

The many meteorologies of the early modern period

In his 1690 book *Libra astronómica y filosófica*, Carlos de Sigüenza y Góngora, royal cosmographer and professor of mathematics at the University of Mexico, expressed nothing but disdain for meteorology. The very idea, he quips, of meteorologically predicting if it will rain, if it will be cold or hot, and so forth would be just ridiculous.¹ If we keep reading, however, it becomes clear what he means by "meteorology": it is just another name for astrology, and the ridiculous idea refers to the assumption that one could predict the weather by observing the motions of the stars.² He then makes the case against astrological meteorology with a simple but lucid argument, putting the American topography into play: How could the configuration of Mars, Venus, or Jupiter affect the weather when the flow of the winds is clearly determined by mountain structures like the Andes—and what is the use of astrology, he then asks, if it is not applicable to all climates and latitudes?³ In the 1730s, the art of weather prediction was still heavily associated with astrology which may be the reason that Fernández Navarrete, in charge of Spain's first instrumental observations (see next chapter), did not use the term "meteorology" at all (he spoke of "barometric" observations instead, see fig. ??).

¹«Luego si para pronosticar en lo meteorológico de una cosa tan ridicula, como es si ha de llover o no, si hará frío o calor, etc. [...]» (Sigüenza y Góngora 1984: 173)

²«[...] hablo de la meteorología y astrología racional no de la judiciaria, por cuyo medio pronostican guerras...» (Sigüenza y Góngora 1984: 173). The distinction between meteorology, i.e., "rational astrology" and "judicial astrology"—the latter intended for the prediction of wars—, had legal implications at the time but can be ignored in the context of this paper

³«Por ventura no se expondría a errar el que en esos llanos, por haber advertido en el cielo configuración que denote lluvias y tempestades, las pronosticase, cuando allí jamás esto sucede, aunque sea en las tortísimas aperciones de Marte y Venus, y de Mercurio y Júpiter, pues la disposición de los montes que impiden a los vientos se opone a todos los influjos de los cielos? Luego aunque fuera verdad haber hecho observaciones el mismo Adán y que se conservasen hasta estos tiempos, de qué le servirían en general a la astrologia, no siendo acomodables a todos [los] climas y paralelos.» (Sigüenza y Góngora 1984: 173)

However, the prevalent meaning of "meteorology" in the early modern period was derived from Aristotle's book of the same name. His *Meteorologica* (Μετεωρολογικά) treats of all kinds of things in the skies, comets, and the Milky Way included⁴ — which is only concordant with the original meaning of the Greek term μετέωρος, "raised from off the ground, high in air"⁵. A typical example of early modern Aristotelian meteorology would be Martin Lister's explanation of the trade winds, published in the 1684 volume of the *Philosophical Transactions*: "Among the known Sea Plants, the Sargosse, or Lenticula Marina, is not to be forgot; this grows in vast quantities from 36 to 18 degrees north latitude, and elsewhere on the deepest Seas. And I think [...] from the daily and constant breath of that Plant, the Trade or Tropick Winds do in great part arise: because the matter of that Wind, coming (as we suppose) from the breath of only one Plant, it must needs make it constant and uniform."⁶

The evidence in encyclopedias and journals for the learned audience indicates that in the second half of the 18th century "meteorology" converged semantically with our current understanding of the term. However, the association with questionable practices had not completely disappeared. Johann Christoph Heppé, author of *Kurze Beschreibung der Barometer und Thermometer auch anderer zur Meteorologie gehörigen Instrumenten* (1776), felt the need to defend meteorological observations against the suspicion of belonging to the dark arts or being an illicit activity: "Die Zeichendeuterkunst ist eben keine so schädliche, unerlaubte und bestrafenswürdige Kunst, als sich viele einbilden, und allgemein glauben. Das ist,

⁴Meteor. lib. I, and lib. IV-VIII (Aristotle 1952: 29-69)

⁵LSJ: «μετέωρος» (metéoros)

⁶Lister 1684: 494; Lister draws here from *Meteor.* lib. II,iv where Aristotle dismisses the idea that wind could be caused by motion of air and suggests instead "exhalations" as cause of wind (Aristotle 1952: 167ff)

höre ich schon im Geiste viele meiner Leser sagen, ein sauberer Anfang; wenn es so fortgehet, werden wir wol nichts als gottlose Sachen zu lesen kriegen. [...] Unter die erlaubte Zeichendeuterey rechne ich nun auch die Kunst das Wetter zu prognosticiren."⁷ The academic understanding of the word—not necessarily its meaning in common parlance—had become aloof from any astrological notions. Meteorology had become a discipline based on the principles of mechanics and instruments offered the opportunity to study the complex machinery in the skies. As Lichtenberg put it in his both sobering and optimistic assessment of the state of meteorology in 1778: "Trotz den Bänden meteorologischer Beobachtungen ganzer Akademien, ist es noch immer so schwer vorherzusagen, ob übermorgen die Sonne scheinen wird, als es vor einigen Jahrhunderten gewesen sein muß, den Glanz des Hohenzollerischen Hauses vorauszusehn. Und doch ist der Gegenstand der Meteorologie, so viel ich weiß, eine bloße Maschine, deren Triebwerk wir mit der Zeit näher kommen können."⁸

The semantic shifts of "meteorology" in the early modern period (and the corresponding epistemic changes) illustrate how history of science entails the study of historical semantics (or, to use the more precise German term *Begriffsgeschichte*).⁹ They also indicate the conceptual changes in an emerging field of science that would eventually result in the formation of an academic discipline of its own. This was, however, a heterogeneous process that played out over the better part of the 18th century. The advent of instrumental meteorology does not equate with a swift

⁷[Heppel] 1776: 3, 7

⁸Lichtenberg 1994c: 266

⁹Ernst Müller and Falko Schmieder have produced a survey examining the manifold approaches within the broad field of Historical Semantics (Müller/Schmieder 2016). Even more pertinent to history of science is *Begriffsgeschichte der Naturwissenschaften. Zur historischen und kulturellen Dimension naturwissenschaftlicher Konzepte* by the same authors (Müller/Schmieder 2008).

establishment of "modern" meteorology. Some instrument users interpreted the measured data according to early modern knowledge systems such as astrology, alchemy, or Hippocratic medicine; others welcomed the devices as a means of contending against precisely those notions which they deemed obsolete. The early modern history of instrumental meteorology is populated by different, sometimes competing disciplines, by learned enthusiasts and established scholars alike. There was no rapid Kuhn-like paradigm shift. Instead, there appear to be many blurry lines and, to borrow a phrase coined by Ernst Bloch, a period of *Gleichzeitigkeit des Ungleichzeitigen*.

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