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Styles of Science and the Pluralist Turn: Between Inclusion and Exclusion

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ABSTRACT: This paper aims to map out the links between style and science. Two moments mark the migration of style from the discursive field of the arts to that of the history and philosophy of science: the first occurred in the German-speaking world during the first decades of the twentieth century; the second appeared in an Anglo-American context between the late 1970s and the early 1990s, when the category of style became involved in the so-called "pluralist turn" in the history and philosophy of science. Taking this framework as its point of departure, the paper uncovers neglected contributions to the epistemology of style in order to foreground the concept of style as both a vector of inclusion (highlighting the plurality, historicity, and locality of scientific ways of knowing) and of exclusion (by generalizing the most correct ways of doing science and side-lining alternative ways of knowing).

KEYWORDS: Styles of knowing – Scientific styles – Gilles Gaston Granger – Aldo Giorgio Gargani

STYLES SCIENTIFIQUES ET LE VIRAGE PLURALISTE : ENTRE INCLUSION ET EXCLUSION

RÉSUMÉ : *Cet article vise à cartographier les liens entre style et science. Deux moments marquent la migration du style du champ discursif des arts à celui de l'histoire et de la philosophie des sciences : le premier s'est produit dans le monde germanophone au cours des premières décennies du XXe siècle ; le second est apparu dans un contexte anglo-américain entre la fin des années 1970 et le début des années 1990, lorsque la*

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catégorie de style a été mobilisée dans le soi-disant « virage pluraliste » de l'histoire et de la philosophie des sciences. En partant de ce cadre, l'article met au jour des contributions négligées à l'épistémologie du style afin de mettre en avant le concept de style à la fois comme vecteur d'inclusion (*soulignant la pluralité, l'historicité et la localité des manières scientifiques de connaître*) *et d'exclusion* (*en généralisant les façons les plus correctes de faire de la science et en écartant les manières alternatives de savoir*).

Mots-clés : *Styles de connaissance – Styles scientifiques – Gilles Gaston Granger – Aldo Giorgio Gargani*

STILI SCIENTIFICI E LA SVOLTA PLURALISTICA : TRA INCLUSIONE ED ESCLUSIONE

Riassunto: *Questo articolo intende mappare i collegamenti tra stile e scienza. Due momenti segnano la migrazione dello stile dal campo discorsivo delle arti a quello della storia e della filosofia della scienza : il primo si è verificato nel mondo di lingua tedesca durante le prime decadi del xx secolo ; il secondo è apparso in un contesto anglo-americano tra la fine degli anni '70 e l'inizio degli anni '90, quando la categoria di stile è stata coinvolta nella cosiddetta "svolta pluralista" in storia e filosofia della scienza. Partendo da questo quadro, l'articolo analizza contributi trascurati all'epistemologia dello stile per mettere in primo piano il concetto di stile come un vettore sia di inclusione* (*evidenziando la pluralità, la storicità e la località dei modi scientifici di conoscere*) *che di esclusione* (*generalizzando i modi più corretti di fare scienza e scartando modalità alternative di conoscenza*).

Parole chiave: *Stili di conoscenza – Stili scientifici – Gilles Gaston Granger – Aldo Giorgio Gargani*

科学风格与多元主义转向：包容与排除之间

摘要：本文试图厘清风格与科学之间的连结。有两个时刻能标示出从艺术的论述场域往科学史与科学哲学论述场域的风格转移：首先发生在二十世纪初期的德语世界；其次则出现在1970年末期到1990年初期之间的英美脉络之下，在科学史与科学哲学里，风格作为范畴受到动员，卷入了所谓的“多元主义转向”中。本文由此框架出发，揭露以往受忽略的，对风格认识论的贡献，借以凸显同时作为包容向量（强调多元性、历史性，以及科学式理解的地区性）和排除向量（借由将最正确的科学实践方式普及化并舍弃理解的另类方案）的风格概念。

关键字：理解的风格 –科学风格 –吉尔．盖斯东．格兰杰 (Gilles Gaston Granger) – 阿尔多．乔治欧．格尔盖尼 (Aldo Giorgio Gargani)

ESQUISSE

Le mot « style », terme technique traditionnellement associé à la littérature et à l'art, appartient désormais – comme c'est souvent le cas pour le vocabulaire de la haute culture – au langage courant. En effet, le style est devenu si omniprésent que sa « densité », ou stratification conceptuelle, passe fréquemment inaperçue. Bien qu'elle soit généralement synonyme de fugacité, la notion de style est en réalité porteuse d'implications multiples et profondes. De fait, le terme s'est avéré si malléable et (peut-être précisément en raison de sa malléabilité) si puissant qu'il a servi et continue de servir de multiples idéologies – sous-tendant divers objectifs artistiques, esthétiques, cognitifs, épistémologiques, éthiques, ainsi que politiques. En dépit de son omniprésence, la notion de style n'a pas encore reçu l'attention systématique qu'elle mérite. En particulier, le lien entre style, connaissance et science devrait être exploré de manière plus approfondie. L'historien Carlo Ginzburg, dans son essai « Style as Inclusion, Style as Exclusion » (1998), retrace certaines étapes centrales de la formation du concept de style à travers l'histoire, surtout dans le domaine de l'histoire des arts[1]*. Ginzburg relève ainsi deux fonctions opposées du style : d'une part, le style a œuvré comme facteur d'inclusion de certaines idées, certaines perspectives ou certains groupes sociaux dans un contexte culturel ou historique spécifique. D'autre part – et souvent de manière simultanée – le style a procédé à la ségrégation des points de vue autres que le sien. Ginzburg montre également qu'un excès dans la considération des choses* secondum quid *– autrement dit, un excès de relativisme – risque de générer une approche insulaire et intolérante.*

Je soutiens qu'une tension entre inclusion et exclusion très similaire à celle détectée par Ginzburg dans l'histoire des arts semble sous-tendre les styles épistémologiques et, plus particulièrement, le domaine de l'histoire et de la philosophie des sciences. Malgré une longue tradition d'association entre style, connaissance et modes de savoir, remontant au moins à la période de la Renaissance, voire plus tôt encore, le lien plus spécifique entre style et science n'a émergé qu'au cours du XX^e^ siècle. Deux moments marquent la migration du style du domaine discursif des arts à celui de l'histoire et de la philosophie des sciences : le premier s'est produit dans le monde germanophone au cours des premières décennies du siècle ; le second est apparu dans un contexte anglo-américain entre la fin des années 1970 et le début des années 1990, lorsque la catégorie de style a été mobilisée dans le soi-disant « virage pluraliste » de l'histoire et de la philosophie des sciences.

Dans le premier moment, s'impose l'idée que la connaissance scientifique se définit soit par une absence fondamentale de style (compris comme décoration inessentielle ou aspect idiosyncratique et donc non objectif), soit comme un seul

1 Ginzburg, 1998.

et même style (*compris comme méthode*). *Dans ce dernier sens, l'idée d'un « style galiléen » reflète une approche moniste en philosophie des sciences, c'est-à-dire une tentative, promue par exemple par les représentants du Cercle de Vienne, de définir un seul style ou méthode pour accéder à la réalité. Le concept de* Denkstil *de Ludwick Fleck est ici présenté comme une exception qui précède à maints égards les philosophies pluralistes de la fin du XXe siècle. Dans ce deuxième moment, en effet, c'est surtout la pluralité des styles, des angles et des perspectives mis en jeu dans l'étude de la réalité qui est soulignée. Toutefois, un excès de pluralisme ou d'ouverture a rendu possibles des approches relativistes et constructivistes fondées sur l'idée que les différentes théories scientifiques sont incomparables entre elles.*

À partir de ce cadre, l'article met en lumière deux contributions négligées à l'épistémologie du style : celle de Gilles-Gaston Granger et celle d'Aldo Giorgio Gargani. Dans son Essai d'une philosophie du style (*1968*), *Granger retravaille profondément la notion de style, en proposant une « stylistique générale » qui ne se pose pas tant comme discours porté sur les différentes manières, formes ou expressions d'un contenu déjà donné, mais comme théorie générale de la dynamique historique du façonnement réciproque entre objets et méthodes de toutes sortes de production ou de travail*[2]. *Le style, loin d'être une simple manifestation d'ordre ornemental, devient chez Granger une catégorie de la pensée formelle à travers laquelle reconsidérer la dialectique entre théorie et pratique, abstraction et individuation. Dans* Stili di analisi. L'unità perduta del metodo filosofico (*1993*), *Gargani plaide en faveur de la centralité du concept de style en philosophie. Il qualifie la croyance en la recherche d'une méthode scientifique et philosophique unique d'idéologique*[3]. *Le pluralisme de Gargani se fonde sur la crise du modèle traditionnel de la « seule vraie théorie » : de l'indétermination des théories scientifiques par rapport à leurs référents empiriques, il découle qu'aucun modèle théorique n'est autosuffisant et que chaque modèle doit être déployé dans le contexte de différentes formes de connaissance.*

Comme le montrent les cas de Granger et de Gargani dans les contextes intellectuels français et italien, l'épistémologie du style est un fil rouge qui traverse le XXe siècle, y compris au-delà des territoires germanophones et anglophones. Ils montrent aussi la centralité du style dans les tentatives d'équilibrage, dans l'étude des sciences, entre les deux extrêmes du monisme et du relativisme. Leurs analyses permettent de mettre en valeur la recherche d'un pluralisme qui soit tolérant mais aussi cohérent, capable, donc, de distinguer le niveau d'objectivité et de crédibilité de revendications scientifiques spécifiques.

2 Granger, 1968.

3 Gargani, 1993.

ON THE ADVANTAGES AND THE DISADVANTAGES OF STYLE STUDIES FOR SCIENCE

The word "style", a highly technical term traditionally associated with literature and art, now belongs – as it is so often the case with high-culture vocabulary – to everyday language. Indeed, style has become so pervasive that its "thickness", or conceptual stratification, frequently goes unnoticed. Though it often signifies a quality of transience, the notion of style actually carries multiple, profound implications. Indeed, the term has proven to be so malleable yet (perhaps precisely because of its malleability) so powerful that it has served and continues to serve a diverse range of ideological functions – underlying various artistic, aesthetic, cognitive, epistemological, ethical, as well as political aims.[4] Despite its ubiquity, the notion of style has not yet received the systematic attention it deserves. An extended discussion of epistemological styles in the context of the ongoing debate over scientific pluralism and realism is also absent. Beginning to address this gap is the main aim of the present paper.

To do so, I will start by drawing insights from the long and complex historical trajectory of the notion of style. In his penetrating essay "Style as Inclusion, Style as Exclusion", historian Carlo Ginzburg (1939-) highlights some of the key moments of this history, which extends from the early-modern period to the early decades of the twentieth century. Ginzburg shows the social, cultural, and ideological implications style has carried and the ways it has served as a means of both "inclusion" and "exclusion". Ginzburg argues that style has often been used as a "cutting device, as a weapon, and as a self-defining category" which "has also played an important (and insufficiently recognized) role in the acceptance of cultural diversity as well as in establishing cultural hegemonies."[5] His historical critique shows the conceptual mold from which a particular version of the notion of style began spreading during the early-modern period: a notion meant to convey a reference to Platonic ideals or standards of perfection, on the one hand, but also its individual, historical versions on the other. In this sense, Baldesar Castiglione (1478-1529) argues in *Il Cortegiano* (The Book of the Courtier) that "excellence can nearly always be reached through different roads." In painting, Castiglione affirms, "Leonardo

4 For some recent ethical studies of style, see Bergounioux, 2013; Macé, 2016; Bordas, 2008 and Bordas and Molinié, 2015 highlight the far-reaching implications of style, from linguistics to sociology, while Martinelli, 2005 and Jousset, 2008 explore the anthropological meaning of the notion. Sontag, 1969 is a classic example of a political application of style.

5 Ginzburg, 1998, p. 27.

Vincio, il Mantegna, Raffaello, Michelangelo, Georgio da Castelfranco, each of them is perfect in his own style."[6] In *The Lives of the Most Excellent Painters, Sculptors, and Architects*, Giorgio Vasari (1511-1574) introduced the idea of a hierarchy among different styles and, using a teleological approach, presented his contemporary Michelangelo (1475-1564) as the pinnacle of the art of painting. Vasari, however, also argued that works of art should be assessed not only *simpliciter*, or in an absolute sense, but also *secundum quid*, that is, "according, to and with respect for places, times, and other similar circumstances."[7]

This ambivalent characterization of the notion of style, which on the one hand indexed something timeless and absolute, and, on the other hand, something contextual, persisted for several centuries. The eighteenth and nineteenth centuries, in particular, were crucial in the conceptual stratification of the notion of style. In his *Geschichte der Kunst der Altertums* (1764), Johann J. Winckelmann (1717-1768) proposes a stylistic periodization for sorting the classical from the decadent periods through a normative confrontation with Greek art understood as a timeless canon of perfection. However, Winckelmann also believed that the history of art consisted in a systematic account of "origins, development, changes and decadence and with the variations of style according to the various peoples, times and artists."[8] The ambivalence of style in the classical framework also appears in neoclassicist sculptor John Flaxman's (1755-1826) attempt to understand, translate, and ultimately appropriate other cultures – which Ginzburg considers equivalent to British imperialism. The triumph of stylistic diversity over uniformity found its legitimation in the historicist architecture of Gottfried Semper (1803-1879), however, whose notion of style, as Ginzburg suggests, had a twofold origin. On the one hand, it could be traced back to Johann W. von Goethe's (1749-1832) morphology and ideas such as *einfachsten Urform* (originary and simplest form), *ursprüngliche Ideen* (originary ideas), *Urformen* (originary forms), and *das Ursprüngliche und Einfache* (the originary and the simple). On the other, it was indebted to Georges Cuvier's (1769-1832) comparative osteology, underpinning Semper's idea that the immense variety of artistic creations presupposes the repetition of the "same skeleton," that is, the existence of a continuous morphological trestle analogous to the schematic simplicity of nature. In partial opposition to materialist understandings of Semper's views, which implied a determination of art by the tools employed by the artists, Alois Riegl (1858-1905) emphasized the autonomy of styles as self-enclosed entities or

6 Castiglione quoted by Ginzburg, 1998, p. 29.
7 Vasari quoted by Ginzburg, 1998, p. 30.
8 Winckelmann quoted by Ginzburg, 1998, p. 33.

Kunstwollen (will to art). At the same time, Riegl also underscored plurality, insisting on the historical nature of *Kunstwollen* and on the intrinsic dignity of artistic strands, such as late Roman art, usually considered derivative or decadent. Both Semper and Riegl unwittingly became reference points for the racial implications of the conflation of style and national character that gained purchase during the nineteenth century – as in the revival of the Gothic as the "indigenous style" of the "Northern races" by George G. Scott (1811-1878). The presumed connection between style and racial themes was taken to an extreme by Wilhelm Worringer (1881-1965), who explicitly linked stylistic purity to a hierarchy of ethnicities.

Interestingly, Ginzburg's essay culminates with a discussion of the notion of style in relation to the historian and philosopher of science Paul Feyerabend (1924-1994). Ginzburg points out that, drawing directly on Riegl, Feyerabend characterizes his anti-positivist views on the history of science as a history of style-periods which he defines as reflecting

> [...] a conception of art [...] according to which in art there is no progress nor decadence, but only different styles. Every style is perfect in itself and obeys to its own laws. Art is here assimilated to the production of styles and history of art consists in a succession of different styles.[9]

Feyerabend thus draws directly on Riegl's *Kunstwollen*, and it is possible to see how Riegl's conception of the different styles of different epochs as expressions of different artistic wills or compulsions aligns well with Feyerabend's "limitless relativism" and views about incommensurability, understood as the doctrine of the untranslatability of different languages (and of the incomparability of different scientific theories).

> Sciences have themselves developed a profusion of styles, especially forms of verification, and the passage from one style to another is by all means similar to the passage from the ancient style to the gothic style.[10]

Feyerabend is not simply pointing out that style shifts bring about methodological shifts. His position is more radical, since he further argues that it has "to do not only with different forms of art, but also with different forms of thought, of truth, of rationality and also with different forms of reality."[11]

9 Feyerabend, 1984, p. 115. I consulted the Italian translation; here I offer my translation.
10 Ibid., p. 154.
11 Ibid., p. 124.

In Ginzburg's view, such a relativistic position is extremely dangerous, as it allows "one to dispense with referentiality, truth, reality – putting them, so to speak, in quotation marks."[12] In his autobiography, recalling some lectures he gave in 1944, Feyerabend writes:

> My main thesis was that historical periods such as the Baroque, the Rococo, the Gothic Age are unified by a concealed essence that only a lonely outsider can understand. [...] it is a mistake to assume that the essence of a historical period that started in one place can be transferred to another.[13]

This "concealed essence" unifying each civilization through its style is another implicit refence to Riegl's *Kunstwollen*. Feyerabend's emphasis on the self-contained features of these "concealed essences" leads to the idea of a lack of communication or translatability among them. This deeper idea is echoed in other passages of the same lectures, where Feyerabend argues that "people have different professions, different points of view. They are like observers looking at the world through the narrow windows of an otherwise closed structure."[14] In "real life," continues Feyerabend,

> Every person has his own well-defined opinions, which color the section of the world he perceives. And when people come together, when they try to discover the nature of the whole to which they belong, they are bound to talk past each other; they will understand neither themselves nor their companions. I have often experienced, painfully, this impenetrability of human beings – whatever happens, whatever is said, rebounds from the smooth surface that separates them from each other.[15]

Slightly later in the lecture, Feyerabend applies this insight to relations between the Germans and the Jews. Ginzburg emphasizes the historical context of these lectures, which were given during the Second World War – which Feyerabend had joined as a volunteer, later becoming a lieutenant – to fellow officials of the *Wehrmacht*. Ginzburg qualifies Feyerabend's remarks on the Jews as "ambiguous and embarrassed." Ginzburg's general point is that conceiving scientific theories or cultures as impenetrable spheres among which communication or translation is impossible leads to intolerance and exclusion. From this point

12 Ginzburg, 1998, p. 42.
13 Feyerabend quoted by Ginzburg, 1998, p. 43.
14 Ibid.
15 Ibid.

of view, Feyerabend's "Dadaist" and "anarchist" epistemology might be seeing as ultimately fostering discrimination precisely by preaching that "anything goes" – that is, by affirming that, since there is no true method for science and no vantage point from which to assess the validity of different forms of knowledge, all points of view are equally valid. In other words, behind the idea of putting all points of view on equal footing lurks the masked superiority of one's own perspective and its unwillingness to mingle with others.

Ginzburg's essay therefore demonstrates the opposing functions of style: on the one hand, style has operated as a vehicle for the inclusion of certain ideas, perspectives, or social groups within a specific cultural or historical context. On the other hand – and often at the very same time – style has served the opposing function of fencing off points of view other to one's own. In what follows, I will argue that a very similar tension between inclusion and exclusion seems to underlie epistemological styles and the field of history and philosophy of science. Far from isolated, the case of Feyerabend is representative of a whole cluster of approaches to science and scientific knowledge which have made central use of the notion of style. Such uses, however, have led to diverging images of science, due to the conceptual polyvalency of the notion of style. Before venturing into this discussion, I will first provide a brief genealogy of epistemological styles. I will then take a closer look at the role the notion of style played in the so-called "pluralist turn" in history and philosophy of science. I will conclude by exploring two neglected theories of styles in science from the second half of the twentieth century in order to show that the notion of epistemological styles allows us both to account for scientific plurality and historicity and to highlight that which emerges and accumulates specifically in the sciences.

A BRIEF GENEALOGY OF EPISTEMOLOGICAL STYLES

Though the concept of style has a long history dating back to the classical world of ancient Greece and Rome, it found a moment of fixation in the modern period when a close connection, which still retains conceptual importance, was established between style and knowledge.[16] In this context, style is conceived as expressing an inseparable link among ways of speaking or writing (the Latin

16 While neglecting the relevance of the early-modern moment, an interesting overview of the most salient applications of the idea of "styles" or "ways of knowing" from the work of Italian philosopher Giambattista Vico (1668-1744) through the contemporary period can be found in Sciortino, 2023.

word "stilus" referring to the instrument for writing on wax or clay tablets), thinking, and being. This nexus plays an important role in the founding narrative of the modern period, which emphasizes the rupture between the Middle Ages (Latin) and the Renaissance. Style plays a central role in this narrative as a marker of a new type of knowledge and new quality in the transmission of knowledge. Far from being secondary to content, style becomes an essential instrument for historical, cultural, and scientific affirmation, at both the individual and collective levels. Being aware of one's style and finding a place in (universal) history functioned as two aspects of the same process of identification during the European modern period. This distinctive early modern link between style and ways of thinking played a specific role not only in the emergence of philology as a model for knowledge but also in discussions of scientific method, particularly by Renaissance Aristotelians.[17] As has been extensively shown, early humanists helped spread historical awareness of the diversity of styles,[18] and style also remained a widespread preoccupation during what has been called the "age of eloquence."[19] Philosophy was likewise invested in this quest for style, as the case of René Descartes (1596-1650) – who might be considered the "founding figure" of the idea of style as a "way of thinking" – shows. Descartes was conscious of his style and how his way of writing and thinking mutually influenced each other and together influenced how he was read and understood by others. The first few sentences of his *Discourse on Method* are emblematic of what Denis Kambouchner (born in 1953) has called "the style of Descartes": a correspondence between the syntactic architecture of Cartesian language – marked by a particular kind of "branching and subordinating" sentence – and his philosophical way of thinking.[20] The intertwinement of these philological and epistemological configurations of style was later epitomized by Georges-Louis Leclerc de Buffon's (1707-1788) well-known *Discours sur le style*, which was given as the acceptance speech for his election to the *Académie française* in 1753. "Style," Buffon argues, "is but the order and the movement one gives to one's thoughts."[21] Thus lack of organization and of adequate reflection on the object of a text are what make a text itself flawed and its writer lacking. However, from early-modern humanists to

17 For philology as a model for knowledge, see Thouard *et al.*, 2010; for the role of rhetoric in the shaping of the notion of "method", see Schuster *et al.*, 1986; and for the importance attributed to "stylistic concerns" by Renaissance Aristotelians, see Sgarbi, 2013; 2017.

18 See Garin, 1994.

19 See Fumaroli, 2002.

20 Kambouchner, 2013, p. 19.

21 Buffon, 1921, p. 279.

Buffon, things varied considerably, and whereas the former had underscored the historicity and diversity of styles, Descartes and Buffon tended to prioritize the idea that there is one correct style in both writing and thinking.[22] Such ideals of uniformity and universality, also generally pursued by members of the *République des Lettres* during the Enlightenment, have been seen as conducive to the establishment of the sciences – as they encouraged individuals to suppress their idiosyncrasies and reach impartiality in judgement in order to achieve a language that could be easily understood and replicated throughout Europe. By contrast, in the nineteenth century, the rise and consolidation of nation states led to the emergence of "national styles" in science, reflecting particular local standards and a general loss of the cosmopolitan spirit characterizing the earlier period.[23]

While the literary or philological configuration of style continued to persist, during the nineteenth century a different paradigm took the lead: an aesthetic understanding of style, in which perception and its conditions of possibility became central. At the turn of the nineteenth century, art historians strove to make their discipline "scientific", and the notion of "style" became a tool for this epistemological shift. Both Riegl's *Stilfragen* (1893) and Heinrich Wölfflin's (1864-1945) *Kunstgeschichtliche Grundbegriffe* (1915), founding milestones in the discipline, argued for the existence of an autonomous logic of stylistic development in order to affirm the independence of art history from general cultural history. Style thus emerged as the object of art history, calling for a specific method of inquiry. Adopting a Kantian perspective, Wölfflin emphasized style as a historically given set of visual categories or "optical possibilities." Wölfflin describes the passage from Renaissance to Baroque painting as the paradigmatic case of stylistic polarization by making reference to five conceptual couples or principles (the linear and the painterly, the planar and the recessional, the closed and the open form, multiplicity and unity, absolute and relative clarity), describing this polarization as also characteristic of other transitional phases in art history. In particular, Wölfflin describes the passage from Cinquecento classical art to Baroque painting as a transition from the first to the second of the five conceptual couples or principles. Against the multiplicity or harmony of free parts characterizing Cinquecento paintings, Seicento artists would favor unity, which was understood either as

22 As we shall see in the next section, in his Gifford Lectures physicist Freeman Dyson distinguishes two styles of doing science: a unifying style and a diversifying style. He traces this distinction back to the early-modern period, finding Descartes the champion of unifiers and Bacon the champion of disunifiers (Dyson, 1988, p. 37-38).

23 See the contribution by Daston in Daston and Otte, 1991.

"drawing the members together into *one* motif" or as the "subordination to one absolutely leading element."[24] This "unifying view" might be seen as recapturing the lines along which the idea of a "Baroque science" took hold in the first decades of the twentieth century, not only in authors as diverse as Benedetto Croce (1866-1952) and Robin G. Collingwood (1889-1943) but also in historians of the life sciences and of the sciences of nature.[25] For Swiss historian of medicine Henry E. Sigerist (1891-1957), for instance, the Baroque expressed a form of thought underpinning such diverse phenomena as Michelangelo's art, the nascent physiology of William Harvey (1578-1657), and Galileo Galilei's (1564-1642) mechanics.[26] Sigerist suggests that physiology and the associated functional conception of life could only emerge in the context of such a framework, which privileged the unfinished and moving forms over static, closed ones.

Styles in Wölfflin provide the framework for expression of the artistic temperament, which, he maintains, is not developed in a void and is not free to move in just any direction:

> Even the most original talent cannot go beyond certain limits that are set for it by date of birth. Not everything is possible at all times, and certain thoughts can only be thought at certain stages of development.[27]

In this perspective, styles revolve around visual paradigms, and the emphasis is not only on their capturing well-defined "ways of doing" (*maniera*) but also their specific "ways of seeing" – as well as the interconnections between the two. Wölfflin also called his five couples of conceptual alternatives "Kantian" visual categories, arguing that a Renaissance artist does not have the same set of optic possibilities as a Baroque one.[28] As we shall see, such claims, and many

24 Wölfflin, 2015, p. 96-97.

25 Collingwood, 1945, p. 4-5; Croce, 1993, p. 22. On the idea of a "baroque science", see also Gal and Chen-Morris, 2013; 2013b.

26 Sigerist, 1932, p. 41-42. Also see the French epistemologist and historian of science Georges Canguilhem (1904-1995), who quotes approvingly Sigerist on this point: Canguilhem, 1991, p. 204-205.

27 Wölfflin, 2015, p. 80.

28 See Wölfflin, 2015, p. 93. Here Wölfflin provides a much more specific version of the claim about the limitations to which every artist is inevitably bound at every epoch: "Every artist finds certain preexisting 'optical' possibilities, to which he is bound. Not everything is possible at all times. Seeing as such has its own history, and uncovering these 'optical strata' has to be considered the most elementary task of art history." Or, more explicitly, "New world content is crystallized in every new style of perception", "One not only sees things differently; one sees different things as well" (Wölfflin, 2015, p. 321). On Wölfflin,

other insights offered by Riegl and Wölfflin, became the backdrop for several subsequent uses of style by twentieth century's historians and philosophers of science.

Though style implied a connection to knowledge since at least the early modern period, a more specific link among style, science, and scientific knowledge emerged only during the twentieth century. Discussions of style were bursting at the seams of the German-speaking intellectual world during the early decades of the twentieth century,[29] but one of its first distinctive uses in relation to scientific knowledge took place in the context of the sociology of knowledge. Inspired by art historian Riegl's views on style, Karl Mannheim (1893-1947)[30] attempted to explain the modification in *Kunstwollen* or worldviews from one epoch to another.[31] Changes in what Mannheim came to call "styles of thought" were conceived as a change in the *Weltanschauungstotalität*, i.e., in the internal unity of a worldview. Mannheim argued that, as a discipline, sociology draws upon the empirical localization and logical reconstruction of "integral styles of thought and perspectives," and that it is able to do so only by "tracing single expressions and records of thought which appear to be related back to a central world view, which they express." As he continues,

> [Sociology] makes explicit the whole of the system which is implicit in the discrete segments of a system of thought. In styles of thought which are not avowedly a part of a closed system, it uncovers the unity of outlook.[32]

It is important to note the dimensions of closeness and self-referentiality, which already characterized Riegl's *Kunstwollen*, in this passage; this aspect is what also leads Mannheim to consider styles of thought as impermeable enclaves.

The holistic approach to science and knowledge articulated by Mannheim finds to some extent an echo in the monist approach to philosophy of science cultivated by adherents of the logical empiricism of the Vienna Circle. It has been widely noted that a philosophical program for the unification of science

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see Cohn and Mermet, 2020. For a joint discussion of Semper's, Riegl's, and Wölfflin's theories of style, see Pinotti, 2001.

29 Interest in the views on style of sociologist and philosopher Georg Simmel (1858-1918) has been recently rekindled by the publication of Simmel, 2020. For two distinctive uses of the notion of style in relation to the sciences whose consideration exceeds the limit of the present paper, see the work of philosopher Ernst Cassirer (1874-1945) and of economist and sociologist Werner Sombart (1863-1941).

30 On Mannheim, see Scivoletto, 1977, p. 311-12; Wessely, 1991; Sciortino, 2023.

31 Wessely, 1991, p. 271.

32 Mannheim quoted by Wessely, 1991, p. 271.

was at the root of the Vienna Circle's project – its main heralds being Rudolf Carnap (1891-1970) and Otto Neurath (1882-1945) – and that the notion of unity became a core tenet of philosophy of science as the discipline developed in most countries during the twentieth century. Central to this approach was belief in only one true scientific method. Their advocation of various forms of reductionism implied that since there is only one world, there can only be one truth about it and one science that seeks it. Parallel to this claim, the Vienna Circle's program generally identified science with a single language: a "physicalist" language populated by spatio-temporal entities, and thus believed to be purified of conceptual flaws and metaphysical temptations. According to Carnap, "all empirical statements can be expressed in a single language, all states of affairs are of one kind and are known by the same method."[33] The building blocks of this physicalist language are so-called *Protokollsätze*, or observation statements: basic accounts of facts deprived of any stylistic features which, like modernist ideals in art and architecture, lack decoration.[34] The resulting image of science was one which converged towards unity precisely through the repression of local, stylistic, or subjective features. This approach also underpinned attempts at reading the so-called "scientific revolution" and the emergence of the natural sciences as results of the rising dominance of a particular "style-less style": the so-called "Galilean style." The "Galilean style" was identified as the most lasting achievement of the scientific revolution and taken to imply a monist and reductivist understanding of the scientific method as a hypothetico-deductive model leading to the mathematization of the physical world. Such an idea can be found, for instance, quite beyond the limits of logical empiricism, in the phenomenology of Edmund Husserl (1859-1838).[35] This interpretation inspired several of the uses of the notion of style in connection with science in the Anglophone world during the 1970s. Drawing directly from Husserl, physicist Steven Weinberg (1933-2021) referred to the Galilean style as "making abstract models of the universe to which at least the physicists give a higher degree of reality than they accord to the ordinary world of sensation." Linguist Noam Chomsky (1928-), in turn drawing on Weinberg, highlighted the centrality and prevalence of the "Galilean style",

33 Carnap, 1995, p. 32.

34 On the link between Bauhaus architecture and logical empiricism, see Galison, 1990.

35 Husserl, 1970. For a more comprehensive appraisal of Husserl's use of style, see Meacham, 2013.

which in his view had eliminated alternatives, at least in the contemporary natural sciences.[36]

In the 1930s, but independently of Mannheim and Husserl, Polish-born physician, biologist, and epistemologist Ludwik Fleck (1896-1961) elaborated one of the most challenging and enduring versions of the idea of style in connection with the sciences by drawing on his work on bacteriology and syphilis. In *Genesis and Development of a Scientific Fact* (1935) Fleck argued that a scientific fact is not a natural, genuine event in the world but is essentially a construed, and therefore historical, phenomenon. A scientific fact, as an observable discovery, is generated by selective attention and scrutiny, through a gaze that has been trained in a community of scientists (*Denkkollektiv*). This collectivity of scientists expresses the features of its scientific production through a particular "thought style" (*Denkstil*).[37] A *Denkstil* is embodied by the researchers, institutions, laboratories, and instruments conducting research – thus showing the inextricable connection between a thought-style and a thought-collective and the overall sociological implications of Fleck's understanding of style. Fleck's view that scientific facts are construed, and that observation is not a neutral activity, makes his position stand out with respect to the dominant logical-empiricist panorama of the 1930s. Fleck's idea of scientific perception as an "ability to see," that is, as a kind of scientific perception or a selective vision acquired through training, runs contrary to one of the main tenets of logical-empiricism – the view that all scientific knowledge should be grounded upon *Protokollsätze*, or neutral observation statements. More generally, Fleck harshly criticizes the philosophy of the Vienna Circle, and he dubs "Simplicius" the logical empiricist who believes progress to be a process of accumulating "true facts" or a methodological path toward the unity of science. Contrary to this "monist" view of science and its implicit assumption of physics as the model for all scientific knowledge, Fleck emphasized what he called a "medical style of thought" and the idea that biology and medicine are more fertile for epistemological reflections than physics.[38] Moreover, Fleck's stressed pluralism, that is, the fact the science is actually characterized by a plurality of styles, and suggested that, regardless of how totalizing some might be, collaboration among and integration of different styles is generally possible and positive.

36 Weinberg, 1976, p. 28; Chomsky, 1980, p. 9. Historian of science Bernard Cohen (1914-2003) used "style" in a similar sense, although in relation to Newton instead of Galileo (e.g. Cohen, 1980).

37 Janik, 2006 points to Oswald Spengler's (1880-1936) idea of "styles of knowing" (*der Stil des Erkennens*) as a source for Fleck's notion of *Denkstil*.

38 Fleck, 2010, p. 585-600.

STYLES AND THE "PLURALIST TURN" IN HISTORY AND PHILOSOPHY OF SCIENCE

A second historical moment in which the link between style and science played an important role is the so-called "pluralist turn" in history and philosophy of science (H&PS) that took place during the second half of the twentieth century. This turn emphasized the disunity of the sciences, in terms of both methods and results, and developed as a response to the philosophical program for the unification of science characterizing the project of the Vienna Circle, and logical empiricism more generally.[39] One of the "pluralisms" that proliferated in Anglophone philosophy of science involved conceiving the history of science as a history of "scientific styles."

Scientific or epistemological styles can be shown to be underpinned by the same tension between inclusion and exclusion that Ginzburg highlighted for artistic styles.[40] As we saw above, the appeal to style underpinned claims about the unity of science and the identification of the essence of science with a "Galilean style" in mathematical physics. All other ways of doing science which could not be translated into this style were considered either non- or less scientific. However, style was also chosen for the very opposite reason: for the pluralistic stance inherent to the word itself. From this perspective, reference to style would suggest a multiplicity, the idea of multiple modalities of knowledge acquisition and of multiple, possibly "alternative" or "rival" theories accounting for the same set of phenomena. This dualism is confirmed for instance by physicist Freeman Dyson (1923-2020), who, in his Gifford Lectures, described "two contrasting styles in science, one welcoming diversity and the other deploring it, one trying to diversify and the other trying to unify. The names of two cities, Manchester and Athens, are symbols of the two ways of approaching science." The latter "emphasizes ideas and theories; it tries to find

39 On the political underpinnings of such a new image of science, see Galison, 1996. Galison notes that "In the last several decades new connotations have been affixed to unity and disunity. Instead of an affiliation between unity and internationalism, liberal democracy and a rational worldview (opposing the disunity of national and racial fascism), the axis unity/disunity has come to polarize around ideas of cultural autonomy in opposition to forces of homogenization, hierarchy, and domination" (Galison, 1996, p. 6).

40 Gayon, surveying many of the applications of style in science studies, traces a similar tension between "individualizing" and "generalizing" uses of style. The former would lead to a more local, social, and institutional history of scientific practices focusing on the study of "local research schools or groups and countries" (Gayon, 1999, p. 234). Whereas the latter would be conducive to a more general and abstract approach to the history of science, in which style is ultimately used as a synonym for method.

unifying concepts which tie the universe together. The science of Manchester," on the contrary, "emphasizes facts and things; it tries to explore and extend our knowledge of nature's diversity."[41] In Dyson's view, the two styles are complementary rather than in contrast to one another; they give us "two views of the universe which are both valid but cannot both be seen simultaneously."[42]

Especially from the early 1980s on, a growing number of historians and philosophers of science (but also linguists and physicists) have touted the concept of style as more flexible than method for conceiving the historicity and plurality of the ways of thinking, discovering, and experimenting that constitute the sciences.[43] Talking in terms of styles invites closer attention to the historical, contextual, and sometimes even geographical aspects of the disparate ways of thinking and doing that constitute the sciences. In this light, the idea of "national styles in science" was part and parcel of the renewed interest by scholars in the "context of discovery" and analysis of the socio-cultural features of scientific knowledge.[44] This also led, among other things, to studying science as a community and in terms of the scientific "traditions" (a term usually confined to the arts or literature) of a community or a nation.[45] While method is normally conceived as a set of procedures granting access to a reality considered largely independent from the method of inquiry itself, style, on the contrary, has been considered in more active relation to objects of knowledge. As philosopher Nelson Goodman (1906-1998) had it, style is one of those "ways of worldmaking," that is, of those processes giving shape and substance to different versions of the world that would not exist (at least not in the same sense) if not for the style that shaped and substantiated them.[46] Lastly, style can capture the finer aspects of scientific practices and theories – for instance

41 Dyson, 1988, p. 40.

42 Ibid., p. 44. Dyson refers to Albert Einstein (1879-1955) as an instance of the "unifying style" and to chemist Ernest Rutherford (1871-1937) and physicist John A. Wheeler (1911-2008) as instances of the "diversifying style".

43 See also Hunger *et al.*, 2010.

44 See Daston and Otte, 1991.

45 According to Scivoletto, "this background makes it easier to make sense of expressions like 'Italian' or 'French' or 'US' science and so forth, if those adjectives make visible the dominating features that make a given scientific community *recognizable*" (Scivoletto, 1977, p. 303). Harwood produced an interesting sociological study of different trends in the German biology of the early twentieth century by appealing to the notion of "style" (Harwood, 1993). In a similar vein, style has also been used reflexively, to distinguish different epistemological strands: in this sense, Braunstein speaks of a "French style in epistemology" (Braunstein, 2002).

46 Goodman, 1978.

by highlighting aesthetic criteria such as simplicity and symmetry in theory choice[47] or by shedding light on the epistemic function of scientific images.[48]

In this sense, scholars developed different perspectives on the idea of a "Galilean style" in science with respect to the "monist" framework discussed above. They attempted to contextualize Galileo and his works within the general social and intellectual framework of the artistic disciplines which developed during the sixteenth century, presenting Galileo as "a man of late Renaissance Italy."[49] At the 1978 congress of the joint commission of the International Union of History and Philosophy of Science (IUHPS), two talks by historians of science explored this sense of a "Galilean style": one by Winifred L. Wisan, the other by Alistair C. Crombie (1915-1996). Wisan explicitly referred to a scientific "writing style" characteristic of Galileo's treatises. According to Wisan, a scientific writing style can be identified by the structure of a text, its content, the techniques it deploys, and its particular expressive quality. The structure of a scientific text can be discursive or axiomatic, classificatory or topical, propositional, geometrical, or algebraic. In terms of content or subject matter, Wisan finds Galileo's writing style characterized by analysis of specific concepts or by the consequences deriving from principles concerning motion. He states that the techniques employed by a scientific text can include geometrical and philosophical methods or mathematical analysis – all variously used by Galileo. The expressive quality of a text remains a somewhat vague notion and difficult to articulate, as Wisan admits.[50] However, using this categorization, Wisan is able to order and display the evolution of successive styles in treatises concerning motion from Aristotle (384-322 BC) to Joseph-Louis Lagrange (1736-1813). According to Wisan, Galileo is the inventor of a mathematical and mathematized "style" for the composition of scientific treatises, following the model offered by Archimedes (c. 287-212 BC), and thus avoiding the earlier essentialist and substantialist Aristotelian philosophical paradigm. In this account, although Galileo's mathematics and some of his achievements in physics were either dismissed or superseded by his successors, and in particular by Isaac Newton (1642-1726/27), his style nonetheless remained at the core of the newly formed science:

47 See McAllister, 1995.
48 Bredekamp *et al.*, 2015.
49 Crombie, 1981, p. 272-273.
50 Wisan, 1981, p. 325.

> Newton draws on Descartes, Kepler, the atomists, and other sources, and unifies mechanics and astronomy on a general foundation for both. But the *form* of his treatise is much like Galileo's.[51]

In her conclusion, Wisan makes a brief reference to Wölfflin to suggest a similarity between her own account of the growth of the Galilean style out of the earlier Aristotelian one and Wölfflin's analysis of the shift from the Renaissance style to the Baroque:

> There is an intriguing analogy here with Wölfflin's analysis of the way in which the banal picturesque was gradually exploited by artists until a new sense of beauty emerged, giving rise to Baroque art. I suggest a parallel in which the mathematical sciences developed in the seventeenth and eighteenth centuries *through small technical changes* in which the very facility of mathematics in further exploration generated a *new feeling* for the power of mathematics and its potential for exploring and understanding nature.[52]

This reference to Wölfflin notwithstanding, Wisan's focus is on scientific writing practices, and hence on a "literary" style, rather than style of painting. She is also more committed to the rhetorical notion of *adequateness* or *appropriateness*: a commensuration between ends and means, between style and subject matter, or between the format of a text and the occasion for which the text is written or spoken. It is important to notice, however, that when Wisan positions Galileo as the inventor of a new literary style, she does so without reference to the hypothetico-deductive model that for Husserl, Weinberg, and Chomsky constitutes the backbone of science.[53]

Speaking at the same 1978 IUHPS conference as Wisan, historian of science Crombie presented on the "Philosophical Presuppositions and Shifting Interpretations of Galileo". Following the lines of Alexandre Koyré's (1892-1964) historiography, Crombie highlights the necessity of relating Galileo's "scientific thinking to contemporary styles of thinking in the arts, in philosophy and practical affairs." Indeed, Crombie aims to detect and underscore, through the concrete example of Galileo, "the various elements that make up an

51 Ibid., p. 330.

52 Ibid., p. 332.

53 The idea of scientific writing styles has recently been found relevant in the history and philosophy of mathematics. See Mancosu, 2008; Rabouin, 2017. For an overview, see Mancosu, 2009.

intellectual style in the study of nature." These various elements are preliminarily identified with "conceptions of nature and science, of scientific inquiry and scientific demonstration and explanation [...] of the identity of science within an intellectual culture and the intellectual commitments and expectations generating attitudes to innovation and change."[54] In the vision developed in the paper, as well as in successive works,[55] Crombie individuates the "unique origins" of European science in the shared morality of *virtù* against *fortuna* that emerged together with rationalism in science and the arts. Underpinning this view, Crombie argues, is a fundamental parallelism between what he calls the rational artist and the rational thinker:

> The scientific movement [...] generated an effective context for seeing and solving the exemplary technical problems shared by the mathematical sciences with the visual, musical, plastic, and mechanical arts. All exemplified a common mastery of nature by the rational anticipation and by modeling a theory with an artifact analytically imitating and extending the natural original. The rational artist and the rational experimenter and observer thus acted alike in conceiving alike an artistic construction and a scientific inquiry first in the mind before executing it with the hands.[56]

If Wisan mobilizes the literary sense of style, Crombie – who nevertheless considers Wisan and British idealist philosopher Robin G. Collingwood (1889-1943) among his sources for conceiving of style – focuses more on style in the visual arts. Far from being a mere nuance, this reflects an important difference in Wisan's and Crombie's respective analyses of Galileo: while the former emphasizes the Platonic-Archimedean origins of Galileo's scientific novelty, the latter aims for a more equilibrated reading. Crombie explains in the following words:

> Whether we see Galileo as a Platonist for whom the book of nature was written in mathematical language, or as a Renaissance artist-engineer who sought to control his materials by taking nature to pieces in a workshop in order to reassemble it from the known principles, he acted also

54 Crombie, 1981, p. 272.

55 See, for instance, Crombie, 1994; 1996. Crombie, 1994, is a 3-volume monumental history of "styles of thinking" in the Western scientific tradition which spans from the Greeks to the nineteenth century; it can be considered the culmination of Crombie's learning and of his career as a historian of science.

56 Crombie, 1981, p. 273.

> as a humanist scholar debating the best ancient models for true scientific thinking.[57]

Crombie's therefore frames Galileo as a transitional figure connecting Michelangelo to Newton, the "world of the rational constructive artist to that of the rational experimental scientist."

Crombie is the source of several other versions of the idea of "scientific styles" in the H&PS panorama.[58] In terms of philosophical applications, the most successful is perhaps that by Ian Hacking (1936-2023), whose style project, spanning over thirty years, attempted to elaborate a notion of scientific styles that could account for the historical, situated nature of scientific knowledge and practice *as well as* their objective and progressive features. From Crombie, Hacking extracts a list of six styles of reasoning that characterize Western science: mathematical postulation, experimental exploration and measurement, hypothetical modelling, taxonomical and statistical reasoning, and historical-genetical explanation.[59] Hacking mobilizes Crombie's list of styles in several of his accounts of styles of scientific reasoning as a template for discussing the theoretical implications and possible extension of historical applications of the notion of style. For Hacking, the emergence of a new style of reasoning is marked by the introduction of a list of "novelties" (e.g., theoretical objects, kinds of sentences and laws) and by what he calls "self-stabilizing techniques" that are specific to each style. Hacking argues that there have been different styles of scientific reasoning across history, that they have emerged in connection with historical (and therefore contingent) events, and that some have disappeared while others persist through time. While a style of scientific reasoning emerges in connection with historical events, from a whole series of "social interactions and negotiations,"[60] it tends to become autonomous once it is in place and becomes rooted in practice and to serve as a standard for determining objectivity. Indeed, Hacking wants his styles to embrace "relativity" while refuting relativism or "subjectivism". Relativity implies that sentences which are either-true-or-false must always be relative to a style of reasoning, which makes them thinkable. Relativism, on the contrary, affirms that sentences are rendered true or false by the adoption of a given style of reasoning.

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57 Ibid., p. 278.

58 Another example of an application of Crombie's styles is Kwa, 2011.

59 Hacking, 1982.

60 Cf. Hacking, 2002, p. 167: "although whichever propositions are true may depend on the data, the fact that they are candidates for being true is a consequence of a historical event."

Hacking's take on style is generally inspired by a pluralist view of science and scientific knowledge, whose fundamental tenet is the idea that

> Our overall interests in truth and reason may well be served by letting other styles of reason evolve in their own ways, unfettered by a more imperial kind of rationalism.[61]

Hacking calls this position "anarcho-rationalism" – a term which clearly alludes to Feyerabend's epistemological anarchism.[62] However, Hacking's project differs from Feyerabend's on important regards. As we saw above, Feyerabend views science as analogous to the arts, in that neither demonstrate objectivity or progress. He mobilized art historian Riegl's idea of self-standing cultural units or *Kunstwollen* to show that different scientific theories, like different artistic styles, cannot be compared against a common background and are therefore "incommensurable." Hacking instead sees his styles project as "a continuation of Kant's project of explaining how objectivity is possible."[63] Furthermore, Hacking provides at least three reasons why his styles do not imply incommensurability. First, he considers styles collaborative, since every scientist must be comfortable with more than one of the fundamental modes of thinking and doing listed by Crombie. Second, by conceiving scientific styles as a relatively closed set of ways of finding out about the world and intervening in it, Hacking's styles tend to accumulate both reasoning strategies and ontological entities.[64] Third, Hacking thinks styles of reasoning can be at least "learned", if not mutually translated into one another. This is true, for instance, of an old and abandoned style of reasoning such as that animating Renaissance medicine:

> I do admit that there is a real phenomenon of disparate ways of thinking. Some styles of reasoning have been so firmly displaced that we cannot even recognize their objects. The renaissance medical, alchemical,

61 Hacking, 2002, p. 176.

62 Together with Foucault, Feyerabend is also mentioned by Hacking as one of the main sources for his philosophical elaboration of Crombie's styles (see Hacking, 2012).

63 Hacking, 2002, p. 181.

64 Hacking also believed for some time that two different styles can become historically "fused" into one another. This, for instance, is the case of what he calls the "laboratory style", which he considers a fusion of the experimental and the modelling styles indicated in Crombie's list and which Hacking situated as emerging with the creation of the air-pump by Robert Boyle (1627-1691). Hacking later dropped this idea, instead suggesting that the list of styles is relatively closed and that each style is potentially rooted in innate cognitive abilities (see Hacking, 2012).

> and astrological doctrines of resemblance and similitude are well-nigh incomprehensible [...] Yet that stuff may not be best described as incommensurable with our modern chemistry, medicine, and astronomy. It is not that the propositions match ill with our modern sciences, so much as that the way propositions are proposed and defended is entirely alien to us. You can perfectly learn hermetic lore and when you do so you end up talking the language of Paracelsus, possibly in translation. What you learn is not systems of translation, but chains of reasoning which would have little sense if one were not re-creating the thought of one of those magi.[65]

Interestingly, Hacking does not derive the concept of style from the arts and instead aims to redefine the concept on entirely new bases.[66] Among the controversial aspects of the history of the notion of style that he does not want to embrace are the racial implications mentioned above, which reflect the extreme consequences of exclusive and intolerant uses of styles.[67] Moreover, at a philosophical level, what Hacking wants from his styles of scientific reasoning is ultimately the explanation of a kind of endurance, of a stability, that characterize the sciences and that the arts, by contrast, do not seem to have.[68] Such stability is premised in the aforementioned idea of a translatability of styles, or rather, on the idea that, in principle, it is not impossible to communicate across styles. Hacking seems to think this is not the case for artistic styles – and thus, on this point, demonstrates an implicit proximity to Feyerabend's Riegl-inspired view of the arts.

Hacking's version of "scientific styles" has been influential among historians and philosophers of science.[69] Among contemporary practitioners of

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65 Hacking, 2002, p. 171.

66 Hacking, 2002, p. 162; 1983, p. 456; 1992, p. 139.

67 See Hacking's remark on the "Jüdisch Denkstil" as a "handy epithet of the Nazis" (Hacking, 1992, p. 139; cf. also 2012, p. 601, where Hacking refers to Ginzburg on style). For this reason, and also because he was not entirely happy with the way his idea of styles of scientific reasoning had been taken up and further developed by other scholars, in his later publications on the subject Hacking drops the term "style" and adopts the more generic "ways of thinking and doing" (see Hacking, 2012).

68 See Hacking's example of the transitory nature of fauvism in painting: "What the word 'style' does not make plain is why fauvism fades almost as soon as named, while a few styles of reasoning become autonomous of their origins and their originators. That is a pressing philosophical issue in the study of styles of reasoning." (Hacking, 2002, p. 189). Also see the similar examples of the *style empire* or *Jugendstil*, which "flourish for short periods of time after which they cease and can at most be imitated" (Hacking, 1992, p. 139).

69 Hacking's version of the concept has been applied, for instance, to low-temperature physics between the nineteenth and the twentieth century (Gavroglu, 1990), nineteenth-century

historical epistemology, Arnold Davidson (1955-) is the first to have recognized Hacking's methodological novelty, embracing and developing his concept of styles of scientific reasoning in relation to the history of psychiatry. In *The Emergence of Sexuality* (2001), Davidson describes what he calls a "psychiatric style of reasoning" as a conceptual space formed by the interrelations among a series of key concepts (sexuality, instinct, function, perversion). According to Davidson, this conceptual space emerged toward the end of the nineteenth century in contrast to a previous, radically different one determined by the anatomical style of reasoning which was composed of different conceptual hinges (sex, organ, structure, anatomical defect).[70] Thus, if Hacking's styles represent very general, historically emergent but collaborative and potentially cognitive-based ways of finding out, Davidson's styles account for the contrast between two conceptual structures located within one discipline or scientific domain. In this respect, Hacking's styles are more akin to longitudinal *longue-durée* processes, while Davidson's constitute relatively local *courte-durée* vertical ruptures between two successive groups of intellectual events. Unlike Hacking, Davidson also embraces the artistic origin of styles, and interestingly points both to Michael Baxandall's (1933-2008) and Wisan's uses of the concept.[71] Davidson's main methodological reference is Michel Foucault (1926-1984), whose approach he nevertheless interestingly relates to the one developed by Wölfflin:

> Just as Wölfflin wanted to reconstitute a specific visual space through a set of interrelated categories – for example, the categories of the linear, plane, closed form, multiplicity and clearness constituted classical space – so a particular style of reasoning is centrally constituted by a set of interrelated or linked concepts. These concepts are linked together by specifiable rules to form what we might think of as a determinate

French and English statistics (Schweber, 1997), and nineteenth-century biology and life sciences (Elwick, 2007). Theoretical discussions of Hacking's "theory of styles" can be found in Kusch, 2010; Ruphy, 2011; Bueno, 2012; Ritchie, 2012; Sciortino, 2023.

70 Davidson, 2001, p. 137.

71 On the one hand, in Baxandall's *Painting and Experience in xv Century Italy* (1972), Davidson finds an attempt to sociologically grasp the concept of style: Baxandall underlines the constraints imposed on the artist by the customer's requests. On the other hand, he understands the "Quattrocento cognitive style" as the "equipment that the fifteenth-century painter's public [i.e., the patronizing classes] brought to complex visual stimulations like pictures" (Baxandall, 1972, p. 38). Part of the mental equipment according to which humans order their visual experience is culturally and socially relative.

> conceptual space, a space that determines what statements can and cannot be made with the concepts.[72]

To the extent that the epistemological shift between the two styles of reasoning he portrays is characterized by a sudden break, Davidson's historiography is incompatible with the idea of cumulative progress. In this sense Davidson's approach to the sciences aligns with Wölfflin's discontinuous take on art history.[73] However, as for Hacking, this allows Davidson to frame styles of reasoning as a historically contingent set of rules for the formation of concepts and to focus on the ways true-or-false statements become possible throughout history. In this regard both Hacking and Davidson follow Foucault's insight that propositions and their meanings are not independent of history, and hence, not every proposition is a candidate for truth or falsity in every epoch.[74] Rather than dispense with objectivity and truth, this approach leads to study of how objectivity and truth get formed and receive status both within and outside the discursive regime of science.

TWO NEGLECTED THEORIES OF STYLES IN SCIENCE

I would now like to discuss two lesser-known analyses of styles in science – one which to some extent precedes the Anglophone "pluralist turn" and one which runs parallel to it – by French epistemologist Gilles-Gaston Granger (1920-2016)

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72 Davidson, 2001, p. 136. Davidson elaborates on the link between Foucault and Wölfflin that he finds in historian Paul Veyne's (1930-2022) inaugural lecture at the Collège de France (Veyne, 1976). Veyne locates in both Wölfflin and Foucault a conceptual determinism that he finds implied by the former's notion of style and the latter's idea of *episteme*.

73 E.g. Wölfflin, 2015, p. 95: "Baroque or modern art is neither the demise nor an escalation of classical art. It is a different art altogether" and p. 313-314: "An abrupt caesura remains something quite 'unnatural' and will only ever occur in conjunction with radical changes in the world of the spirit. […] the case of the renewal of art around 1800 is unique, just as unique as the circumstances that went along with it at the time. Western man had undergone a radical process of regeneration within a relatively short period. The new directly confronted the old, and right down the line. Here it really does seem they were able to start over from the beginning.".

74 Foucault, 2002, p. 49: "The conditions necessary of the appearance of an object of discourse, the historical conditions necessary if one is to 'say anything' about it […] are many and imposing. Which means that one cannot speak of anything at any time." For Wölfflin's corresponding version of this claim for art history, see p. 12-13 above.

and Italian philosopher Aldo Giorgio Gargani (1933-2009).[75] Granger's widespread production is still relatively neglected in Anglophone scholarship: only his *Pensée formelle et science de l'homme* (1960), which was translated long after its original French publication, appears in the Boston Studies in Philosophy of Science series. Granger developed a rich and much understudied epistemological analysis of style, published in 1968 with the title *Essai d'une philosophie du style* (Essay on a philosophy of style). Granger was a former student of both Gaston Bachelard (1884-1962) and Jean Cavaillès (1903-1944), two of the main representatives of French historical epistemology, and, in his *Essai*, further elaborates their historical *cum* philosophical methodology by drawing on insights from Marxism, phenomenology, structural linguistics, and hermeneutics.[76]

What Granger calls the "aesthetics of knowledge" investigates the relation between the content of knowledge and the form in which knowledge is expressed or presented as a dynamic, historical relation. While Granger sees Immanuel Kant (1724-1804) as having developed a "static analysis of structures," he aims to retrieve an Aristotelian "dynamic philosophy of structures." In a passing reference, Granger implicitly criticizes Wölfflin's "ontology of forms" as closer to the former, and thus lacking in dynamism.[77] This dynamism characterizes knowledge when knowledge is not considered reducible to the contemplation of already fully formed forms, which one must simply accept as they are. Instead, Granger aims to focus on the processes leading to the creation of forms as open-ended activity.[78] To be linked to one another, or even to produce one another, the kind of labor (*travail*) required by a certain content and certain form must always take place in a certain "style" or modality. It is the task of a stylistic analysis to unpack and reconstruct such production.[79] This sort of analysis could in principle be carried out in relation to any kind of production, either intellectual or material. However, the domain of application for what Granger calls "generalized stylistics" is scientific production and, in particular, mathematics, linguistics, and the so-called "human" or "social sciences" (which, as in the case of econometrics, applies mathematics or formal methods to the study of human facts and behaviors).[80]

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75 I would like to express my gratitude to an anonymous reviewer, whose suggestion of including Gargani in my discussion has proven decisive to the final shape of this paper.

76 On Granger's philosophy, see Proust and Schwarz, 1995; Lacour, 2012; and, in particular, the contributions by Sinaceur and Naude in Soulez and Moreno, 2010. On style, also see Robert, 1972; Macherey, 2004.

77 Granger, 1968, p. 11.

78 For these latter remarks, see Macherey, 2004.

79 Granger, 1968, p. 5.

80 Granger applied his stylistic approach to physics much later, showing that what Erwin Schrodinger (1887-1961) and Werner Heisenberg (1901-1976) had developed were in fact two variants of the same theory (Granger, 1995; see Naude, 2010, p. 221).

From this perspective, scientific knowledge, understood as a process of conceptualizing reality, seems to imply rejection of the individual and her lived experience. However, many sciences, especially the so-called "human sciences", aim to objectively account for the subjective elements of reality. More generally, Granger understands science – which he also sees including the natural and formal sciences – as an effort to produce mostly abstract structures (like concepts and theories) that aim to make our experience of the world intelligible. This is why Granger turns to the arts, and to the concept of style in particular, to account for the unavoidable individual elements in science. Artistic creations are, according to Granger, "conceptualized individualities," and they represent "one of man's attempts to overcome the impossibility of a theoretical grasp of the individual."[81] Unlike Hacking, Granger emphasizes the parallelism between his analysis of scientific works and the art historian's analysis of works of art. Just like artistic works, scientific productions also bear the hallmark of their individual or collective authors on their objective structures and procedures.[82]

> Scientific practice would seem to cast aside the individual, and, as a consequence, turn its back on style. There seems to be nothing more impersonal and less individualized than science, about which we like to repeat that it aims for the general. The universal success of science would itself imply, apparently, the death of style [...] However, the individual remains on the horizon of science [...] The plurality of the modes of structuration [...] should be taken seriously and constitute the subject of a stylistic analysis.[83]

Stylistic features are thus linked to the different ways of formally defining objectivity, that is, of structuring an object or integrating it into an operational or symbolic system. In other words, a scientific style depends on the fact that "a mode of structuration has been chosen instead of another to build a model of a given phenomenon."[84]

Stylistic progress is the "thematization" (a concept Granger draws from Cavaillès) of the same structure in different ways. Stylistic variations thus do not correspond to different structures or theories but rather to different ways of constructing the same theory and relating it to the lived experience to which it refers. However, even if the structure itself, as an "*in fieri* object," is single,

81 Granger, 1968, p. 7.
82 See Sinaceur, 2010.
83 Granger, 1968, p. 13. Translations from Granger's *Essai* are my own.
84 Ibid.

"its *meaning* varies in function of the facts of style."[85] In this sense, it is possible to say that Granger develops a form of theoretical pluralism which is "stylistic," as it implies choice among "alternative ways of doing things." However, Granger specifies that the different versions of a theory are not givens but objects "in the making" whose meanings are shaped by the style adopted. Furthermore, as the passage above suggests, Granger specifies that what defines the stylistic feature of a theory is both the particular way that theory goes about objectifying a particular experience and its "reminder," or rather, the part of this experience which resists organization by the theory. What eschews conceptualization, in this sense, is intuition or, more generally, the empirical sources of knowledge.[86]

The part of the *Essai* where these ideas are most clearly articulated is the first, which is dedicated to the role played by different styles in the construction of mathematical objects. Granger's reconstruction takes up figures as chronologically and intellectually distant as Euclid (fl. 300 BC), Descartes, Girard Desargues (1591-1661), and Hermann Günther Grassmann (1809-1877) as thinkers contributing to the establishment of vector analysis in the nineteenth century. This process required the gradual transition of the properties of numbers to geometrical magnitudes. For Granger, Euclid's "purism," or prevalently "qualitative mentality," made the identification of magnitudes with numbers unthinkable for him. Decisive steps in this direction thus were not made until the seventeenth century with the work of Descartes and Desargues. Granger's discussion of Descartes and Desargues in this context is particularly relevant to the issue of theoretical pluralism, since he presents them as offering two contemporary and radically opposed takes to the same issue.[87] While Descartes' analytic geometry, which was based more on calculation, focuses on the algebraic processes involved in the construction of conics curves, Desargues' projective geometry, based more on reasoning, instead defines conic curves as invariants through the operation of projection.

Interestingly, Granger reads this stylistic bifurcation within geometric theory as one of the most decisive moments in the history of mathematical thinking. Granger not only wants his scientific styles to be "objective" in the sense specified before – i.e., as an effort of structuring reality and experience. He also wants scientific styles to be progressive, that is, capable of accounting

85 Ibid., p. 103. Granger draws from Charles S. Peirce's (1839-1914) semiotic theory, such that "meanings" in Granger are close to what Peirce mean by "interpretants".

86 Ibid., p. 20.

87 Ibid., p. 60: "Desargues is the real anti-Descartes of his century."

for progress in science.[88] In the case at hand, Granger's stylistics aims to show, by discussing the epistemological obstacles that were overcome in their conceptual genesis, that the concepts of contemporary mathematics are more refined than older ones. This is consistent with Granger's views on the history of science, which frame the progressive thematic unification (i.e., integration) carried out by mathematics as self-evident. For Granger, there is a unity underlying the stylistic variety of the different theories explaining a given set of phenomena. More generally, science possesses a unity despite the dialectics of the different scientific systems and methods. On this point, Granger openly criticizes both Thomas S. Kuhn's (1922-1996) idea of incommensurability and Feyerabend's "methodological anarchism"; he intends his epistemology to instead be "comparative," offering style as the conceptual tool enabling translation and comparison among different theories.[89]

Another neglected "stylistic analysis of science" is that of Italian philosopher Gargani, which was contemporary to many of the Anglophone uses of the notion of style characterizing the "pluralist turn." Gargani worked in the fields of philosophy of language (where he shared with Granger a strong interest in Ludwig Wittgenstein [1889-1951]) and philosophy of science (where his name has been linked to an Italian strand of historical epistemology).[90] Gargani's *Il sapere senza fondamenti* (Knowledge without foundations), originally published in 1975, analyzes the origins of modern science by expounding upon the role played by human and social factors in the constitution of abstract domains of knowledge. Largely drawing on Wittgenstein, Gargani claims that even a body of mathematical propositions ultimately finds its *a priori* irreducible condition in a form of life, and that "the search for a further foundation corresponds to the naive attitude of the child in front of a painting, wondering whether the painted hill sustains the painted house."[91]

In his later book *Stili di analisi. L'unità perduta del metodo filosofico* (Styles of analysis. The lost unity of philosophical method), Gargani argues for the centrality of the concept of style to philosophy. Following Goodman's insight that, with intellectual and practical endeavors such as the sciences and the

88 Granger, 1968, p. 105.

89 Granger, 1985, p. 369-370.

90 On Gargani's work, see Perissinotto and Donatelli, 2010; Marinucci *et al.*, 2020; Pelgreffi, 2022. For his link to French historical epistemology, see Gargani's interview with Manlio Iofrida (Gargani, 2002) as well as Alunni, 2011 and Vagelli, 2015. Gargani's 1975 book has been recently translated into French and published in a collection comprising Foucault's unpublished works, thus rejoining a French strand of contemporary philosophy (Gargani, 2012).

91 Gargani, 2012, p. 142. Cf. Wittgenstein, 1998, vii, § 16, p. 378.

arts, we shape multiple "versions of the world," Gargani claims that the world we investigate is "both discovered and invented":

> There is the version of the world of Galilei, Descartes and Newton just as there is the version of the world of Van Gogh and Canaletto, and each of them has captured a significant and relevant aspect of the world that surrounds us, but which can never claim to be the objective world, since the so-called objective world is always one version among others of this plurality of worlds both invented and discovered.[92]

There is no unique method either for science, philosophy, or the arts – where tonality, in music, gave way to the alternative grammar of atonality or pantonality – the physics of sounds enabling both grammars, and constituting no stronger warrant for one against the other.[93] Following in the wake of Wittgenstein, and of the wider Central European intellectual context to which Wittgenstein belonged, Gargani argues against the intrusiveness in modern Western culture of mechanistic and deterministic ways of thinking, and their permeation into other domains.[94] Accordingly, he qualifies belief in the search for a unique scientific and philosophical method as ideological. The notion of a scientific method itself for Gargani represents one of those macro-categories or "super-concepts", such as "world", "mind" and "language", which respond to the desire to tame complex states of affairs.[95]

> There are profound differences [within science], different styles of thought and of scientific rationality. There isn't just a single analytical method; there are multiple methods, more possibilities of orders to establish. There are analogies, but also differences between Einstein's theory of relativity on one hand, and classical physics on the other, which lead us to epistemological perspectives that are different and alternative to each other. These perspectives emerge as the ones that construct physical

92 Gargani, 1993, p. 6.

93 On this point, also see Gargani, 1993, p. 96.

94 Gargani, 1993, p. 8. Gargani often associates this theme to the contrast between *Kultur* and *Zivilisation* that he finds in writer Robert Musil (1880-1942). Musil remarked that *Zivilisation* predominates over *Kultur* and its values in our industrialized and scientific culture. The former is seen as imposing a "*logische Mechanisierung*" (logical mechanization) upon the latter – an automated and mechanistic organization that has informed our entire culture, starting from our mathematical procedures.

95 Gargani, 1993, p. 9.

> theories through logical methods of abstraction and those that construct them through formative principles.[96]

Despite the fact that the "game of science" can be played in many ways, Gargani does not conclude that "anything goes." He is well aware that we do not "simultaneously apply an indefinite multiplicity of methods, nor do we pass indifferently or arbitrarily from one method to the other."[97] Instead, while using a given method, we should recognize that that method is surrounded by "a multiplicity of intellectual and existential morphologies that are alternative possibilities."[98] In this sense, we find the suggestion of a theoretical pluralism for which

> The intellectual act and the cultural gesture do not necessarily have to take sides, to decide once and for all for the yes or no of a theory or a sentence, but they can proceed through the hesitation constituted by a suspended suggestion.[99]

Such pluralism is premised in the crisis of the traditional model of the "one true theory." From the underdetermination of scientific theories with respect to their empirical references it follows that no theoretical model is self-sufficient and that each model should be deployed in the context of different forms of knowledge.[100] On this point, Gargani interestingly anticipates later forms of interactive pluralism, which move beyond simple acknowledgement of the coexistence of multiple systems of practice operating simultaneously in a given scientific area by aiming "to reap benefit from their productive interactions."[101] Again, Gargani firmly denies that this position implies scepticism or relativism – rather, it entails acknowledgement and encouragement of the interplay among different aspects of the study of reality. Gargani concludes his book with a harsh criticism of Marxist and sociological approaches to science, arguing that they represent science as the expression of economic and social formations as well as of the ideology they harbor. Contrary to the thesis of incommensurability that would seem to follow from the adoption of such approaches, Gargani claims that

96 Ibid., p. 120.
97 Ibid., p. 19.
98 Ibid., p. 19.
99 Ibid., p. 22.
100 Ibid., p. 63.
101 Chang, 2022, p. 232.

> Scientific rationality cannot be confined within a notion of order and growth that anticipates intellectual modes of vision and the actual procedures of scientific enterprises. However, this does not imply the incommensurability of scientific theories within a broader framework of revolution and epistemological ruptures.[102]

Not only can forms of continuity be identified within science but so can forms of progress, not in the sense of linear and cumulative stratification but as "the growth of tested knowledge that a new theory introduces with respect to the previous or the rival theories, with which it can be compared and measured through appropriate rules of correspondence."[103]

CONCLUSION

In the first section of this paper, I showed that, despite its seemingly descriptive use, the notion of style has often been employed in a normative manner, as a conceptual tool delimiting inclusion or exclusion which can also be understood as a divisor of possible, legitimate, or correct modes of reasoning and invalid or incorrect ones. Ginzburg's essay shows that works of art can be considered *simpliciter*, that is, in an absolute sense, or *secundum quid*, that is, as relative to something else (a historical period or context). This situation also characterizes approaches to science via the notion of style: monism reflects the attempt to define one single style or method for accessing reality, whereas pluralism acknowledges the plurality of styles, angles, and perspectives that can be put into play in the study of reality.

The second section of this paper demonstrated that the early decades of the twentieth century saw a varied group of people – including economists, sociologists, physicians, and philosophers – developing theories of style generally conceived as encompassing and self-enclosed units of analysis. In some cases, style underwrote a monist view of science; in other cases, it was used to argue for the cultural relativity of scientific claims. In the subsequent section, the notion of style was shown to have played a key role also in the Anglophone panorama of science studies of the second half of the twentieth century. The notion of style and its different uses allowed for identification and comparative discussion of not one but several "pluralist turns." As the cases of Granger and

102 Gargani, 1993, p. 122. This critique is also the *leitmotiv* underlying Gargani's 1975 book (see Gargani, 2012).

103 Ibid.

Gargani show for the French and the Italian intellectual contexts, the epistemology of style is a red thread running across the twentieth century, including beyond Anglophone territories. Despite, or precisely because of, its lack of formalization or clear definition, the idea of "scientific styles" has come to serve very different functions. However, as shown by Ginzburg in his reconstruction, excess in considering things *secondum quid* – excess of relativism, in other words – has often generated an insular, intolerant approach. Within H&PS too, as remarked by Ginzburg himself in the case of Feyerabend, an excess of pluralism or openness sometimes signified indifference to the alternative takes on reality. Such indifference, in turn, risks falling back upon or reproducing a monism implying closure and exclusion. The case of Feyerabend, in this sense, is emblematic of a tension between "modest" and "radical" pluralist interpretations that characterize the "pluralist turn" in philosophy of science.[104] If "modest" forms of pluralism risk indirectly reverting back to a kind of monism, more radical approaches might be seen as conducive to relativist and constructivist claims that ultimately undermine science and its assumptions about objectivity and progressiveness.[105] In this context, style is central in various attempts to strike a balance between these two extremes and in the search for a pluralism which is tolerant but also coherent, that is, capable of distinguishing the level of objectivity and credibility of specific scientific claims. For instance, whereas Feyerabend's styles invite epistemic relativism and constructivism, Hacking's, Granger's, and Gargani's theories show that style can support objectivity, realism, and progressiveness. Ginzburg concludes his essay by drawing on the metaphor of translation, as a counterargument to the idea of the incommensurability of alternative points of view – thus reaching a similar conclusion to the one suggested by Hacking:

> The Latin word *interpretatio* means translation. The interpreter who compares different styles of thought in order to stress their intrinsic diversity performs a sort of translation, a word that comes easily in this context, insofar as styles, having been originally related to writing, have been often compared to languages in order to stress their intrinsic diversity. But translation is also the most powerful argument against relativism. Each language is a different and, to a certain extent, incommensurable world: but translations work. Our ability to understand different styles

104 On the distinction between modest, radical, and empirical takes on pluralism see the introduction to Kellert *et al.*, 2006.

105 Kellert *et al.*, 2006.

> may throw some light on our ability to understand other languages and other styles of thought – and the other way around.[106]

Similarly, in his paper on style in science studies, Jean Gayon (1949-2018) acknowledges that "the epistemological use of the notion of style bears the traces of older debates on rhetoric, literary criticism, the philosophy of history, and the philosophy of art: the shadows of Cicero, Buffon, Goethe, and Gombrich are all clearly perceptible." However, Gayon continues, "this culture does not form part of the visible landscape I intend to survey. At most its influence is slightly felt, much as sedimentary effects or tectonic movements can be detected on a geographical map."[107] I hope to have shown that much can be learned from the porosity between the historiography of art and that of science. After all, the "shadows of Cicero, Buffon, Goethe and Gombrich" to which Gayon refers to are neither distant, nor so dreadful.

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106 Ginzburg, 1998, p. 45.

107 Gayon, 1999, p. 234.

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