent'. Source: C.W. Thornthwaite, The climates of the Earth, *Geographical Review* 23, 3 (1933), 437.

on other phenomena. Herbertson and Thornthwaite took profoundly different cues from Köppen. Herbertson harnessed Köppen's regional scheme to his turn away from a notion of climate as a separable entity acting on other spatially distributed phenomena and towards a more fully holistic conception of regions. Thornthwaite instead grafted increasingly complex statistical tools onto Köppen's classification in an attempt to constitute climate as a stand-alone and preponderant object.

As well as having enormous influence on geographical research and teaching in the United States, Thornthwaite's regional method provided the basis for British geographers' understandings of climate as the discipline underwent a quantitative turn. The contributors to the 1965 essay collection *Frontiers in Geographical Thinking*, a seminal volume in this approach, did not mention Herbertson even as a representative of the regional method that they disdained for its supposed lack of rigour and theorisation.[136] The standard textbook on climate for British geographers in the later twentieth century, co-authored by climatologist Roger Barry and one of the leading exponents of quantitative methods Richard Chorley, also omitted Herbertson and instead located Köppen alongside Thornthwaite.[137] The latter's theory and formula of potential evapotranspiration became a central element of the mainstream understanding of climate in British academic geography. In place of Herbertson's emphasis on the indissociable connections between climate and other spatially variable phenomena, Barry and Chorley followed Thornthwaite in defining climate as an isolable

[129] G. Endfield, Reculturing and Particularizing Climate Discourses: Weather, Identity, and the Work of Gordon Manley, *Osiris* 26, 1 (2011), 147.
[130] J. Lehman, Making an Anthropocene Ocean: Synoptic Geographies of the International Geophysical Year (1957–1958), *Annals of the American Association of Geographers* 110, 3 (2020), 613.
[131] Gilbert, Idea, 173—174.
[132] Livingstone, *Geographical Tradition*, 282—283.
[133] Gilbert, Idea, 160.
[134] C.W. Thornthwaite, The Climates of the Earth, *Geographical Review* 23, 3 (1933), 433—435; G.T. Trewartha, *An Introduction to Climate*, 3rd ed. (New York, 1954), 225—231.
[135] Thornthwaite, Approach, 76 and 88—89.
[136] For example, P. Haggett and R.J. Chorley, 'Frontier Movements and the Geographical Tradition', in: Chorley and Haggett (Eds), *Frontiers*, 369—370.
[137] R.G. Barry and R.J. Chorley, *Atmosphere, Weather and Climate*, 3rd ed., London, 1976, 389—392.

object. In place of scepticism to quantification, theirs was a resolutely statistical approach in which regions were not the primary concern, but merely an outcome of statistical manipulations of data sets.[138]

Herbertson's efforts to define a version of climate for geography distinct from that of climatology were reversed from the 1960s. Geographers of the later twentieth century followed the increasingly influential insights of climatologists, empowered by new infrastructures and technologies of the Cold War.[139] A Herbertson memorial lecturer acknowledged this shift in 1966: 'as [climatology] has grown more respected, more useful and more elaborate in its intellectual demands, so have the geographers' contributions to it diminished'.[140] As in the case of dynamic oceanography during the 1950s discussed recently by Jacob Darwin Hamblin, the turn to quantification and new patterns of integrating disciplines entailed nothing less than 'redefining what deserved to be called' geography.[141] Although only eighteen years separated the final edition of Herbertson's *Preliminary Geography* in 1950 from the first edition of Barry and Chorley's *Atmosphere, Weather and Climate*, there was a vast gulf between their treatments of climate as an object of geographical research and teaching.

Conclusion: the life and death of natural regions

Herbertson's teaching and textbooks shaped a generation of students and academics in Britain and ensured that natural regions far outlived their creator. But his regional theory also died two deaths. The first was slow, lasting through the interwar period and into the middle decades of the century. It involved British geographers amplifying tendencies already present in Herbertson's later work, the most notable of which was a move away from prioritising climate. If this was a deliberate killing off in sense that it explicitly called Herbertson's ideas into question, the second death was one of neglect. Led by Warren Thornthwaite, American geographers took Central European climatology, especially Köppen's climate regions, in a different direction than Herbertson. A corollary of Köppen being coopted into a distinct intellectual lineage is that Herbertson's engagement with this tradition was, and remains, largely ignored. A new set of methods and frameworks for comprehending climate, derived solely from the physical sciences, crossed the North Atlantic to be incorporated into British academic geography from the 1960s. From this point on, Herbertson's regional approach was cast as merely an episode in the history of the discipline rather than an active presence.[142]

Should recent suggestions that climate has become much too important to leave to the climate scientists prompt reconsideration of Herbertson's natural regions?[143] Despite the advent of multiple theories of secular climate change during his lifetime and at least one subsequent attempt to infuse his regional scheme with 'histories of climatic oscillations', Herbertson dealt with climate as a static object.[144] In some other respects, however, Herbertson's theories appear more amenable to present-day ways of thinking about and acting upon climate than the alternative conceptualisations of region that killed them off in the mid-twentieth century. Just as quantified methods devised in the 1960s to define regions quickly came to seem, in Trevor Barnes's words, 'too purified, antiseptic, and removed', so reducing climate to numbers is now subject to increasing criticism for failing to account for climate's uneven and far-from-determined impacts.[145] How to think and how to visualise across scales are once again pressing issues.[146] The value of organic and vital metaphors for thinking and communicating planetary processes is also increasingly recognised.[147]

The fact that substantial aspects of Herbertson's natural regions theorising resonate with current priorities means that we should rethink influential genealogies of climate knowledge. Many historical accounts of climate science continue to focus on the discovery of greenhouse gases as agents of climate forcing, privileging a purely geophysical conception of climate and an established canon of scientists. Taking Herbertson and his successors seriously as theorists of climate is one way of critiquing this blinkered perspective. British geographers of the early twentieth century took issue with narrow conceptions of what climate is and does. They instead sought to relate it to other spatial distributions and to human agency by proposing complex patterns of mutual influence. Aspects of their 'multidisciplinary' agenda — ranging across disciplines while retaining for geography a distinctive methodology and set of conceptual objects — chime with more capacious understandings of climate's causes and effects fit for the Anthropocene.[148] At a time when geographers attentive to Anthropocene debates are discussing the discipline's capacity to act as a meeting point of sciences and humanities, the overlooked nuances and impacts of Herbertson's framings of climate and natural regions merit reconsideration.[149]

However, the imperial engagements that we have identified in Herbertson's work clearly trouble any attempt to position him as a positive precursor to framings of climate fit for the current moment. In fact, although this article 'starts from' the epicentre of British geography, Oxford, and is largely confined to continental Europe and the 'Anglo-world', our analysis can contribute to present-day decolonial priorities.[150] By showing how Herbertson rarely related natural regions to 'Imperial Problems' despite relying on Habsburg imperial climatology and Alexander Buchan's British

[138] 'No attempt is made to present a comprehensive coverage of regional climates': Barry and Chorley, *Atmosphere*, 18. On two American approaches to climatology that gave greater priority to regional units, see R.W. Dixon, Differing approaches to regional climatology: *Climates of the Continents* by W. G. Kendrew and *Climatology and the World's Climates* by G. R. Rumney, *Progress in Physical Geography* 44, 6 (2020), 971—977.

[139] P.N. Edwards, A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming, Cambridge, 2010.

[140] Hare, Concept, 101.

[141] J.D. Hamblin, Seeing the Oceans in the Shadow of Bergen Values, *Isis* 105 (2014), 354.

[142] R.J. Johnston, Geography and Geographers: Anglo-American Human Geography since 1945, London, 1979, 42.

[143] For example, M. Hulme, *Weathered: Cultures of Climate*, London, 2017.

[144] The attempt to bring Herbertson together with 'climatic oscillations' was J.L. Myres, Region and Race, *Geography* 21, 1 (1936), 26. On theories of climate change during this era, see: Coen, *Climate in Motion*, 235—273; F. Locher and J.-B. Fressoz, Modernity's Frail Climate: A Climate History of Environmental Reflexivity, *Critical Inquiry* 38, 3 (2012), 596—597.

[145] Barnes, From Region, 154. For an example of anti-quantitative climate thinking in geography, see M. Mahony and M. Hulme, Epistemic geographies of climate change: Science, space and politics, *Progress in Human Geography* (2016), 12—15.

[146] For example, Coen, Big; C. Simonetti, Weathering climate: telescoping change, *Journal of the Royal Anthropological Institute* 25 (2019), 241—264; B. Schneider and T. Nocke, Image Politics of Climate Change: Introduction, in Schneider and Nocke (Eds), *Image Politics*, 9—25.

[147] For example, L. Robin, Environmental humanities and climate change: understanding humans geologically and other life forms ethically, *WIREs Climate Change* (2017), 8.

[148] J.A. Thomas, M. Williams, and J. Zalasiewicz, *The Anthropocene: A Multidisciplinary Approach*, Cambridge, 2020.

[149] S.S. Ziegler, The Anthropocene in Geography, *Geographical Review* 109, 2 (2019), 271—280; N. Castree, The Anthropocene and Geography, *Geography Compass* 8, 7 (2014), 436—476.

[150] On the importance of where histories of geography 'start from', see R. Craggs and H. Neate, 'What Happens If We Start From Nigeria? Diversifying Histories of Geography', *Annals of the Association of American Geographers*, 110, 3 (2020), 899—916. On the 'Anglo-world', see J. Belich, *Replenishing the Earth: The Settler Revolution and the Rise of the Anglo-World, 1783-1939*, Oxford, 2009.

imperial data gathering, we illuminate a broader tendency in geographical and climatic studies to elide influences from and implications for empire. Equally, we have suggested how some of those who encountered Herbertson's texts, maps, and lectures — ranging from a determinist Australian geographer to teachers and pupils in British schools — harnessed natural regions to imperialist ideologies.

These case studies suggest that histories of geography should take a broader perspective on the much-repeated characterisation of the discipline as the 'handmaiden of empire'.[151] In his seminal *The Geographical Tradition*, David Livingstone suggests that Herbertson was imperial only in overtly racialised and deterministic exceptions within his oeuvre such as *Man and His Work*.[152] In fact, even when he steered away from theorising race or moralising climate, Herbertson's work remained grounded in imperial information and concepts. We have also shown how it was put to work in various imperial and colonial contexts. Highlighting some of the techniques that occluded this interplay of geography and empire — such as Herbertson's apparently non-imperial world maps and depoliticised 'ideal continent' — clearly cannot do the vital work of constructing a more diverse geographical canon.[153] But it can contribute to a complementary project. Specifically, it not only reveals an aspect of 'the logic of coloniality underneath the rhetoric of modernity', to use Walter Mignolo's phrase, but identifies one of the ways in which coloniality *was hidden* underneath the rhetoric — and visuals — of modernity.[154] Like many other elements of the geographical and climate science traditions, the imperial and colonial entanglements of Herbertson's natural regions are still all too easily concealed by their apparently depoliticised globality.

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[151] For example, S. Legg, 'Decolonialism', *Transactions of the Institute of British Geographers*, 42 (2017), 345.

[152] Livingstone, Geographical Tradition, 280—281.

[153] S.A. Radcliffe, 'Decolonising geographical knowledges', *Transactions of the Institute of British Geographers*, 42 (2017), 331; R. Craggs, 'Decolonising *The Geographical Tradition*', *Transaction of the Institute of British Geographers*, 44 (2019), 444—446.

[154] W.D. Mignolo, *The Darker Side of Western Modernity: Global Futures, Decolonial Options* (Durham, NC: Duke University Press, 2011), 10.