

RESEARCH ARTICLE

Colours, humours and material change in late Renaissance chymistry and medicine

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Abstract

This article explores the notion of colour at the crossroads of humoral medicine and chymistry in late Renaissance Europe. First, it considers the broader context of the traditional analogy between the transmutation of the stone and the formation of humours in medieval alchemy. By highlighting colours as visual markers of material change, alchemical texts drew analogies and metaphors from Galenic medicine to describe the gradual transformation of bodies and their corresponding chromatic change during transmutation. As argued in this paper, such views shifted with the emergence of Paracelsian medicine. This ‘new’ chymical philosophy downplayed the humoral conception of colours in favour of the chymical ‘principles’ and ‘seminal powers’ obtained by distillation. In examining the views of Petrus Severinus, Joseph Du Chesne, and Daniel Sennert, this article aims to appraise their reception of the medical and alchemical tradition on colours, as well as their contribution to a novel yet epistemically ambivalent understanding of colour and sensory properties in the early seventeenth century.

Colours were ubiquitous in alchemical texts and imagery across the ages. From the Middle Ages, countless manuscripts and books had made reference to different colours in the transmutation of the so-called ‘prime matter’ into the philosophers’ stone. These alchemical colours were analogous to the humours of the medical tradition.¹ Indeed, the black, white, yellow and red phases of the stone were reminiscent of the corresponding colours of black bile or ‘melancholy’, phlegm, yellow bile and blood respectively. As Chiara Crisciani has shown, this scheme harkened back to medieval comparisons between alchemical transmutation and biological processes, including the formation of bodily fluids. Such analogies with the transformation of living beings aimed to stress the organic character of alchemical change, often compared to the growth of plants or ‘vegetation’, and that of embryos.²

Whilst striving to build their knowledge and practice on scientific grounds, medieval alchemists anchored the transformation of the stone, and its corresponding colours, in

¹ See Chiara Crisciani, ‘Il corpo nella tradizione alchemica: teorie, similitudini, immagini’, *Micrologus* (1993) 1, pp. 189–233; Barbara Obrist, ‘Les rapports d’analogie entre philosophie et alchimie médiévales’, in Jean Claude Margolin and Sylvain Matton (eds.), *Alchimie et philosophie à la Renaissance*, Paris: Vrin, 1993, pp. 43–64; Liba Taub, ‘Physiological analogies and metaphors in explanations of the Earth and the Cosmos’, in Manfred Horstmanshoff, Helen King and Claus Zittel (eds.), *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity into Early Modern Europe*, Leiden: Brill, 2012, pp. 41–64.

² On the alchemical notion of ‘vegetation’ see William R. Newman, *Newton the Alchemist: Science, Enigma, and the Quest for Nature’s ‘Secret Fire’*, Princeton, NJ: Princeton University Press, 2019, pp. 175–8.

the authoritative sources of their time: Galenic medicine and Aristotelian natural philosophy. As such, alchemists often drew on processes of making blood and humours within the human body as a crucial reference point for their own explanations. The physiological function of digestion, in particular, was fundamental in the description of alchemical transformations and their associated colours. Such a medical framework influenced alchemical discourses about the nature of bodies, their core components, and their sensory properties, including colours.

In their metaphorical language, based on prevailing medical and natural-philosophical theories, early alchemists sought to account for the inner structure of bodies in elements or principles. As shown in previous studies, medieval alchemists followed the Galenic and Aristotelian traditions in stating that bodies were composed of four elements (air, water, earth and fire) which were related to the primary qualities (hot, dry, cold and moist).³ Within this schema, humours were intermediaries between the organs and the microstructure of bodies, themselves made of elements and qualities. During the Renaissance, however, the alchemical endorsement of elements and qualities was challenged by the Swiss physician Theophrastus von Hohenheim, or Paracelsus (1493–1541). An iconoclast figure in Renaissance medicine, Paracelsus promoted an empirical approach to therapy through the distillation of mineral drugs, whilst claiming that his religious vocation granted him unparalleled insight into the secrets of nature.⁴ Along with his disciples in the early modern period, Paracelsus aimed to supplant the humoral system with three alchemical principles deriving from distillation: Salt, Sulphur and Mercury. Called the *tria prima*, these principles were the foundation of a ‘new’ chymical medicine that aimed to debunk the Galenic tradition.⁵

Two questions arise from this new Paracelsian approach in the sixteenth and seventeenth centuries: what was the status of colours in the Paracelsian understanding of principles? And what were the ruptures and continuities between humoral medicine, medieval alchemy and the Paracelsian philosophy regarding the notion of colour? This article investigates these questions by considering chymical understandings of colour at the crossroads of premodern medicine and natural philosophy, moving beyond the historiographical focus on physics, natural history and material studies.⁶ Studies on the materiality of colour have thus far been conducted within the history of art and in laboratory reconstructions, with growing attention being paid to alchemy.⁷ Such studies of alchemical colour

³ See Jennifer M. Rampling, ‘Citration and its discontents: yellow as a sign of alchemical change’, *Ambix* (2024) 71, pp. 73–97; Lawrence M. Principe, *The Secrets of Alchemy*, Chicago: University of Chicago Press, 2013, pp. 37–41.

⁴ See Bruce T. Moran, *Paracelsus: An Alchemical Life*, London: Reaktion Books, 2019; Andrew Weeks, *Paracelsus: Speculative Theory and the Crisis of the Early Reformation*, Albany: State University of New York Press, 1997.

⁵ See Principe, op. cit. (3); Didier Kahn, *Le fixe et le volatil: Chimie et alchimie, de Paracelse à Lavoisier*, Paris: CNRS Editions, 2016; Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*, Mineola: Dover, 2002.

⁶ See Tawrin Baker, Sven Dupré, Sachiko Kusakawa and Karin Leonhard (eds.), *Early Modern Color Worlds*, Leiden and Boston: Brill, 2015; Magdalena Bushart and Friedrich Steinle (eds.), *Colour Histories: Science, Art, and Technology in the 17th and 18th Centuries*, Berlin and Boston, MA: De Gruyter, 2015; Herman Pleij, *Colors Demonic and Divine: Shades of Meaning in the Middle Ages and After*, New York: Columbia University Press, 2005; Rolf G. Kuehni, *Color Ordered: A Survey of Color Order Systems from Antiquity to the Present*, Oxford and New York: Oxford University Press, 2008.

⁷ See Spike Bucklow, *The Alchemy of Paint: Art, Science, and Secrets from the Middle Ages*, London: Marion Boyars, 2009; Pamela H. Smith, ‘Vermilion, mercury, blood, and lizards: matter and meaning in metalworking’, in Ursula Klein and Emma C. Spary (eds.), *Materials and Expertise in Early Modern Europe: Between Market and Laboratory*, Chicago: University of Chicago Press, 2010, pp. 29–49; Valentina Pugliano, ‘Ulisse Aldrovandi’s color sensibility: natural history, language and the lay color practices of Renaissance virtuosi’, in Baker et al., op. cit. (6), pp. 70–108; Pamela H. Smith, ‘Historians in the laboratory: reconstruction of Renaissance art and technology in the making and knowing project’, *Art History* (2016) 39, pp. 210–33; Marjolijn Bol, *The Varnish and the Glaze: Painting Splendor with Oil, 1100–1500*, Chicago: University of Chicago Press, 2023.

have recently examined the role of specific colours like yellow as a sign of active properties and specific ingredients in medieval alchemy.⁸ In this article, I extend this focus to Galenic and Paracelsian systems to reveal the importance of colour at the juncture of alchemical-medical theories, exploring colour's place as a marker of the basic components of bodies, such as elements and principles. By examining the growing influence of Paracelsianism in the late Renaissance, I aim to highlight the medical tradition prior to the iatromechanical and iatrochymical considerations that flourished in the mid-seventeenth century.⁹ Whilst previous studies have shown that seventeenth-century naturalists developed a chymical and corpuscular approach to colour in reaction to Aristotle, this article contextualizes the epistemic roots of such a shift by delving into medieval alchemy and its relationship with Galenic medicine.¹⁰

In the first section of this article, I will explore the alchemical approach to colours and its foundation in Galenic medicine. If the analogy between colours, humours and digestion has been established by historians already, it remains to be understood how this analogy relates to the microstructure of bodies, including their components and properties. To clarify this issue, I will survey the theoretical stakes of colours in Galenic physiology and pharmacology, including the distinction drawn between primary and secondary qualities, and the status of sensible qualities. As will be argued, the Galenic tradition examined the connection between colours and the core elements of bodies, either the human body or the ingredients to be used for making drugs. The resulting approach to colour, which was rooted in Aristotelian philosophy, was decisive for the epistemic status of colours in alchemy, namely regarding the ways in which colours provided insight into the nature of bodies at the level of their core components.

It is only by exploring this medical framework and how it shaped the conception of colour in alchemy that we can grasp the continuities and changes that Paracelsus and his followers introduced during the late Renaissance. Exploring this matter requires us to pay particular attention to the numerous Paracelsian interpretations that emerged in the early modern period, and their various degrees of harmonization with the medical tradition.¹¹ I will examine these views in the second section of this article, which investigates the conception of colour and its relation to humours, elements and principles in the works of prominent late Renaissance physicians trained in both Galenic medicine and Paracelsian chymistry. First, I will consider the Paracelsian approach to colours through the lens of the Danish physician Petrus Severinus (1542–1602). I will then look at the original interpretation of this theory by the French physician Joseph Du Chesne or Quercetanus (1544–1609), and its reception by both the French apothecary Jean Beguin (1550–1620) and the German physician Daniel Sennert (1572–1637).

⁸ Rampling, op. cit. (3), p. 73–97. See also Marjolijn Bol, Matteo Martelli, Lucia Raggetti and Jennifer M. Rampling (eds.), *Changing Colour: Yellow Dyes from Antiquity to Early Modernity*, special issue of *Ambix* (2024), 71.

⁹ On colour in early medicine see Domenico Bertoloni Meli, 'The color of blood: between sensory experience and epistemic significance', in Lorraine Daston and Elizabeth Lunbeck (eds.), *Histories of Scientific Observation*, Chicago and London: University of Chicago Press, 2011, pp. 117–34; Berenice Cavarra and Marco Cilione (eds.), *Medicine and Colour*, special issue of *Medicina nei Secoli* (2020) 32; Franck Collard and Evelyne Samama (eds.), *Le corps polychrome: Couleurs et santé. Antiquité, Moyen Âge, époque moderne*, Paris: L'Harmattan, 2018; Elizabeth Craik, 'A note on colour terms in hippocratic texts', *Medicina nei Secoli* (2019) 31, pp. 541–6.

¹⁰ Anna Marie Roos, 'The saline chymistry of color in seventeenth-century English natural history', in Baker et al., op. cit. (6), pp. 274–300.

¹¹ See Gerhild Scholz Williams and Charles D. Gunnoe (eds.), *Paracelsian Moments: Science, Medicine, & Astrology in Early Modern Europe*, Kirksville: Truman State University Press, 2002.

As will be shown in the second section of this article, the Paracelsian shift in thinking colour was related to the Galenic conception of qualities and sensory properties. Following both an empirical and a religious approach, Paracelsian physicians conceived of the transmutation of bodies in terms of their distillation, in particular the extraction of their incorruptible essence and chymical principles. As other scholars have demonstrated, the Paracelsian view of the principles entailed a divergent conception of natural change, characterized by the manifestation of an alternative set of sensory properties, including colour, odour and taste.¹² I argue that these properties were not only designed to challenge the traditional scheme of qualities, but also to reform the Galenic conception of sensory properties as signs that allowed alchemists and medical practitioners alike to infer knowledge about bodies.

This article will thus contribute to scholarship on early modern theories of colour by extending its focus to include Paracelsian chymistry and the medical conception of signs in the late Renaissance. Indeed, the epistemic status of colour and sensory qualities in chymistry questioned the Galenic approach to signs and its influence in medieval alchemy. In the medical tradition, colours were taken to be important signs of material change while also being epistemically elusive. Although they were considered useful empirical tools that could be used to identify the nature and powers of bodies, colours needed adjunct sensory qualities in order to account for their limited degree of reliability. Such a view on colours was common in the Galenic tradition. As Ian MacLean has shown, Renaissance physicians tended to adopt a 'hierarchy of certainty' in distinguishing between necessary and probable signs when defining health and disease, acknowledging the partly conjectural dimension of medical practice.¹³ Hence colours were deemed important in the medical discussion of material change despite their unreliable status in pointing to the active powers of bodies. This status, however, would change in the chymical philosophy. By redefining colours as properties related to the chymical principles, Paracelsian physicians sought to address their instability.

Through an exploration of Paracelsian accounts of colours, we will see to what extent the elusive nature of colour was deemed an epistemic obstacle to the systematic knowledge of bodies, and the ways in which colour was related to the chymical principles. This topic resonates with what David Freedberg has called 'the failure of colour' concerning early modern attempts to classify plants according to their visual features, and the resulting debates on their mutability over seasons, years and an individual's lifetime.¹⁴ From this critical viewpoint, the unstable and 'non-essential' nature of colour led to 'confusion and error' in the early modern sciences. Interestingly, Paracelsian physicians attempted to overcome the ambivalent nature of colour which stemmed from the medical tradition. As a core property of chymical principles, colours needed to be redefined as essential properties that were intended to provide a stable way of knowing the composition of bodies. This article therefore recounts how such a Paracelsian effort to renew the epistemic status of colours resulted in qualified success, while proposing original views on the material structure and sensory properties of bodies.

¹² See Evan R. Ragland, 'Chymistry and taste in the seventeenth century: Franciscus Dele Boë Sylvius as a chymical physician between Galenism and Cartesianism', *Ambix* (2012) 59, pp. 1–21; Saskia Klerk, 'The trouble with opium: taste, reason and experience in late Galenic pharmacology with special regard to the University of Leiden (1575–1625)', *Early Science and Medicine* (2014) 19, pp. 287–316.

¹³ Ian Maclean, *Logic, Signs and Nature in the Renaissance: The Case of Learned Medicine*, Cambridge: Cambridge University Press, 2002, pp. 148–70.

¹⁴ David Freedberg, 'The failure of colour', in John Onians (ed.), *Sight & Insight: Essays on Art and Culture in Honour of E.H. Gombrich*, London: Phaidon, 1994, pp. 242–65.

Colours and humoral medicine in the alchemical tradition

As posited in the introduction, medieval alchemists drew on humoral medicine and the Galenic tradition to emphasize colour change as a gateway to understanding transmutation. Such a connection between humoral change and transmutation has long been studied in the history of medicine and alchemy. In this section, I will build on these studies to explore the Galenic influence on the alchemical views on colours, in particular, from physiology and pharmacology. This will lead me to explicate the relationship between colours, humours, qualities and elements, as well as their epistemic role in defining the composition of bodies. First, I will focus on colours as a palette of definite hues, exploring the analogy between transmutation, blood and the humours produced during digestion. Although an under-studied theme in existing scholarship, the digestive analogy was fundamental to understanding matter theory and the alchemical processes at stake during colour change. Beyond unveiling a chromatic palette, this analogy expanded on the microstructure of bodies and their processes of transformation within the body. I will then address the epistemic status and limitations of colour in the medical tradition, providing a useful preamble to investigate, in the second section, why Paracelsian physicians aimed to redefine this topic in chymical medicine. Anchored in Aristotelian conceptions of colour, this theme entailed the Galenic view on colours as secondary qualities, as well as their role in inferring the constitutive elements and qualities of bodies.

In the medieval West, the alchemical tradition associated the colour change that manifested during the phases of transmutation with the four humours. This scheme spread during the late Renaissance through a series of florilegia compiling medieval alchemical texts, as we can see in the example of the *Rosarium philosophorum* (Rosary of Philosophers).¹⁵ Through the voices of venerable, yet apocryphal, figures of alchemy, such as the Catalan physician Arnald of Villanova (c.1240–1311), the *Rosarium* stated that four main colours manifested during the decomposition of ‘prime matter’ into its constituent elements. This chromatic change indicated that the material of transmutation saw its main components progressively blending into a series of mixtures. In alchemy, these phases were well known as *nigredo* (blackness), *albedo* (whiteness), *citrinitas* (yellowness) and *rubedo* (redness).¹⁶ Such a sequence was similar to the formation of the humours: melancholy (black bile), which was made of earth; phlegm, a white fluid which was made of water; yellow bile, which was made of fire; and blood, which was made of air. Such parallels between the humours and alchemical transmutation are also found in a description attributed to the Catalan physician Ramon Lull (c.1232–c.1315) contained in another compilation of medieval alchemy, *Clangor buccinae* (Blast of the Trumpet). This treatise explored the colours of the four humours in the context of their relationship with elements, primary qualities and the philosophers’ stone.¹⁷

It was no accident that the alchemical tradition adopted the same sequence of colours as were used in the Galenic theory of humours. In the late Middle Ages, learned alchemists sought to establish *alchemia* not only as an art – that is, a practice requiring technical skills – but also as a *scientia*, namely a source of knowledge based on Aristotelian natural philosophy and Galenic medicine.¹⁸ Consequently, the transformation of bodies

¹⁵ *Rosarium philosophorum* (Frankfurt: Cyriacus Jacob, 1550), f. i2v^o: ‘Dixerunt aliqui, quod in opere lapidis apparent omnes colores ... cum non appareant nisi quatuor principales ... Et si tibi non apparent omnes colores, non cures dummodo possis elementa segregare. Nam citrinitas choleram significat adustam, et ignem, rubedo sanguinem et aërem: albedo flegma et aquam, nigredo melancholiam et terram.’

¹⁶ Principe, op. cit. (3), pp. 37–41, 123–5; Rampling, op. cit. (3), pp. 77–82.

¹⁷ *Clangor buccinae*, in *De alchimia opuscula complura veterum philosophorum*, Frankfurt: Cyriacus Jacob, 1550, ff. 21v–25r and *passim*. See, for instance, *Clangor*, ff. 21v–22r: ‘Item corpora sub concavitate orbis lunae a creatore condita participant quatuor elementis, quatuor humoribus naturalibus ... Quatuor coloribus principalibus, album, nigrum, citrinum, rubeum.’

¹⁸ Crisciani, op. cit. (1), pp. 191–3; Obrist, op. cit. (1), pp. 43–7.

during the making of the philosophers' stone was explained by analogy with physiological processes that engaged with different humours and whose respective colours revealed several phases of transformation. In this regard, late medieval treatises on alchemy like the *Rosarium* considered transmutation as a kind of 'digestion' (*digestio*) where matter, sometimes called 'nutriment' (*nutrimentum*), was progressively brought to a more achieved state, as evidenced by the showing of different colours and elemental qualities. The *Rosarium* eloquently developed the digestive analogy in relation to colours, blood and the making of the stone:

The colour of redness is created through the completion of digestion, as blood in humans is not generated unless it is first carefully cooked in the liver. In the same way, when we see our urine pale in the morning, we know we have not slept enough. Returning to bed and regaining sleep completes digestion, and our urine becomes yellowish. Thus, through cooking alone, whiteness can transform into redness. By maintaining the fire in this way, if our white copper is diligently cooked, it becomes optimally reddened. Therefore, it must be cooked with dry fire and through dry calcination until it reddens like cinnabar. After this point, you must not add water or anything else until the red colour has been fully developed.¹⁹

The physiological process of digestion was an ideal source for comparisons with alchemical transmutation as it entailed the progressive transformation of a material into a series of substances under the action of heat.²⁰ In describing these processes, the *Rosarium* and *Clangor* elaborated on analogies from a referential treatise in late medieval alchemy: the *Testamentum* (c.1330) attributed to the Catalan physician Ramon Lull.²¹ In this work, Pseudo-Lull characterized the transmutation of the philosophers' stone as a process of digestion, comparable to the assimilation of nutrients in the stomach, the liver and the urinary tract to produce blood and urine. This alchemical digestion expressed a series of colour changes according to the different mixtures of materials, which resulted in the formation of a stone with a pure essence. This subtext fostered the medieval analogy of digestion and chromatic change, which followed the explanation of digestion as expressed in Galenic medicine and Aristotelian natural philosophy.

From the standpoint of the medical tradition, the notion of digestion took on distinct dimensions that warrant further investigation. In Galenic medicine, digestion consisted of a process of cooking or 'concoction', where food – the body's prime matter for nourishment – was converted into the four humours in the digestive organs.²² The notion of concoction had been established as a process of slow cooking in natural philosophy through Aristotle's

¹⁹ *Rosarium philosophorum*, op. cit. (15), f. 3v: 'Color namque rubedinis creatur ex complemento digestionis, quoniam sanguinis non generatur in homine nisi prius diligenter coquatur in epate, sic nos cum videmus de mane nostram urinam albam, scimus nos parum dormivisse, redimus ad lectum somno autem recepto, completur digestio, et nostra citrinatur urina, sic per solam decoctionem potest albedo devenire ad rubedinem, ignem sic continuando, aes nostrum album si diligenter coquatur, optime rubificatur, igne ergo sicco, et calcinatione sicca decoquatur, donec rubeat ut cinobrium, cui de caetero nequaquam impones aquam neque aliam rem quousque ad complementum decoquatur rubeum.' See also *Rosarium*, f. a4r, n4r–v et passim.

²⁰ Crisciani, op. cit. (1), pp. 201–5.

²¹ Ramon Lull, *Testamentum duobus libris universam artem chymicam complectens*, Cologne: Iohannes Byrckmann, 1566, ff.34r–35v. See Michela Pereira, 'Vegetare seu transmutare: the vegetable soul and pseudo-Lullian alchemy', in F. Domínguez Reboiras, P. Villalba-Varneda and P. Walter (eds.), *Arbor Scientiae: Der Baum des Wissens von Ramon Llull*, Turnhout: Brepols, 2002, pp. 93–119.

²² Danielle Jacquart, 'La nourriture et le corps au moyen âge', *Cahiers de recherches médiévales et humanistes* (2006) 13, pp. 259–66. See Galen, *On the Usefulness of the Parts of the Body* (tr. Margaret Tallmadge May), Ithaca, NY: Cornell University Press, 1968, pp. 204–77; Galen, *On the Natural Faculties* (tr. Arthur J. Brock), London: Heinemann, 1916, pp. 31–219.

Meteorology, and became central in Galenic physiology. In the late Renaissance, the French physician Jean Fernel (1497–1558) summarized the Galenic view on digestion in a seminal textbook, the *Physiologia* (1567).²³ This treatise described digestion as a series of concoctions by heat in the stomach and the liver, followed by filtration through the veins.²⁴ In the process, the transformation of nutriment resulted in the production of a series of humours with a palette of white, yellow, red and black shades. These colours showed how the raw matter of food, namely ‘chyle’, was progressively cooked into a purer form, ending in bright red blood as the most refined humour: phlegm came from the cold and raw portion of chyle, bile from its hot and fine portion, blood from its temperate portion and melancholy from its cold and earthy portion.

From the viewpoint of a Galenic physician, colour therefore signalled the changing nature of bodies in terms of their basic constituents, the elements. In the case of humours, such elemental change could be explained through the transformation of sensory properties such as primary qualities and texture. This scheme stemmed from Galen’s *On the Usefulness of the Parts*, which drew an analogy between the constitution of the four humours and the formation of wine due to the fermentation of grapes.²⁵ As phases of the blood, the humours were analogous to the products of vinification, such as lees and must. This process explained the association of the four humours with a certain colour and texture: blood was red and temperate, bile was yellow and fine, melancholy was black and thick, and phlegm was white and liquid – see Table 1.

To the chromatic palette of the four humours, Galenic physicians added a series of hues corresponding to pathological variants that stemmed from faulty transformations in the digestive system. As Fernel explained in the *Physiologia*, these morbid humours were pathological residues of bile and phlegm, which were considered ‘preternatural’ because they came from a defective digestion.²⁶ Established in Galen’s *On Black Bile* and Avicenna’s *Canon*, these noxious humours were said to be formed by processes of combustion, fermentation and coagulation. In the case of bile, each of these processes was accompanied by some chromatic change, including green and blue tones. For instance, ‘excremental’ bile was successively transformed into light green (‘porraceous’), verdigris (‘eruginous’), blue (‘cerulean’) and black (‘dark’) bile.

In light of this medical framework, it becomes possible to explain why early alchemists established the analogy between transmutation and the formation of blood. Both processes were based on chemical transformations under the action of heat which developed into a sequence of substances, each with a specific colour. As Jennifer Rampling has shown, colours, in this scheme, played the role of authoritative signs and tokens that marked the successful alchemical transformation of materials.²⁷ Such an emphasis on ‘signs’, including visual markers such as colour, was a cornerstone of the Galenic tradition.²⁸ Indeed, in

²³ Jean Fernel, *The Physiologia of Jean Fernel (1567)* (ed. and tr. John M. Forrester), Philadelphia: American Philosophical Society, 2003. See Elisabeth Moreau, ‘From food to elements and humors: digestion in late Renaissance Galenism’, in Roberto Lo Presti and Giouli Korobili (eds.), *Nutrition and Nutritive Soul in Aristotle and Aristotelianism*, Berlin: De Gruyter, 2020, pp. 319–38.

²⁴ Fernel, op. cit. (23), pp. 424–31. This treatise was first published in 1542 under the title *De naturali parte medicinae* (On the Natural Part of Medicine).

²⁵ Galen, *On the Usefulness of the Parts of the Body*, op. cit. (22), pp. 205–6. See Isabelle Boehm, ‘La couleur du corps chez Galien: Coloration naturelle et couleurs modifiées dans la polychromie du vivant’, in Collard and Samama, op. cit. (9), pp. 11–22.

²⁶ Fernel, op. cit. (23), pp. 462–3: ‘Altera species ex ea fit bile quam vitellinam dixerunt. Exustione enim haec primum in porraceam, deinde in aeruginosam, post in ceruleam, novissime in atram omnium perniciosissimam commigrat ... Ea enim est quae in terram impacta, fermenti more et quodam quasi aestu effervescens, hanc iactat et excutit.’

²⁷ Rampling, op. cit. (3), pp. 1–5.

²⁸ Maclean, op. cit. (13), pp. 276–332.

Table 1. The humours and their corresponding colour, texture, qualities and elements in Galenic medicine.

	Colour	Texture	Qualities	Element
Bile	Yellow	Thin	Hot–dry	Fire
Blood	Red	Median	Hot–moist	Air
Phlegm	White	Liquid	Cold–moist	Water
Melancholy	Black	Thick	Cold–dry	Earth

medical practice, the chromatic change of humours and body parts was taken as a major diagnostic sign that could help medical practitioners understand alterations of health. Galenic physicians were attentive to the colours of blood and urine, as well as to their related texture and taste, as useful signs and symptoms of a disease caused by an imbalance of qualities. They also highlighted the change in the colour of the face or the limbs to identify illness or, conversely, any significant sign in the progress of the cure.²⁹

Yet the status of colour revealed some limitations in the medical tradition. Its epistemic role was restrained to that of a probable sign, which needed to be coupled to other sensory features to collect empirical information about bodies. Alone, colour had a limited role in defining their nature and powers. Indeed, for Galenic physicians, the definite palette of four colours only related to humours, and did not reveal a systematic relationship between specific colours, qualities and texture in general. In other words, colour change allowed physicians to identify a change in the constitution or ‘temperament’ of a certain humour or body part but could not help them to define the temperament or composition of all bodies – these were defined by the mixture of their primary qualities (hot, dry, cold and moist) related to the four elements. In contrast, colours were considered ancillary to the primary qualities because they could not define the nature and properties of bodies as a mixture of the elements. Following Aristotelian physics, colours were considered ‘secondary’ qualities, which required additional sensory features such as texture, taste and odour.³⁰

The epistemic status of colours in the medical tradition was grounded in the explanation of colour in Aristotelian natural philosophy. In *On the Soul*, *On the Senses* and *Meteorology*, Aristotle expounded the notion of colour in relation to the visual perception of light, the distribution of colours between two extremes (light and dark), and their application to natural phenomena like rainbows. Accordingly, there were seven colours ranging over a series of intermediates – yellow, red, green, blue and dark – between two extremes – white and black. Their wide number of shades came from the various mixtures of extreme colours (white and black) with the intermediary hues, as well as the level of transparency or opacity of bodies, which denoted their ability to reflect or absorb light.³¹ As Tawrin Baker has shown, Aristotle’s considerations of colours ended in different interpretations of their provenance and their ways of formation in premodern natural philosophy.³² From this

²⁹ Michael Stolberg, *Learned Physicians and Everyday Medical Practice in the Renaissance*, Munich and Vienna: De Gruyter, 2021, p. 41 and *passim*; Jerome Bylebyl, ‘The manifest and the hidden in the Renaissance clinic’, in W.F. Bynum and Roy Porter (eds.), *Medicine and the Five Senses*, Cambridge: Cambridge University Press, 2004, pp. 40–60.

³⁰ Robert Pasnau, ‘Scholastic qualities, primary and secondary’, in Lawrence Nolan (ed.), *Primary and Secondary Qualities: The Historical and Ongoing Debate*, Oxford and New York: Oxford University Press, 2011, pp. 41–61.

³¹ See Berenice Cavarra, ‘Parousia: colori, diafano e luce in Aristotele e nella tradizione aristotelica’, *Medicina nei Secoli* (2020) 32, pp. 543–58; Alberto Jori, ‘La teoria aristotelica dei colori tra fisica e fisiologia’, *Medicina nei Secoli* (2020) 32, pp. 491–542.

³² Tawrin Baker, ‘Color in the early modern period’, in Dana Jalobeanu and Charles T. Wolfe (eds.), *Encyclopedia of Early Modern Philosophy and the Sciences*, Cham: Springer, 2020, pp. 1–10; Kuehni, op. cit. (6), pp. 28–30.

stream of theories, it emerged that Aristotelian scholars did not reach a clear consensus about the explanation of colour and the seemingly limitless number of hues.

The elusive nature of colours shaped Galenic understandings of the active powers of bodies. One key medical field that addressed this question was pharmacology, which established that the power of drugs could be determined according to certain sensory features. Indeed, to infer the nature of drugs, physicians valued not only the primary qualities, but also sensations that were deemed secondary qualities. Among them, taste had a prominent role as it allowed physicians to systematically assay the temperament and texture of ingredients to prepare a suitable remedy with an opposite constitution.³³ For instance, the acerbic taste of a drug signalled a cold temperament and a thick matter, which could cure ailments stemming from a hot and thin humoral imbalance. However, this scheme did not work in the case of colours. For example, bright red denoted a hot and moist constitution in the case of blood, but the same observation could not be extended to all bodies. This reasoning was rooted in Galen's *On Simple Drugs*, which stated that each colour could signal any of the primary qualities, so that it was impossible to systematically attribute a specific temperament to a single colour.³⁴ In the medical tradition, this statement would seal the epistemic status of colour as a useful indicator, though alone it was insufficient to infer the composition of bodies in terms of qualities and elements.³⁵

The Galenic conception of drug powers consequently relied on some epistemic order of sensations to infer drug powers: if taste received a prominent position, colour was the least meaningful sensation. This reasoning was grounded in Aristotelian physics, which established the epistemic value of sensations according to their degree of tangibility. From a physiological perspective, colours required the reflection of light on the surface of an object, as well as the air as a medium to reach the eyes. Hence they were not tangible properties like the four primary qualities and the secondary qualities which were fundamental in Galenic medicine, namely taste and texture. The impalpable and constantly changing conditions of colour vision led the medical tradition to state their lack of reliability in determining temperament outside the framework of a specific substance. In consequence, taste was deemed more insightful than odours and colours. The latter were intangible and labile perceptions, which could not alone help physicians to define the nature of bodies.

Interestingly, this epistemic limitation was not considered problematic in Galenic medicine, since colours were deemed probable signs related to empirical conditions and natural change. Without offering systematic insight into the composition of bodies, colours still revealed the various stages of alteration in specific cases and consequently held a prominent position in the medical tradition despite their limitations. This reasoning was striking in the case of uroscopy, as the colour wheel of urine ascribed a wide range of colours to a certain lack or excess of primary qualities.³⁶ In the case of pharmacology, Galen exhorted physicians to examine colours in particular types of bodies. Accordingly, the medical tradition discussed how the chromatic change of mineral, vegetal and animal ingredients reflected their inner transformation – mostly under the action of heat – and their value in pharmacy. These variations applied to the colours of vegetables, fruits and

³³ Marilena Panarelli, 'Scientific tasting: flavors in the investigation of plants and medicines from Aristotle to Albert the Great', in Maria Auxent, Katja Krause and Dror Weil (eds.), *Premodern Experience of the Natural World in Translation*, London: Routledge, 2023, pp. 74–89; Klerk, op. cit. (12), pp. 287–316.

³⁴ Galen, *De simplicium medicamentorum temperamentis ac facultatibus*, 4.22–3 (ed. Karl G. Kühn), Leipzig: Karl Knobloch, 1826, vol. 11, pp. 702–3: 'Multo minus ex coloribus de medicamentorum viribus colligere quid valeas, quippe quum in singulis coloribus calida, frigida, humida siccaque reperias.'

³⁵ Galen, op. cit. (34), pp. 696–703.

³⁶ See Michael Stolberg, *Uroscopy in Early Modern Europe*, London: Routledge, 2015; Helen Hickey, 'Medical diagnosis and the colour yellow in early modern England', *e-Rea: Revue électronique d'études sur le monde anglophone* (2015), doi: [10.4000/erea.4413](https://doi.org/10.4000/erea.4413).

wine during their maturation. In the Renaissance, physicians could also rely on the ancient treatise *On Colours* (*De coloribus*), which was wrongly attributed to Aristotle, to uncover the relationship between colours, elements and natural phenomena such as plant ripening.³⁷ These sources offer a more nuanced view on the mutability of colour, which, in the Aristotelian and Galenic tradition, was understood not as an epistemic ‘failure’ but rather as a moderately reliable marker that reflected the physiology of growth and health alterations.

Most importantly, these medical views on colour worked in definite empirical conditions related to specific bodies and humours, and it was precisely this framework that learned alchemists took up to convey the visual and inner change of their materials during transmutation. In conceiving digestive analogies concerning the phases of transmutation, learned alchemists posited a chromatic palette that reflected the ‘dynamic process’ of material change.³⁸ The instability of colours reflected the changing world of the elements and the humoral system which followed the cycle of seasons and life. Yet such an elusive nature and limited ability to give information on the temperament and active powers of bodies would raise criticism in late Renaissance chymistry. As we will see in the following section, Paracelsian physicians attempted to ascribe colour to the main principles of bodies, and to extend their epistemic role in drug analysis. If they maintained some ambiguousness in their explanation of colour, they nonetheless reframed it in an innovative account of principles and sensory properties.

Colours and chymical principles in Paracelsian medicine

Paracelsus and his followers continued to discuss colours in a chymical framework, but centred their theories on Salt, Sulphur and Mercury as an alternative set of principles. In doing so, they tended to downplay the analogy between the four humours and the chromatic tetrad of transmutation from medieval alchemy. The main reason for this was Paracelsus’s dismissal of some of the major tenets of Galenic medicine, including elements, primary qualities and humours, in favour of alternative chymical principles and sensory properties. Yet the Swiss physician demonstrated a keen attention to the colours of various materials, which could be traced back to early alchemy. If Paracelsus’s works at times acknowledged the four colours that signalled the transmutation of materials, they also mentioned a series of blue and green compounds with symbolic names (*Decknamen*), for instance copper- and iron-based minerals like *Spongrün* and vitriol.³⁹

Paracelsus did not provide any systematic explanation of colour in his works, although more research is necessary given the extensive corpus that has been attributed to him. According to recent scholarship, his meteorological writings expressed a critical reception of the Aristotelian theory of colours.⁴⁰ More broadly, many of his writings explored the relationship between colour and the four elements, though the exact correlations shifted between texts. From the late sixteenth century onwards, a series of learned physicians attempted to build on these diverse and somewhat contradictory Paracelsian texts and produce a unified account of chymical medicine. As we will see in this section, they shed new

³⁷ See Lisa Devriese, ‘The colorless history of pseudo-Aristotle’s *De coloribus*’, *Early Science and Medicine* (2021) 26, pp. 254–88; Tawrin Baker, ‘Colour in three seventeenth-century scholastic textbooks’, in Bushart and Steinle, op. cit. (6), pp. 161–77.

³⁸ On the notion of colour change as ‘dynamic process’ see Rampling, op. cit. (3), p. 4 and *passim*.

³⁹ See Paracelsus, *Paracelsus (Theophrastus Bombastus von Hohenheim, 1493–1541): Essential Theoretical Writings* (ed. and tr. Andrew Weeks), Leiden: Brill, 2008, pp. 134–5; Paracelsus, *Drey Bücher der Wundartzney Bertheoneae*, in Paracelsus, *Chirurgische Bücher und Schrifften* (ed. Johannes Huser), Basel: Latzar Zetzners, 1605, pp. 358c, 362a, 368b.

⁴⁰ See, for instance, the recently edited Paracelsian texts on colours and the rainbow in Paracelsus, *Paracelsus (Theophrastus Bombast von Hohenheim, 1493–1541): Cosmological and Meteorological Writings* (ed. and tr. Andrew Weeks and Didier Kahn), Leiden: Brill, 2024, pp. 598–601, 508–11, 628–9, 668–71.

light on the Paracelsian approach to the active powers of bodies, including their colour, and their affiliation with the principles. In the process, Paracelsian physicians questioned the traditional status of colours as probable signs proper to the elements of the physical world. Most importantly, they claimed to disrupt this view by redefining colours as essential signs proper to the true foundations of nature which came from the celestial world. Yet early modern conciliators of chymistry and Galenic medicine would nuance this claim. In discussing the stance of Paracelsian chymistry on the medical tradition, they criticized the ambiguous relationship between colours and the principles.

Following the works of Paracelsus, most adepts rejected, or at least criticized, Galenic medicine, consequently casting aside the earlier alchemical analogies between colours and the four humours. One of the earliest digests of Paracelsian medicine to put forth the reasons for rejecting humoral medicine in chymistry was the *Idea medicinae philosophicae* (Ideal of Philosophical Medicine) (1571) by the Danish physician Petrus Severinus (Peder Sørensen).⁴¹ An appointed physician at the court of Frederick II and Christian IV of Denmark, Severinus expounded his interpretation in a dedicated framework for humanist physicians.⁴² As he claimed, humours needed to be dismissed because they were made of elements, which were perishable entities that could not define the perennial cycle of nature.⁴³ Moreover, Severinus claimed, Galen failed to unify into a consistent system the many bodily fluids from Hippocratic medicine. For instance, the pathological types of bile and phlegm, which we saw in the previous section, were deemed to reflect Galen's confusion and failure to establish the true foundations of nature. As a corollary to this rejection of Galenic humours and elements, Severinus dismissed the primary qualities as irrelevant in defining the essential properties of bodies.

With this official endeavour to debunk humoral medicine, Paracelsian physicians like Severinus promoted alternative sensory properties in contrast to the primary qualities. Their core foundations were related to the celestial world. Indeed, in the Paracelsian system, the true components of nature were celestial 'seeds' (*semina*), which provided the chymical powers of bodies, including stable sensory features such as colour, taste and odour.⁴⁴ For Severinus, this claim was rooted in the most ancient sources of medicine (*prisca medicina*), which were grounded in Hippocrates rather than Galen. According to the Danish physician, Hippocrates posited that active powers (*dynameis*) were defined by alternative properties which had escaped the Galenic system of primary qualities and humours.⁴⁵ In this regard, Hippocratic texts like *On Ancient Medicine* and *On Regimen* only aimed to explain the sensory powers of diverse bodily fluids following the natural cycle of seasons.⁴⁶ With this claim, Severinus shared Paracelsus's appeal for alternative ancient sources. Accordingly, Hippocratic humoral theory was redefined as an empirical approach to bodies that anticipated chymistry and emphasized sensory properties but was subsequently corrupted by the Galenic tradition.⁴⁷

⁴¹ Petrus Severinus, *Idea medicinae philosophicae: fundamenta continens totius doctrinae Paracelsicae, Hippocraticae, & Galenicae*, Basel: Heinrich Petri, 1571.

⁴² See Jole Shackelford, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540/2–1602)*, Copenhagen: Museum Tusculanum Press, 2004; Hiro Hirai, *Le concept de semence dans les théories de la matière à la Renaissance, de Marsile Ficin à Pierre Gassendi*, Turnhout: Brepols, 2005, pp. 179–216.

⁴³ Severinus, op. cit. (41), pp. 42–3, 190–1.

⁴⁴ Severinus, op. cit. (41), p. 49: 'In his [seminibus] colores, sapes, odores et universae qualitates delitescent: horum virtute perfusa corpora reddunt formosa, viventia, et multis illecebris obducuntur, sensibus insidiaturis.'

⁴⁵ Severinus, op. cit. (41), p. 59: 'Ex quibus [seminibus] sapes, odores, colores et qualitates vitales omnes quantitates, numeri, conformationes et signaturae coeterae, in mechanico generationum et transmutationum processu procedunt.'

⁴⁶ Severinus, op. cit. (41), pp. 195–6. See Ragland, op. cit. (12), pp. 4–5.

⁴⁷ Jole Shackelford, 'The chemical Hippocrates: Paracelsian and Hippocratic theory in Petrus Severinus' medical philosophy', in David Cantor (ed.), *Reinventing Hippocrates*, Aldershot: Ashgate, 2002, pp. 59–88.

Consequently, Paracelsian philosophy introduced a pivotal change in the early modern conception of colours. From then on, colours were integrated into a chymical system that posited them as the essential features of bodies, contrary to the Aristotelian and Galenic traditions. Severinus explained this view in the case of plants: colours, flavours and odours came from the *dynamis* of their spiritual *semina* within their physical seeds.⁴⁸ Their sensory properties no longer pertained to the physical realm of the elements, but to some celestial entity within bodies, whose seminal powers operated during chymical transformations. As a result, Paracelsian physicians related colours to the immutable essence of bodies instead of their perishable elements. The status of colours was renewed as an ontological property and a necessary sign of the principles that composed bodies.

If colours were related to a celestial principle and were to share with flavours and odours the status of an essential property, they also appealed to the chymical practice of distillation. For Severinus, this had already been the case in both Hippocratic medicine and the so-called 'Hermetic' alchemy.⁴⁹ According to this view, Paracelsian philosophers were disciples of Hermes Trismegistus for their empirical knowledge of three principles (*tria prima*) resulting from the process of 'separation'; that is, the distillation of bodies. This process superseded the notion of digestion or 'concoction' as the overarching way of transforming all bodies. As an experimental process, distillation allowed practitioners to extract Mercury as a liquid or volatile principle, Sulphur as an oily principle, and Salt as a solid principle.⁵⁰ These *tria prima* designated the phases of distillation, which each had a specific texture, and were distinct from common ingredients of the same name. The extraction of the principles was characterized by the immediate experience of colours, odours and flavours, as major sensory markers of a successful 'separation'.

If this Paracelsian view of colour reformed that of the medical tradition, it still had to explain the relationship between colour and the three principles, in distinction from odours and flavours. In the late Renaissance, the adepts agreed that colours were essential properties stemming from the *tria prima*, although they rarely provided any details on this point. This was mostly due to the various ascriptions of colour in Paracelsian texts to Salt, Sulphur or Mercury alternately without any systematic explanation. Paracelsian physicians stated that colours, odours and flavours were altogether the necessary signs of strong chymical principles. Simultaneously, they might attribute certain colours to one of the said principles, depending on the chymical ingredients and empirical conditions at stake.

In the early seventeenth century, however, the French physician Joseph Du Chesne attempted to establish a more systematic relationship of colour and sensory properties with the chymical principles. An appointed physician at the court of Henry IV of France, Du Chesne was a key figure in the diffusion of Paracelsian therapy and the early endeavours to compromise with Galenic medicine.⁵¹ His *De priscorum philosophorum verae medicinae materia* (On the Matter of the True Medicine of the Ancient Philosophers) (1603) examined the

⁴⁸ Severinus, op. cit. (41), pp. 113–14: 'Diximus seminalem materiam vegetabilium, in corporibus crassis et solidioribus habitare: idque collatione facta ad animalium semina. Haec corpora non sunt illa externa, crassa, concreta, quae sensibus obvia sunt: sed interna, spiritualia. In corporibus tamen ... in quibus vigent virentque δυνάμεις Hippocraticae ... in quibus colorum et saporum virtutes, imo colores et sapor ipsi proxime fundantur.'

⁴⁹ See Florian Ebeling, *The Secret History of Hermes Trismegistus: Hermeticism from Ancient to Modern Times*, Ithaca, NY: Cornell University Press, 2011.

⁵⁰ Severinus, op. cit. (41), pp. 67–8. See Hirai, op. cit. (42), pp. 179–216.

⁵¹ See Allen G. Debus, *The French Paracelsians: The Chemical Challenge to Medical and Scientific Tradition in Early Modern France*, Cambridge: Cambridge University Press, 1991, pp. 51–9; Hiro Hirai, 'The world-spirit and quintessence in the chymical philosophy of Joseph Du Chesne', in Miguel López Pérez, Didier Kahn and Mar Rey Bueno (eds.), *Chymia: Science and Nature in Medieval and Early Modern Europe*, Newcastle upon Tyne: Cambridge Scholars, 2010, pp. 247–61; Didier Kahn, 'L'interprétation alchimique de la Genèse chez Joseph Du Chesne dans le contexte de ses

essential powers of bodies by defining the nature of chymical principles and their sensory properties. First, Du Chesne aimed to demonstrate the foundations of the so-called ‘balsamic’ medicine, based on the teachings of Paracelsus and the tenets of the most ancient sources of medicine, such as Hippocrates and Hermes.⁵² In his view, bodies owed their active powers and chymical properties to their ‘balsam’ (*balsamum*), a Paracelsian notion that designated a divine essence within bodies that was made of celestial seeds but could be extracted through chymical means. Inspired by Severinus’s *Idea*, the notion of balsam was foundational to Du Chesne’s conception of Paracelsian therapy. As he recounted, balsamic remedies were based on the *tria prima*, including Salt, Sulphur and Mercury. Yet Du Chesne did not fully reject the Galenic humours and elements, which he considered ancillary entities to the chymical principles and their related properties.

In the context of late Renaissance Paracelsianism, Du Chesne’s interpretation was remarkable in ascribing specific sensory properties to each of the three principles. In defining these principles, he first compromised with the medical tradition by attributing elements and qualities to each of them.⁵³ Salt was a solid and ‘fixed’ principle made of earth, yet with a hot and dry nature. Sulphur as an oily substance was similar to fire for its flammability. Mercury had a fluid nature, as a vapour or a liquid, and expressed moistness (*humiditas mercurialis*) as a primary quality constitutive of the elements air and water. Du Chesne argued that sensory properties could be associated with each of these principles:

For in these three hypostatic principles, the aforementioned active and sensible qualities are found not by imagination, analogy, or conjecture, but in reality and effect. Namely, flavours are primarily found in Salt, odours in Sulphur, and colours in both, but especially in Mercury, since it contains the volatile Salt common to all things.⁵⁴

From this explanation of the *tria prima*, it emerges that Du Chesne aimed to reorganize the traditional distribution of primary and secondary qualities in light of the Paracelsian philosophy – see Table 2.

In this schema, it was colour itself, and no longer a series of humoral hues, that was related to principles, qualities and texture. Indeed, for Du Chesne, colours came from Mercury, while being also related to Sulphur and Salt, for their ability to become stabilized or ‘fixed’ in a liquid or solid substance. In this regard, the ‘volatile Salt’ in Mercury referred to a central concept in Du Chesne’s treatise. As Anna Marie Roos has shown, his *De priscorum* was notable for putting forward a prominent principle of nature called ‘saltpetre’, ‘nitre’ and ‘Salt of the earth’.⁵⁵ Pervading all bodies, this foundational principle existed in three types: fixed (‘saline’), liquid (‘sulphureous’), and volatile (‘mercurial’), which ‘fixed’ colours in bodies. Hence, for Du Chesne, this overarching saline principle was in the Mercury that composed colours.

With this emphasis on Mercury, Du Chesne went further than previous Paracelsian conceptions of colours, but did so without providing any further explanation of the relationship

doctrines alchimiques et cosmologiques’, in Barbara Mahlmann-Bauer (ed.), *Scientiae et artes: Die Vermittlung alten und neuen Wissens in Literatur, Kunst und Musik*, Wiesbaden: Harrassowitz, 2004, vol. 2, pp. 641–92.

⁵² Joseph Du Chesne, *De priscorum philosophorum verae medicinae materia*, Saint-Gervais: Eustache Vignon, 1603.

⁵³ See Ragland, op. cit. (12), pp. 8–9; Anna Marie Roos, *The Salt of the Earth: Natural Philosophy, Medicine, and Chymistry in England, 1650–1750*, Leiden and Boston: Brill, 2007, pp. 12–25.

⁵⁴ Du Chesne, op. cit. (52), p. 90: ‘In his quippe tribus principiis hypostaticis illae memoratae qualitates virtuales atque sensibiles, non imaginatione, analogia, aut coniectura, sed reipsa et effectu reperiuntur. Nempe sapor in sale potissimum: odores in sulphure, colores ex utrisque etiam, sed potissimum ex mercurio, quod hic sibi adiunctum habeat sal volatile rerum omnium.’

⁵⁵ Roos, op. cit. (53), pp. 12–25; Roos, op. cit. (10), pp. 274–300.

Table 2. The chymical principles and their corresponding properties, texture, elements and qualities according to Du Chesne's *De priscorum* (1603).

	Properties	Texture	Elements	Qualities
Salt	Taste (+ colour)	Solid	Earth	Hot–Dry
Sulphur	Odour (+ colour)	Oily	Fire	Hot
Mercury	Colour	Liquid/volatile	Air–Water	Moist

between colour and Mercury.⁵⁶ We can only conjecture as to the reasons why he attributed colours to this principle in particular. One suggestion might be that Mercury was the volatile or ‘spiritual’ principle of bodies, in contrast with Salt, which, in Du Chesne’s interpretation, was a solid principle providing taste. Interestingly, this scheme fitted the implicit hierarchy of sensory properties from Galenic medicine, where taste was deemed a more stable marker of temperament than colour. Moreover, the extremely diverse palette of hues in nature might have buttressed the relationship between the lability of Mercury and that of colours. More than any other principle, Mercury encapsulated this high degree of mutability and intangibility. Additionally, its vaporous nature fitted the ancient conception of colours coming from light and the imperceptible medium of air. Regardless of his reasonings, Du Chesne disrupted the ancient tradition. Where colours were once considered secondary qualities in the Galenic medical tradition, they were now essential properties proper to the main principles of bodies.

In the early seventeenth century, a series of learned physicians took up or discussed Du Chesne’s conception of chymical principles and properties. Among them, the German physician Daniel Sennert was famous for being the great ‘conciliator’ of Paracelsian chymistry, Galenic medicine and Aristotelian physics. Serving as a professor of medicine at the University of Wittenberg, he sought to introduce chymical remedies into Galenic pharmacy. With this aim in mind, he published *De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu liber* (Book on the Agreement and Disagreement of Chymists with Aristotelians and Galenists) (1619).⁵⁷ Along with his other works on medicine and chymistry, this treatise would prove to be highly influential and was much debated amongst seventeenth-century physicians and naturalists.⁵⁸

Sennert’s account was particularly significant in appraising the notion of *tria prima* and their related properties in the works of Paracelsus and his followers. As he explained in *De chymicorum*, it was largely Severinus and Du Chesne who had shaped the explanation of the principles in the early reception of Paracelsian medicine. According to Sennert, their account of the sensory features of the *tria prima* had been reprised by many Paracelsian scholars.⁵⁹ Sennert specifically noted the interpretation of colours found in the writings of the French apothecary Jean Beguin. Indeed, Beguin distinguished himself in taking up Du Chesne’s attribution of colour to the principle of Mercury. In early seventeenth-century

⁵⁶ Du Chesne, op. cit. (52), p. 91: ‘Qui mercurius, ut diximus, utrique elemento, aeri, inquam, et aquae adsimilari potest: aeri, quod calori admotus, nihil fere esse deprehendatur, quam aer seu vapor, qui statim in auras evanescat. Hunc si placet, non male humidum activum dixeris. Aquae vero comparari potest, quod sit fluidus.’

⁵⁷ On Sennert see William R. Newman, *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution*, Chicago: University of Chicago Press, 2006, pp. 85–156; Hirai, op. cit. (42), pp. 151–72; Joel A. Klein, ‘Daniel Sennert, the philosophical hen, and the epistolary quest for a (nearly-)universal medicine’, *Ambix* (2015) 62, pp. 29–49.

⁵⁸ Daniel Sennert, *De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu liber*, Wittenberg: Zacharias Schürer, 1619.

⁵⁹ Sennert, op. cit. (58), p. 264.

France, Beguin was among the first Paracelsian scholars to lecture on chymical medicine and drug making.⁶⁰ As Didier Kahn has argued, his *Tyrocinium chymicum* (First Chymical Training) (e.p. 1610) drew on Du Chesne's theoretical approach to chymical medicine and Andreas Libavius's practical textbook *Alchemia*.

Most importantly, Beguin adopted the Paracelsian framework of the *tria prima* and their essential sensory features, namely odours, colours and flavours. In a revised edition of the *Tyrocinium* (1612), he associated colour with Mercury, following Du Chesne's definition of a vaporous and changing principle made of air and water, which was usually fixed in a body.⁶¹ Interestingly, this statement was absent from the first edition of this treatise, which only mentioned colours in the case of gems, attributing them to some sulphureous principle coming from metals.⁶² The variety of these colours was due to the body of gems, which was made of fixed Mercury described as 'congealed water'.

Such a wavering between mercurial, sulphureous or saline principles to define colour was recurrent in late Renaissance chymical medicine. As Sennert noted about Du Chesne's interpretation, the relationship between colour and Mercury was rarely stated as such in the texts of Paracelsus and his followers:

They also attribute colours to Mercury. However, even in this regard, they do not agree among themselves. Paracelsus, for instance, elsewhere asserts that Salt grants all things their colour and form, but this seems to be scarcely consistent with truth. It does not appear likely that colours arise from either Salt or Mercury. For when Salt is well purified, it is white and transparent, and even more so is the mercurial, aerial, and ethereal liquid in its purest state. Therefore, it is more correct to attribute colour to Sulphur.⁶³

Ironically, Sennert somewhat joined Beguin and Du Chesne in not providing any further details to support the preferential relationship between colour and one specific principle, here Sulphur, outside downplaying the role of Salt and Mercury for their transparent shade.

If Sennert criticized the unclear relationship between principles and sensory properties, he also acknowledged a series of innovative aspects of Paracelsian medicine regarding this point. As he noted, Paracelsian physicians like Du Chesne were not only remarkable for shifting the medical priority of sensory features towards colours, flavours and odours. They also associated these properties with the assaying of drugs that were formerly considered 'occult' in pharmacology.⁶⁴ Indeed, in the Galenic tradition, the active powers of strong

⁶⁰ Didier Kahn, 'The first private and public courses of chymistry in Paris (and Italy) from Jean Beguin to William Davisson', *Ambix* (2021) 68, pp. 247–72; Debus, op. cit. (51), pp. 80–2.

⁶¹ Jean Beguin, *Tyrocinium chymicum recognitum et auctum*, Paris: Matheus Le Maistre, 1612, p. 27: 'Mercurius est liquor ille acidus, permeabilis, penetrabilis, aethereus ac purissimus, a quo omnis nutritio, sensus, motus, vires, colores, senectutisque praeproperae retardatio. Confertur elemento aeris et aquae: illi quidem, quatenus caloris vicinia alteratus facile in auras abit: huic, quatenus ut ea difficulter proprio; facile autem alieno termino continetur.' See also the English translation of this treatise in Jean Beguin, *Tyrocinium Chymicum: Chemical Essays Acquired from Nature & Manual Experience* (tr. Richard Russell), Gillette: Heptangle Books, 1983, p. 20.

⁶² Jean Beguin, *Tyrocinium chymicum, e naturae fonte et man[u]ali experientia depromptum*, Paris: 1610, p. 67–8: 'Lapides differunt inter se colore tantum, nam eorum corpus est aqua congelata fixa. Colores ut plurimum sumunt ex sulphuribus metallorum, ideo etiam metalla convertuntur in lapides pretiosos ... Mercurius lapidum est aqua congelata fixa.'

⁶³ Sennert, op. cit. (58), p. 315: 'Tribuunt etiam mercurio colores: verum nec in eo ipso sibi consentiunt. Paracelsus enim cum alibi ... salem omnibus rebus, colorem et formam dare statuit; quod tamen vero parum consentaneum videtur: et neque a sale, neque a mercurio colores provenire probabile. Cum enim sal bene purificatus sit candidus et perspicuus; multo magis talis erit liquor mercurialis aereus, aethereus, purissimus: et proinde rectius color sulphuri attribuitur.'

⁶⁴ Sennert, op. cit. (58), p. 268.

purgatives and antidotes were deemed hidden or ‘occult’ and formed a different category of drug properties altogether.⁶⁵ Their remarkable powers stemmed from the substance of bodies, rather than from their primary qualities. Moreover, this category of drug powers could only be identified with hindsight through multiple trials and the observation of their effects, hence not through the assaying of sensory features such as colours.

Interestingly, Sennert developed the relationship between sensory properties and the substance of bodies in his own conception of principles and active powers in *De chymicorum*. The main goal of this treatise was to reconcile the medical tradition, Aristotelian natural philosophy and Paracelsian chymistry by harmonizing notions of principles, elements and qualities. In doing so, Sennert explained the relationship between sensory properties, such as colours, and the chymical principles. At first, Sennert followed Paracelsian physicians in positing colours as the main properties of the *tria prima*, along with flavours and odours. In his view, these sensory properties were different from the primary qualities because they did not stem from the four elements but rather from the essence of bodies, which had celestial origins.⁶⁶ If Paracelsian physicians shared the same claim, Sennert reframed it according to similar conceptions grounded in alchemy and Platonic interpretations of Galenic medicine. Before developing this point, the German physician aimed to restore the connection between the chymical principles and the four humours.

As Sennert contended, colours and sensory properties such as flavours and odours were not proper to the *tria prima*, as they could be found as well in the humours. Indeed, outstanding sensory properties came from bodies as ‘mixtures’ of elements, which manifested chymical and medicinal powers due to the superior nature of their essence.⁶⁷ Such essences or ‘substantial forms’ had a celestial nature as they had been introduced by God into the seeds of beings during the Creation. Enclosed in the matter of bodies, they could be extracted through distillation. Yet, for Sennert, this material core was made of the four elements, which thus remained the main components of bodies, endowed with primary qualities.⁶⁸ This interpretation offered the advantage of acknowledging the specific nature of chymical principles whilst incorporating them into a Galenic framework. Consequently, colours remained sensory properties that signalled outstanding substances with a particular essence or superior form, such as chymical principles and humours. With this view, Sennert agreed with Severinus on the relationship of colour with the essence of bodies but also drew upon medieval alchemy and Galenic medicine to maintain the traditional conception of elements and qualities as the core components of bodies.

The attribution of specific powers to the celestial essence or ‘form’ of bodies was far from new in Sennert’s time. This explanation had been proposed in early alchemy with the notion of ‘quintessence’ (*quinta essentia*).⁶⁹ For instance, compilations of medieval sources such as the *Rosarium* and *Clangor* stated that bodies were made of the four elements and

⁶⁵ See Klerk, op. cit. (12), pp. 287–316; Paula S. De Vos, *Compound Remedies: Galenic Pharmacy from the Ancient Mediterranean to New Spain*, Pittsburgh: University of Pittsburgh Press, 2021; Frederick W. Gibbs, *Poison, Medicine, and Disease in Late Medieval and Early Modern Europe*, Abingdon and New York: Routledge, 2019; Alisha Rankin, *The Poison Trials: Wonder Drugs, Experiment, and the Battle for Authority in Renaissance Science*, Chicago and London: University of Chicago Press, 2021.

⁶⁶ Sennert, op. cit. (58), pp. 264–96.

⁶⁷ Sennert, op. cit. (58), p. 432: ‘Non sunt inania nomina humores, non sua essentia et proprietatibus destituuntur, sed ex principiis prioribus mista formam habet specificam, proprietates, potestates, colores, sapes et similia, quibus ab aliis rebus differunt ... Ita licet principia et elementa in omnibus alimentis, et quae ex iis in corpore fiunt, insint: quoties tamen nova forma introducitur, novum nomen imponitur; et quod prius panis nominabatur, iam chylus nominatur; hinc sanguis, bilis, pituita, melancholia ... dicuntur.’

⁶⁸ Newman, op. cit. (57), pp. 85–156; Hirai, op. cit. (42), pp. 151–72.

⁶⁹ Michela Pereira, ‘Heavens on earth: from the Tabula Smaragdina to the alchemical fifth essence’, *Early Science and Medicine* (2000) 5, pp. 131–44; Didier Kahn, ‘Quintessence and the prolongation of life in the works of Paracelsus’, *Micrologus* (2018) 26, pp. 183–225.

enclosed a divine essence that could be distilled for medicinal purposes.⁷⁰ In the late Renaissance, chymist physicians like Libavius promoted these medieval sources to relegate the pretensions of Paracelsian physicians to novelty.⁷¹ A fervent opponent of Paracelsian medicine, Libavius contributed to the diffusion of chymistry in Europe through many polemical treatises and correspondences, and the textbook *Alchemia* (1597). His reception of medieval alchemy shaped Sennert's argument in *De chymicorum*, especially concerning the elemental and humoral nature of bodies, whose outstanding sensory features were related to their quintessence.

At any rate, Sennert's and Libavius's accounts of elements and quintessence were rooted in the alchemical corpus attributed to Lull and Rupescissa in the late Middle Ages. As shown in the previous section, Pseudo-Lull's *Testamentum* established the analogy between the chromatic change of transmutation and the formation of humours during digestion. Accordingly, the remarkable sensory properties of the 'stone', including colours, odours, flavours and textures, stemmed from its composition as a mixture of elements enclosing a celestial essence. This 'fifth essence' was distinct in nature from the four elements of the physical world.⁷² The same idea of quintessence was developed in the alchemical treatise *De consideratione quintae essentiae omnium rerum* (On the Consideration of the Quintessence of All Things) (c.1351), attributed to the French physician John of Rupescissa. This text emphasized the divine nature of the alchemical essence and its application to pharmacy, through recipes for distilling the quintessence of materials and healing various diseases.⁷³ As Leah DeVun has shown, Pseudo-Rupescissa's conception of quintessence became fundamental in Renaissance medicine. Paracelsian physicians elaborated on this notion to promote the extraction of a celestial substance that protected bodies from disease and corruption.⁷⁴ Moreover, Platonic physicians and philosophers propagated the alchemical conception of a celestial essence that was enclosed in elemental bodies, because it highlighted the divine imprint in bodies. This latter aspect requires further examination in light of Sennert's view on quintessence.

In associating the celestial quintessence with outstanding sensory properties, Sennert was also referring to Platonic interpretations of medicine during the Renaissance. It was Jean Fernel who largely influenced his conception of the substantial form of bodies in a Galenic context. Fernel was noted for having claimed the celestial origin of the hidden and 'occult' qualities of bodies which came from their substantial form. His stance was emblematic of the resurgence of Platonic philosophy in Renaissance medicine for its emphasis on the divine origin of active powers, as well as the relationship between living bodies and the celestial realm.⁷⁵ Interestingly, Fernel shortly discussed the alchemical implications of his philosophy in his treatise on Platonic medicine, *De abditis rerum causis* (On the Hidden Causes of Things) (1548). Following the views of the Italian scholar and alchemist Giovanni Aurelio Augurello (1441–1524), he argued that the essence of distillates had a celestial origin in the same way as 'aether', the celestial element in Aristotelian physics, and as quintessence in

⁷⁰ *Rosarium philosophorum*, op. cit. (15), f. g2v^o; *Clangor buccinae*, op. cit. (17), f. 23v^o–26r^o and *passim*.

⁷¹ See Bruce T. Moran, *Andreas Libavius and the Transformation of Alchemy: Separating Chemical Cultures with Polemical Fire*, Sagamore Beach: Watson Publishing, 2007.

⁷² Lull, op. cit. (21), f. 27v, ff. 72v–73r, ff. 7v–8r. See Michela Pereira, *The Alchemical Corpus Attributed to Raymond Lull*, London: Warburg Institute, 1989.

⁷³ Johannes Rupescissa, *De consideratione quintae essentiae rerum omnium*, Basel: Pietro Perna, 1561, pp. 15–21.

⁷⁴ Leah DeVun, *Prophecy, Alchemy, and the End of Time: John of Rupescissa in the Late Middle Ages*, New York: Columbia University Press, 2013, pp. 57–73.

⁷⁵ Linda Deer Richardson, 'The generation of disease: occult causes and diseases of the total substance', in Roger K. French, Iain M. Lonie and Andrew Wear (eds.), *The Medical Renaissance of the Sixteenth Century* (1985), pp. 175–94; Gibbs, op. cit. (65), pp. 188–220; Hirai, op. cit. (42), pp. 46–79.

medieval alchemy.⁷⁶ As Fernel recounted in *De abditis*, this entity caused the strong colours and sensory properties of distilled waters and oils, along with their sharp odour and taste. In the case of colours, Fernel focused on certain hues following the alchemical tradition, noting the strength of red and white distillates.⁷⁷

If the alchemical side of Fernel's works was not mentioned in Sennert's *De chymicorum*, the latter expressed similar views in synthesizing alchemical and Paracelsian accounts of sensory properties related to the essence of bodies. From Sennert's account emerged the redefinition of colour as a fundamental feature of principles and humours, following previous conceptions from medieval alchemy and the chymical accounts of Severinus and Du Chesne. Whereas Sennert restored the connection between colours and the Galenic schema of humours and qualities, the Paracelsian indecision regarding the underlying principle of colour as a distinctive chymical property remained, in his interpretation, unresolved.

Conclusion

It has been argued that Galenic medicine shaped the understanding of colours in late medieval alchemy. Accordingly, colours served as markers of transformations in materials with defined compositions, signalling changes in their basic elements and qualities. In the description of these processes, colours were involved in a series of well-established analogies with physiological phenomena that went beyond simple parallels between the humours and the phases of transmutation. Indeed, these analogies also relied on the formation of bodily fluids during digestion and so included processes of combustion, coagulation and fermentation. Following this framework, colours were related to mixtures of elements and primary qualities, as well as their successive transformations during transmutation.

As has been shown, this reasoning needs to be understood in the context of the ambiguous epistemic status of colours in Galenic medicine as transitory markers of change that only applied to specific substances which were subject to empirical observation. Outside these specific conditions, colours remained insufficiently reliable to infer the inner structure of bodies, such as their composition of elements and the four qualities. In the medical tradition, this epistemic uncertainty had been remarked upon in pharmacology, which posited colour as a probable marker that needed to be confirmed by other sensory features. Indeed, the lability of colour was integrated in the Galenic understanding of empirical observation to account for the inner material change of bodies over time. Consequently, the non-essential status of colour was not deemed an epistemic 'failure' in the medical tradition and would be a direct source of inspiration for learned alchemists to convey the material transformations of their substances.

Whereas the mutability of colours was deemed an asset to account for material change, it could also be perceived as an obstacle to the attribution of perennial characteristics related to substances. In the late Renaissance, Paracelsus and his followers considered the Galenic perspective on colour a failure or, at the very least, an unsatisfactory category, whose epistemic status needed to be redefined. In so doing, they overlooked the traditional analogy with humoral medicine, despite their keen attention to the many colours of substances

⁷⁶ Sylvain Matton, 'Fernel et les alchimistes', *Corpus: Revue de philosophie* (2002) 41, pp. 135–75; Elisabeth Moreau, 'Temperament and the senses: the taste, odor and color of drugs in late-Renaissance Galenism', *Early Science and Medicine* (2023) 28, pp. 526–52.

⁷⁷ Jean Fernel, *De abditis rerum causis*, in *Jean Fernel's On the Hidden Causes of Things: Forms, Souls, and Occult Diseases in Renaissance Medicine* (ed. John Henry and John Forrester), Leiden: Brill, 2005, p. 710: 'Id [oleum] autem duplex: unum tenue et albicans, alterum siccius atque rubens.' Also p. 712: 'Efficacior in oleo, multoque in rubente quam in albo: illud siquidem et odore, et sapore totius substantiam referens.'

obtained by distillation, and their diverse degrees of compliance with the notions of elements and qualities. In this regard, the Paracelsian conception of *tria prima* aimed to disrupt the Aristotelian and Galenic approaches to the components of the body by replacing them with chymical principles.

By challenging the traditional view of colour, the Paracelsian adepts introduced a significant shift, asserting that colour was a sensory property essential to defining bodies, rather than merely associating it with humoral hues from medical and alchemical traditions. While downplaying the humours for being composed of elements and qualities, they supported the chymical principles as endowed with an internal power (*dynamis*) which held alternative properties to the primary qualities, including colours, flavours and odours. Paracelsian physicians like Severinus buttressed these views by dissociating Galenic medicine from the empirical approach to bodily fluids and sensory properties, which they attributed to Hippocrates. Such a line of argument was common in the context of the Paracelsian appeal for *prisca medicina* as a vector of renegotiation of the intellectual references to ancient medicine.

Following this view, colours were no longer secondary qualities, but essential properties related to the main components of nature, which could be experienced through chymical operations. In emphasizing the chymical principles (Salt, Sulphur and Mercury) rather than the four humours, Paracelsian physicians ascribed colours and significant sensory properties to the celestial quintessence enclosed in these principles, instead of their elemental substrate. These concepts of quintessence and principles had a long history in medieval alchemy. In the Renaissance, their diffusion reflected the general appeal of Platonic views on the active properties of bodies and their connection with the celestial world, in the context of a craze both for intellectual reformation and for alternative drug making.

Yet Paracelsian physicians did not overcome the epistemic ambivalence of colours. On the one hand, they shifted their epistemic status from probable sign to essential properties that could build chymical knowledge. On the other, they could explain neither their specific relation to principles, nor their distinction from other essential properties such as odour and flavour. On this point, it was Du Chesne who proposed the most original explanation of colour in an attempt to clarify the properties of the *tria prima*. Yet Du Chesne's view on the mercurial nature of colour would be neither elaborated upon by his followers, as illustrated by the case of Beguin, nor challenged by a more convincing theory from his readers, such as Sennert. In sum, colours would retain their elusive status despite their significance in late Renaissance chymical medicine.

This shifting moment in early seventeenth-century chymistry complements the history of early modern theories of colours. First, it confirms the Paracelsian redefinition of colour as an ontological feature of bodies which reflected the relationship between the materiality of nature and the celestial world. Such a view not only questioned Aristotelian conceptions of colour in relation to light and opacity, it also disrupted the understanding of colour derived from Galenic medicine which was transmitted through medieval alchemy. Beyond the analogy with the humours, the conception of colours in learned alchemy was shaped by the Galenic views of matter and transformation in physiology, of sensory markers and drug assay in pharmacology, and of empirical observation and uncertainty in semiotics. This complex framework elucidates the Paracelsian reformation of the epistemology of colour as a humoral feature, a sensory property, and a sign of bodily change. Such parameters, in turn, modelled the early stages of the Paracelsian chymistry of colour, and paved the way for its elaboration in late seventeenth-century matter theories and natural philosophy.

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