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Cheesemaking in the Scientific Revolution

A Seventeenth-Century Royal Society Report on Dairy Products and the History of European Knowledge

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1 The Document

Sometime during the 1660s (the manuscript is not precisely dated), Royal Society correspondent William Jackson wrote a report to the fellows on the way in which cheese was made in Cheshire, one of the most renown regions for the production of good cheese in England. The five-page manuscript document details the work of the "dayrywomen" in all the phases of cheesemaking: from preparing rennet with the calves' stomachs to the pressing and smoothing of the curds with the hands, from pressing the cheese in a mechanical press to expel the whey to making sure that cats chase away rats when the cheese is seasoned in the "cheese chamber." The manuscript includes 7 images illustrating the tools of the trade. Why the fellows of the Royal Society were interested in cheesemaking? What was the significance of cheese as an object of knowledge in the context of the "new sciences" of the early modern period?

In this introduction, I will place practices of cheesemaking in the wider context of the relationships between the transformation of milk into cheese and the history of European knowledge from Aristotle to seventeenth-century Corpuscularism. In fact, in the 1660s, members of other important European scientific societies – including the *Académie des Sciences* in Paris and the *Accademia del Cimento* in Florence – animatedly debated issues of transformation of mat-

ter, coagulation of fluids, and artisanal manipulation of natural substances related to milk, dairy products, and cheesemaking. These seventeenth-century efforts at knowing the processes of cheesemaking belong to the history of Renaissance and early modern European science and medicine and concerned naturalists, physicians, agronomists, and natural philosophers. The history of cheesemaking and knowledge is made of several intertwined threads: from early chemical analyses to medical dietetics, from skilled artisanship to husbandry, from cosmology to embryology. By raising important issues of natural philosophy, cheesemaking functions as a seismographer recording the little shocks punctuating this "age of the new." Moreover, it functions as a case study for the history of knowledge circulation and knowledge mediators in early modern Europe, and it highlights the historical relationships between cognition and emotion.

2 Crafts and Trades at the Royal Society

The report presented here belongs to the "History of Trades" project of the Royal Society of London, running roughly from its foundation (1660) to the middle of the 1680s. The program proposed to collect information on crafts and arts in order both to improve such crafts and to learn about the processes of nature from the people who worked everyday with their own hands. Historians of British seventeenth-century science widely agree on tracing back this project to the ideas and writings of Francis Bacon and, later, of Samuel Hartlib and his circle, who both emphasised the "usefulness" of the new science.[1] Indeed, passages such as this one from the *Novum organum* (1620) seem to perfectly describe the experimental philosophy animating the members of the Royal Society who were most active in the History of Trades (including the president Henry Oldenburg, Robert Boyle, Robert Hooke, William Petty, Robert Moray, John Evelyn, and Christopher Merrett): "Among the parts of history I have enumerated, the most useful is the *History of Arts* because it displays things in motion and leads more directly to practice. Moreover it strips the mask and veil

1 See Walter E. Houghton, "The History of Trades: Its Relation to Seventeenth-Century Thought: As Seen in Bacon, Petty, Evelyn, and Boyle," *Journal of the History of Ideas*, 1941, 2/1:33–60; Kathleen H. Ochs, "The Royal Society of London's History of Trades Programme: An Early Episode in Applied Science," *Notes and Records of the Royal Society of London*, 1985, 39/2:129–158; Michael Hunter, *Science and Society in Restoration England* (Cambridge: Cambridge University Press, 1981), pp. 87–112.

from natural things which generally lie concealed or hidden beneath a variety of shapes and outward appearances."[2]

While the History of Trades is part of that process that both Marxist and non-Marxist social and economic historians widely describe as the spoliation of artisans of their skills and the birth of the modern factory worker culminating in the nineteenth-century, from the point of view of the history of science, the project has been considered mostly as a failure. This has been attributed to the excessive vastity of the program, the difficulties of communication between scholars and artisans, and the early loss of interest by the majority of the members of the Royal Society. In fact, while several reports have been published in the early years of the *Philosophical Transactions*, many of them remained unpublished. However, as one historian put it, "although the programme had few immediate effects on industry, it promoted a long-term development-the transfer of manufacturing knowledge from the craftsman to the engineer, scientist, and corporation."[3] The nature of this "transfer" – which could also be called "appropriation" – has in fact attracted the attention of many historians.

Since the 1940s scholars like Edgar Zilsel have penned a history of the scientific revolution centered around the idea that the scientific method has been created within the artisans' workshops,[4] while others like Robert Merton emphasized the relationships between science and the economic needs of seventeenth century England.[5] In more recent years the idea that Renaissance and early modern artisanal knowledge – or "epistemology" – led the way to the empiricism, the experimentalism, and the focus on observation and description of the new sciences has bloomed anew. Bodily engagement with natural matter and active pursuit of the inner workings and processes of transformation of nature have been tracked back to "invisible technicians" and artisans of all kinds and genders, in all kinds of settings – from the court to the marketplace, from the household to the alchemical workshop.[6] Elaine

2 Francis Bacon, *Parasceve ad historiam naturalem, Aphorismi de conficienda historia prima*, aph. 5. See *The Oxford Francis Bacon*, Vol. 11, *The Instauratio magna. Part II: Novum organum and Associated Texts*, edited and translated by Graham Rees, Maria Wakely (Oxford: Clarendon Press, 2004), p. 463.

3 Ochs, "The Royal Society of London's History of Trades Programme" (cit. note 1), p. 151.

4 Edgar Zilsel, "The Origins of William Gilbert's Scientific Method [1941]," in Id., *The Social Origins of Modern Science*, edited by Diederick Raven, Wolfgang Krohn, Robert S. Cohen (Dordrecht: Springer, 2003), pp. 71–95.

5 Robert K. Merton, *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago: The University of Chicago Press, 1973), pp. 173–190.

6 Steven Shapin, "The Invisible Technician," *American Scientist*, 1989, 77/6:554–563. For recent scholarship on crafts, markets and science see, as examples, Pamela Smith, *The Body of the*

Leong, discussing recipe collections, has pushed forward this historiographical trend by describing what she calls "household science," bringing about a kind of knowledge gained in pursuing collaboratively everyday activities that had much in common with the protocols of manipulation, observation, recording, and transmitting information typical of seventeenth century "high" science.[7] And sometimes, as argued by Pamela Long, the "high" and the "low," the artisanal and the learned become indistinguishable in the eyes of both the contemporaries and the historians.[8]

Closer to our case, Michael Hunter claimed that that the History of Trades project occupied a minor place in the early history of the Royal Society, and that its goals were primarily intellectual.[9] But in light of recent historiography, the two aims – usefulness and theory – cannot be separated anymore. The works of artisans such as cheese-makers actually influenced the intellectual or theoretical view of knowledge – and not just the knowledge-making practices – of the new sciences of the seventeenth century. It is true that dyeing, tanning, brewing cider, mining and all its applications, metallurgy, and instrument design were the most explored areas of craftsmanship in the History of Trades project. Cheese was a minor interest, mostly used by the fellows in experiments on spontaneous generation,[10] but still, it had wide-ranging connections and resonances with theories of nature and of the composition of matter. In this introduction I will explore such connections.

Artisan: Art and Experience in the Scientific Revolution (Chicago: The University of Chicago Press, 2004); Harold J. Cook, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age* (New Haven: Yale University Press, 2008); Alisha Rankin, *Panaceia's Daughters: Noblewomen as Healers in Early Modern Germany* (Chicago: The University of Chicago Press, 2013). For an overview see Eva Struhal, "Who Can Read the Book of Nature? Early Modern Artists and Scientists in Dialogue," *Nuncius*, 2017, *32*/3:501–513.

7 Elaine Leong, *Recipes and Everyday Knowledge: Medicine, Science, and the Household in Early Modern England* (Chicago: The University of Chicago Press, 2018), pp. 4–10.

8 Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400–1600* (Portland: Oregon State University Press, 2011), p. 7.

9 Hunter, *Science and Society in Restoration England* (cit. note 1), pp. 87–89.

10 Thomas Birch, *The History of the Royal Society of London for Improving of Natural Knowledge from its First Rise* (London: A. Millar in the Strand, 1756), Vol. 1, pp. 266 and 355. Most famously, Francesco Redi put rotting cheese in a state of semi-vacuum in a sealed glass jar and observed no generation of insects, concluding that rotting cheese was just a favourable environment for worms to place their eggs in, and not the cause for the creation of life. Redi's experiments had a deep impact on the problem of spontaneous generation, even if that book did not settle the matter; see Francesco Redi, *Esperienze intorno alla generazione degli insetti* (Firenze: all'insegna della Stella, 1668), pp. 102–103.

The most famous sixteenth-century miller, Domenico "Menocchio" Scandella, said under the pressure of the Inquisition: "I have said that, in my opinion, all was chaos, that is, earth, air, water, and fire were mixed together; and out of that bulk a mass formed – just as cheese is made out of milk – and worms appeared in it, and these were the angels. The most holy majesty decreed that these should be God and the angels, and among that number of angels there was also God, he too having been created out of that mass at the same time, and he was named lord with four captains, Lucifer, Michael, Gabriel, and Raphael."[11] Commenting on this passage, Carlo Ginzburg spoke of a "basically materialistic – and tendentiously scientific" cosmology that was alternative to creationism.[12] However, Menocchio's ideas can be placed in a wider context. No doubt, Renaissance and early modern cheesemaking could serve as an analogical resource for a cosmological way of thinking about the facts of generation, putrefaction, and decay. But in this period, cheesemaking also conveyed ideas about technology, skill, and ways of thinking about natural philosophy and theories of matter. This wide spectrum included cosmology, natural philosophy, and technology; it characterized, synchronically, the whole early modern period up to the eighteenth century.

There is a *will to know* that runs through the history of cheesemaking: the desire to understand this peculiar natural process of transformation of natural matter by collecting information from those who mastered such process in their everyday life. One should ask how these observations and artisanal practices contributed to changing the way knowledge was made and nature was known by physicians, natural philosophers, and natural historians. Connections existed between liquid cosmologies and techniques of manipulation of nature.

When looking at the history of early modern European knowledge with an eye to cheesemaking, many intertwined threads emerge. This introduction focuses only on a few of such threads, touching on the translation of practical knowledge into natural philosophy and chemistry, and the importance of cheese in a cultural history of proto-ethnology and the social sciences.[13]

11 Carlo Ginzburg, *The Cheese and the Worms: The Cosmos of a Sixteenth-Century Miller* (Baltimore: Johns Hopkins University Press, 1980), p. 53.

12 Ibid., p. 57.

13 An essay on gender and the embodied skills of cheesemakers in relation to the natural philosophers' observations is in preparation. Significant areas of study related to this introductory essay include the history of breastfeeding and the history of cattle breeding.

While descriptions of cheesemaking techniques circulated by the time of the Roman writers of *res rusticae* (a genre mixing husbandry, country life, gardening, economics, and agronomy),[14] early modern natural philosophers, and especially those chemically inclined, began to collect information on cheesemaking, to experiment with milk, rennet, and curdling, and to elaborate different explanations, breaking with the Aristotelian-Galenic tradition of natural philosophy and pharmacology. This phenomenon was part of a culture of experimental practice and of sharing empirical knowledge through letter and the exchange of notebooks. The Royal Society fellows were not alone.

For example, in the spring of 1669 the Parisian *Académie des Sciences* devoted a series of long sessions to the problem of the coagulation of fluids, involving the most prestigious physicians, natural historians, and natural philosophers including Samuel Cottereau Duclos, Claude Perrault, and l'Abbé Mariotte.[15] This statement from the *Mémoires* of the Académie, written in the eighteenth century as the opening of the summary of such discussions, is remarkable: "Not everyone is amazed by the fact that milk curdles. It is neither something curious nor something known by few people; on the opposite, it is such an ordinary thing that it is almost despicable. And yet Philosophers can find in it several things worth examining; the more this matter is examined, the more it becomes wondrous, and at that point science engenders admiration."[16] In this quasi-Wittgenstenian passage what we have in plain sight remains paradoxically hidden and in need of explanations. The academicians projected to interview peasants, dairywomen, cheesemakers in order to acquire the conceptual equipment capable of explaining the making of cheese out of milk. Duclos was charged of observing, reporting, and eventually replicating the "vulgar experiences" of the peasants. Some experiences – he claimed – had to be

14 The most famous of them, Columella (4–70 CE), devoted one section of his *De re rustica* on cheese making; see *On Agriculture*, 3 vols., translated by Harrison Boyd Ashe (Cambridge: Harvard University Press, 1941–1955), bk. VII, sec. viii, pp. 284–289.

15 Académie royale des sciences, *Procès-verbaux*, T5 (1669, Registre de mathématique), fol. 60r.

16 *Mémoires de l'Académie royale des sciences depuis 1666 jusqu'en 1699* (Paris: par la Compagnie des libraires, 1733), Vol. 1, p. 92: "Il n'appartient pas à tout le monde d'être étonné de ce que le Lait se caille. Ce n'est point une experience curieuse, & connue de peu de gens, c'est une chose si ordinaire qu'elle en est presque méprisable. Cependant un Philosophe y peut trouver beaucoup de matiere de reflexion; plus la chose est examinée, plus elle devient merveilleuse, & c'est la science qui est alors la mere de l'admiration" (my translation).

re-made behind the walls of the Académie in order to "confirm or contradict the inductions made from the observation of the vulgar experiences."[17] In the last decades of the seventeenth century Lorenzo Magalotti, former member of the *Accademia del Cimento* in Florence, noted in a manuscript all the details of artisanal cheesemaking, specifically insisting on the skilfulness of the makers' hands.[18]

These seventeenth-century actors operated against a background of philosophical knowledge on milk and dairy products. Around 1500 Aristotelian biology, on the one hand, and medical dietetics (i.e. that part of Hippocratic-Galenic medicine dealing with regulating human complexions through balancing the intake of food and drink) on the other, constituted distinct traditions concerning milk and dairy products.

Milk and its coagulation process play a fundamental role in mythologies about the origins of the world. With all due caution it can even be hypothesised that coagulation is a global and almost-universal way of understanding cosmological beginnings, birth, and the generation of all things. In the book of Job, he rhetorically asks God: "Did you not pour me out like milk and curdle me like cheese, clothe me with skin and flesh and knit me together with bones and sinews?" (Job 10:8–11, 18). In Hindu ancient cosmology milk transformations are compared to the generation of the universe – the "Churning of the Primordial Ocean of Milk." The famous iconography of the multi-breasted Isis is telling, as well as the classical Greco-Roman myth of the origins of the Milky Way.[19] Cheese and religious ritual have a long history. Renaissance Christianity found an expression of it in the cult of saint Lucius, protector of shepherds and cheesemakers, widespread in the Alps between Switzerland and Northern Italy.[20]

Aristotelian biology remained the central way of thinking about milk, cheesemaking, coagulation and transformation of matter in the Renaissance. Aristotle used cheese as an analogy, with this dairy substance becoming an explanatory tool in different parts of his work, and for different purposes. The

17 Académie royale des sciences, Procès-verbaux, T5 (1669, Registre de mathématique), fol. 60^{r}: "propres à confirmer ou infirmer les inductions tirées des observations faites sur les experiences vulgaires" (my translation).

18 Archivio di Stato di Firenze, Carte Magalottiane, ms. 212, transcribed and published by Piero Camporesi, *La miniera del mondo. Artieri inventori impostori* (Milano: Il Saggiatore, 1990), pp. 115–117.

19 Deborah M. Valenze, *Milk: A Local and Global History* (New Haven: Yale University Press, 2011), p. 15.

20 *San Lucio di Cavargna* (*San Luguzzone, S. Uguzo, Sant'Uguccione*)*: il santo, la chiesa, il culto, l'iconografia* (Cavargna: Associazione Amici di Cavargna, 2000).

process of coagulation of milk through the action of rennet (which came mostly from the stomachs of calves, lambs and goats) was useful for illustrating the process of generation of a foetus *in utero*: the rennet on milk acted just as active male semen on passive menstrual blood in order to create and shape human life; the formation of human skin as a crust made of dried flesh which captured the vapours of foetal concoction inside the body was similar to how rind on cheese is formed;[21] the processes of transformation of natural matter through the action of hot and cold elements; and finally, the process through which worms and insects could be generated spontaneously from rotten matter.[22]

In the most explicit way, Aristotle wrote: "The male provides the 'form' and the principle of the movement, the female provides the body, in other words, the material. Compare the coagulation of milk. Here, the milk is the body, and the fig-juice or the rennet contains the principle which causes it to set."[23] And later in the same work he went on: "The action of the semen of the male in setting the female's secretion in the uterus is similar to that of rennet upon milk. Rennet is milk which contains vital heat, as semen does, and this integrates the homogeneous substance and makes it set. As the nature of milk and the menstrual fluid is one and the same, the action of the semen upon the substance of the menstrual fluid is the same as that of rennet upon milk. Thus when the setting is effected, i.e., when the bulky portion sets, the fluid portion comes off; and as the earthy portion solidifies membranes form all round its outer surface."[24] In these passages one can see the essence of the way of explaining milk coagulation in natural philosophical terms: rennet solidifies milk by virtue of its heat, exactly like the male semen solidifies and "informs" the material in the female uterus; furthermore, the essential identity of blood and milk is established. In the second century CE Tertullian used Aristotle's embryological analysis to defend the theory of the trinity and the incarnation of Christ. He argued that God created Christ without sexual intercourse just as if he had created a perfect cheese from milk without the action of rennet. One sub-sect of the Montanists in Asia Minor during the 2nd century substituted cheese to bread as the Eucharist.[25] And traces of this

21 Aristotle, *Generation of Animals*, translated by A.L. Peck (Cambridge: Harvard University Press, 1942), II, iv (739b, 22–23), pp. 190–193.

22 Aristotle, *History of Animals*, translated by A.L. Peck (Cambridge: Harvard University Press, 1970), V, xxxi (556b, 22–30), p. 209.

23 Aristotle, *Generation of Animals* (cit. note 21), I, xx (729a, 10–15), p. 109.

24 Ibid., II, xx (739b, 22–30), pp. 191–193.

25 Paul Kindstedt, *Cheese and Culture: A History of Cheese and its Place in Western Civilization*

analogy have been found in the folk cosmology of twentieth-century Basque rural communities.[26]

These passages were based on the widely accepted Aristotelian theory of material change, which was detailed in the fourth book of *Meteorology*, a very important source for Renaissance and early modern natural philosophers and chemists.[27] Aristotle defined concoction as ruled by two active opposites – heat and cold – and two passive ones – moist and dry – "Concoction is maturity [...]. And the maturing process is initiated by the thing's own heat, even though external aids may contribute to it: as for instance baths and the like may aid digestion, but it is initiated by the body's own heat. In some cases the end of the process is a thing's nature, in the sense of its form and essence. In others the end of concoction is the realization of some latent form, as when moisture takes on a certain quality and quantity when cooked or boiled or rotted or otherwise heated; for then it is useful for something and we say it has been concocted."[28] The key concept was *pepsis*. It served Aristotle to explain a number of things, including digestion, the formation of the foetus, the ripening of fruits, putrefaction, and cheesemaking.[29]

Finally, this principle of transformation through the power of heat also formed the basis for the Aristotelian version of the idea of spontaneous generation, which crossed the cultural history of knowledge up until the nineteenth century, and even later. According to Aristotle, "the slightest quantity of putrefying matter gives rise to fleas (they are found taking shape where there is any dry excrement); bugs are produced out of the moisture from living animals as it congeals outside them; lice are produced out of flesh [...] Also an animal is produced in cream cheese which is getting ancient, as in wood, and this is considered to be the smallest of all living creatures."[30] This link between sexual

(White River Junction: Chelsea Green Pub, 2012), pp. 111–113. In medical embryology, the metaphor linking cheese and the foetus will slowly fade by the early seventeenth century, when the form/matter distinction will appear to be less interesting for physicians engaged in observing female "eggs" and to paint a different picture of sexual generation; on the popularity of the analogy up to the later Middle Ages see Joseph Needham, *A History of Embryology* (New York: Abelard-Schuman, 1959), pp. 84–87.

26 Sandra Ott, *The Circle of Mountains: A Basque Shepherding Community* (Reno: University of Nevada Press, 1993), pp. 208–210.

27 See Craig Martin, *Renaissance Meteorology: Pomponazzi to Descartes* (Baltimore: Johns Hopkins University Press, 2011).

28 Aristotle, *Meteorologica*, translated by H.D.P. Lee (Cambridge: Harvard University Press), IV, ii (379b, 21–29), p. 299.

29 Joseph S. Fruton, *Fermentation: Vital or Chemical Process?* (Leiden: Brill, 2006), pp. 2–4.

30 Aristotle, *History of Animals* (cit. note 22), V, xxi–xxii (556b, 22–30 and 557b, 1–5), pp. 209 and 213–215.

and spontaneous generation illustrates the centrality of milk and dairy products in cultural beliefs on transformation, birth, but also, and fundamentally, on decaying and rotting.[31] In Western thought, milk and dairy products were always thought of as in between life and death, as well as between civilization and barbarianism.[32]

Milk itself was a *homeomerous* substance (namely, a substance composed of apparently different parts but was still a unified, single substance) composed of two or three parts. For Aristotle, it had two components, the watery one (whey) and the earthly one (cheese).[33] Galen in some passages acknowledged the existence of a third part, oily and fat, the butter component, but he was not consistent at that.[34]

The best Renaissance theoretical synthesis on milk and dairy products was published in 1477 by the Piedmontese physician, traveller, and diplomat Pantaleone of Confienza.[35] He combined the principles of Aristotle's physics, mixed with Galenic physiology, as appeared in the Arabic sources circulating in the universities. Milk was to be understood as an exceeding white liquid (a *superfluitas*) generated from a double process of concoction in the female body. Food nourished the body mainly because it was transformed into blood by the physiological process of digestion. Menstrual blood, derived from the concoction of food and its transformation into blood, was divided in two: the purest part of it went from the vagina to the breast through the veins, where a second process of digestion took place, in which the blood became white and assumed the complexion of milk. The other part of menstrual blood, the impure one, was expelled. In the most basic terms, milk was simply cooked blood, or white blood.

This categorization was still widely accepted – if more and more called into question – by the 17th century. In his 1633 impressively informed *Lactis physica analysis*, Florentine physician and natural philosopher Gabriele Nardi

31 See John Farley, *The Spontaneous Generation Controversy from Descartes to Oparin* (Baltimore: Johns Hopkins University Press, 1977); Daryn Lehoux, *Creatures Born of Mud and Slime: The Wonder and Complexity of Spontaneous Generation* (Baltimore: Johns Hopkins University Press, 2017).

32 Valenze, *Milk* (cit. note 19), pp. 23–27.

33 Aristotle, *History of Animals* (cit. note 22), III, XX (521b, 17–25), p. 225.

34 Galen, *On the Properties of Foodstuffs* (*De alimentorum facultatibus*), edited and translated by Owen Powell (Cambridge: Cambridge University Press, 2003), pp. 123–126 (K. VI 681–689).

35 On Pantaleone see the essential work of editing and interpretation by Irma Naso, *Università e sapere medico nel Quattrocento: Pantaleone da Confienza e le sue opere* (Cuneo: Società per gli studi storici, archeologici ed artistici della provincia di Cuneo, 2000).

reviewed what the classical authors had said on the number of parts composing milk, and he also believed that the essential component of milk were three: whey, butter, and cheese.[36] The whole point was to explain how the component separated and joined together during the coagulation process. From this close relationship between milk and blood, early modern scholars will be pushed to investigate further the nature of these fluids, and especially the transformations that went under the name of coagulation, and to expand the realm of chemical analysis.

5 Dietetics and Consumption

As recalled above, milk and cheese were sometimes thought of in terms of the opposition between barbarism and civilization. In fact, despite being present as an important ingredient in European recipe books from Italy to England by the Middle Ages, and despite being widely desired as an object of gourmet tastes, cheese was also the object of a bad cultural and medical reputation.

Cheese was believed, among other things, to be fat and difficult to digest, causing kidney and bladder stones, producing constipation, hurting the stomach with its process of decomposition, and causing vapours ascending through the body and affecting the brain.[37] To quote a few examples, the Salernitan regimen, a widely popular book of easy-to-memorise dietetic advice widespread all over Europe, did not contain a positive image of cheese: "For healthie man may *Cheese* be wholesome food/But for the weak and sickly 'tis not good/*Cheese* is a heavie meate, both grosse and cold/And breedeth Costinesse both new and old."[38] Other authors were more resolute in condemning it. The famous French physician (also a poet and a historian) Symphorien Champier wrote in his popular *Rosa gallica* (1518) that "all kinds of cheese are bad for health: nobody would recommend them. They all are difficult to digest, they all breed constipation, bad humours and obstruct the intestine generating an excessive excretion."[39] In a 1529 dietetics handbook Peter Treveris concurred that "Cheese is a meate not very well dygestyfe and doth grate harme to them that hath a harde

36 Gabriele Nardi, *Lactis physica analysis* (Florentiae: typis Petri Nestij, sub signo Solis, 1634), pp. 206–210.

37 Galen, *On the Properties of Foodstuffs* (cit. note 34), pp. 129–131 (K. VI 696–699).

38 *The School of Salernum: Regimen Sanitatis Salerni, the English Version by Sir John Harington* (Salerno: Ente Provinciale per il Turismo, 1957), p. 39.

39 Quoted by Ken Albala, *Eating Right in the Renaissance* (Berkeley: University of California Press, 2002), p. 93.

lyver and mylte."[40] Here is how the humanist Bartolomeo Platina summed up common Renaissance Galenic wisdom on cheese in the late 15th century:

> The quality of cheese is derived from its age. Fresh cheese is cold and moist, salt cheese hard and warm and dry. Fresh cheese is very nourishing, represses the heat of the stomach, and helps those spitting blood, but it is totally harmful to the phlegmatic. Aged cheese is difficult to digest, of little nutriment, not good for the stomach or belly, and produces bile, gout, pleurisy, sand grains, and stones. They say a smaller amount, whatever you want, taken after a meal, when it seals the opening of the stomach, both takes away the squeamishness of fatty dishes and benefits digestion and head.[41]

But when it comes to food medical norms often differ from everyday life. During the Renaissance and the early modern period, cheese became increasingly popular and refined, a food worth of becoming the subject of gift-giving among lords and noblemen, an important economic resource for many European regions, and an elaborate way of stimulating the palates of the European rising middle classes. However, physicians, writers, and merchants all agreed that the cheese for the poor was different from the cheese of the wealthy. Cheese had always been one of the main sources of proteins for the European peasant populations, who made a rough, unrefined cheese which would have been unsavoury, socially unfit, and medically dangerous for the complexions of urban dwellers. For example, the seventeenth-century Dutch theologian and natural philosopher Martin Schoock believed that in general, habit was powerful: where cheese was eaten commonly and frequently, such as in Savoy and Switzerland, it was harmless; but if a noble man eaten it frequently, he could die.[42]

Beginning in the late Middle Ages, a slow and contrasted process of ennoblement took place that progressively modified the social and cultural image of cheese, which was associated with "barbarian" Northern and eastern popula-

40 Peter Treveris, *The grete herball whiche gyveth parfyt knowlege and understandyng of all manner of herbes and there gracious vertues* (1529), quoted by David Gentilcore, *Food and Health in Early Modern Europe: Diet, Medicine, and Society 1450–1800* (London: Bloomsbury, 2016), p. 67.

41 Platina, *On Right Pleasure and Good Health: A Critical Edition and Translation of De honesta voluptate et valetudine*, edited by Mary Ella Milham (Tempe: Medieval & Renaissance Texts & Studies, 1998), p. 159.

42 Martin Schook, *Tractatus de Butyro, accessit eiusdem Diatriba De aversatione casei* (Groningen: typis Johannis Collen, 1664), p. 220.

tions such as the Germans and the Scythians. Monastic culture was a mediator between high and low dietary practices, introducing models of popular consumption into elitist social milieus. At the same time, this new attention to cheese brought about a new culture of taste for it. In Italy more than in Northern Europe there are early signs of a more notable presence of cheese in the taste of the elite. By the fifteenth century, cheese became a fashion good in Italian humanist circles. In the early sixteenth century cheese appears to be solidly entrenched in the dietary habits of the upper classes, no longer as a mere ingredient but also as a product in its own right to be served at the table during a meal. All these factors contributed to modifying the plebeian image of cheese. But doctors were aware that different people must eat different food, according to their social rank. All medical texts and dietary manuals show this concern in differentiating the food for the poor from the food for the rich. The appearance of lowly foods on the upper classes tables was achieved with much caution and suspect, and thus it suddenly became crucial to distinguish the noble cheese from the peasant cheese.[43]

By the middle of the sixteenth century, agriculture and land cultivation entered a period of revolution. Fuelled by the reorganization of classical and medieval botany, a new agriculture began to take shape based on continuous rotation, alternation between agriculture and farming, and the beginning of a massive cultivation of forage.[44] This of course meant that animal products, meat and milk, became independent economic enterprises: cheesemaking and the sale of cheese reached larger scales, cheesemaking workshops became bigger, farms specialized in cheesemaking. In this period, landlords rent their lands to a class of "yeomen farmers." At the same time, a new wealthy class of urban merchants began to invest in country landholdings. England and the Netherlands became the major players by the seventeenth century, also counting on a global market. Cheshire cheese and Dutch cheeses – tasty, big, and beautiful – became symbols of refinement just like the more ancient and famous Parmesan cheese from the Northern Italian regions of the Po val-

43 Massimo Montanari, *Cheese, Pears, and History in a Proverb*, translated by Beth Archer Brombert (New York: Columbia University Press, 2010), pp. 25–35; Piero Camporesi, "Il formaggio maledetto," in Id., *Le officine dei sensi* (Milano: Garzanti, 1985), pp. 47–77; Anna Maria Nada Patrone, *Il cibo del ricco e il cibo del povero. Contributo alla storia qualitativa dell'alimentazione* (Torino: Centro Studi piemontesi, 1981), pp. 349–357; Allen Grieco, "The Social Politics of Pre-Linnaean Botanical Classification," *I Tatti Studies*, 1991, *4*:131–149.

44 Marcel Mazoyer, Laurence Roudart, *A History of World Agriculture: From the Neolithic to the Current Crisis* (London: Earthscan, 2006), pp. 313–353; Mauro Ambrosoli, *The Wild and the Sown: Botany and Agriculture in Western Europe, 1350–1850* (Cambridge: Cambridge University Press, 1997), pp. 1–11.

ley. Cheesemakers now did not merely respond to market forces, but actively shaped them: they developed new equipment, focused on a few varieties, created new packaging, and concentrated on cheese that could be durable and easily transportable.[45]

6 Fascination and Repulsion

The desire to know about the transformation of milk into cheese was not entirely a new feature of the seventeenth century. By late fifteenth century, as we have seen, learned physician Pantaleone of Confienza in his *Summa lacticiniorum* drew more specific connections between cheesemakers and Aristotle in the passages in which he described his travels through Western Europe while looking for new observations about cheesemaking. Pantaleone remarked that if one were to ask the cheese artisans why they preserve it in the way they do, "they would reply that they don't know the reason," because many of them "simply follow habit and tradition."[46] The physician was fascinated by the artisanal skills, mainly non-verbal, of the cheese-makers, who, even if ignorant of Aristotle's natural philosophy and Galen's theory of complexions, seemed to know better than others how to help out natural processes of transformation. And significantly enough, Pantaleone often calls these artisans *magistri* and *doctores* in their art of bringing about smooth surfaces out of fermenting and coagulating matter.[47]

In 1556, natural historian Conrad Gessner asked his correspondent Jacob Bifrun, a Protestant lawyer living in the Swiss Alps (Upper Engadina), to report about how local cheesemakers made butter and cheese. The result was a long letter containing passages like this one: "Then this material [milk cooked with rennet], which they call *Ponna*, is stirred with a long rod, until it settles. Then it is removed and transferred into a mould while the whey is pressed out. Then the curds are taken out and put on a little board and sprinkled with salt and surrounded by a skin, so that it doesn't expand [fall apart]. Every day for 8 days it is turned over and rubbed with salt until the cheese is made solid and dry [...] When that happens it is put into a dry place and smeared with oil so that it won't be infested with any rottenness."[48]

45 Kindstedt, *Cheese and Culture* (cit. note 25), pp. 180–181.

46 Pantaleone, *Summa Lacticiniorum*, in Naso, *Università e sapere* (cit. note 35), p. 188 (my translation).

47 Ibid., pp. 193–194.

48 The letter is printed in Jodocus Willich, *Ars magirica hoc est, coquinaria, de cibariis, fer-*

The examples of Pantaleone and Gesner show that cheese-making practices did play a role in the rise of what can be called proto-ethnographic enterprises. Between1701 and 1703, more than two centuries after Pantaleone, Swiss naturalist Jacob Scheuchzer travelled the Alps and accounted for the practices and customs of Swiss cheesemakers and cheese-eaters, as he says *historice*, as a dispassionate observer, without the erudition and philological zeal of his great Swiss predecessor, Conrad Gesner. He left a proto-ethnographic description of the tools and techniques Swiss cheesemakers used, accompanied by beautiful illustrations [fig. 1]. He described their housing, their way of making cheese, their best recipes, and above all their technical prowess and technological ability.[49]

Besides such accounts, cheesemaking was so present in the cultural imagery of the early modern period that it inspired complex physiological and psychological explanations of aversion or disgust for it. Martin Schoock wrote an entire treatise to explain cheese phobia.[50] In the first half of the seventeenth century, Venetian theologian and humanist Alessandro Gatti composed a "discourse" against cheese, in which evoked in vivid terms the feelings of repulsion cheese evoked in him and in those who felt disgusted by it. After all, cheese came from dirty animals, milk was milked by the unclean hands of rough shepherds, and "God only" knew "how many dirty animal hair ended up being incorporated in that kind of foodstuff!"[51]

7 Cheshire Cheese in Context

William Jackson's report to the Royal Society combined observation, description, and collection of recipes from these "housewives" and dairywomen who mastered the process of cheesemaking. For example, when describing how artisans knew about the consistence of coagulated milk, Jackson prescribed that the mass of cheese must be together and firm enough by proofing the matter with the hands. Clearly, Jackson also aimed at discussing cheesemaking according to regular, experimental protocols.

culis opsonijs, alimentis & potibus diuersis parandis, eorumque facultatibus (Zürich, 1563), pp. 220–227 (translation by Aelianora de Wintringham).

49 Johann Jacob Scheuchzer, *Ouresiphoites Helveticus, sive Itinera per Helvetiae alpinas regiones facta annis MDCCII. MDCCIII. MDCCIV. MDCCV. MDCCVI. MDCCVII. MDCCIX. MDCCX. MDCCXI* (London: typis ac sumptibus Petri Vander Aa, 1723), Vol. 1, pp. 54–57.

50 Martin Schook, *De aversatione casei* (cit. note 42).

51 Alessandro Gatti, *Il formaggio biasmato*, edited by Franco Minonzio (Milano: Consorzio Grana Padano, 1994), pp. 27–28 (my translation).

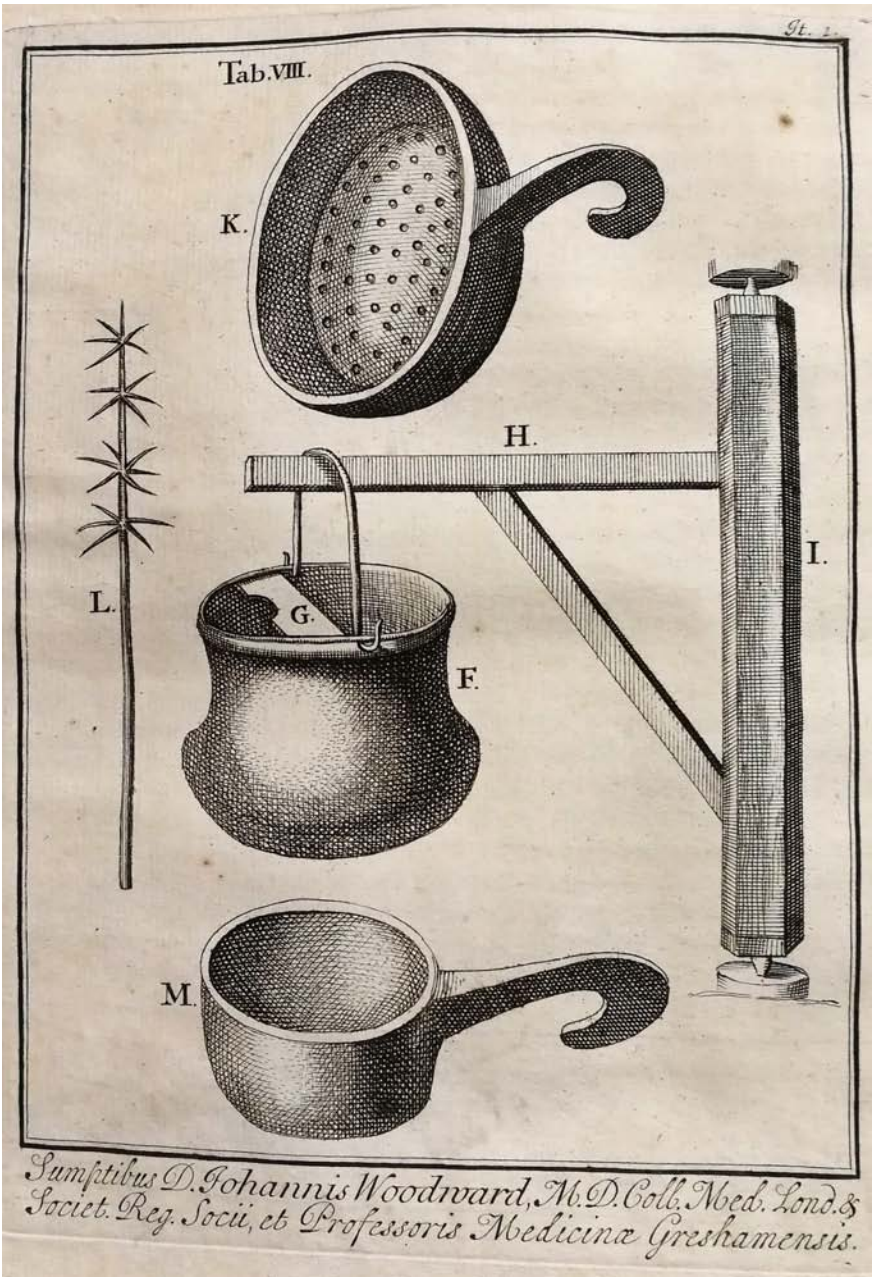

FIGURE 1 Johann Jacob Scheuchzer, *Ouresiphoites Helveticus, sive Itinera per Helvetiae alpinas regiones facta annis MDCCII. MDCCIII. MDCCIV. MDCCV. MDCCVI. MDCCVII. MDCCIX. MDCCX. MDCCXI.* (London: typis ac sumptibus Petri Vander Aa, 1723), Vol. 1. Tools for making cheese

By the time Jackson wrote his description, Cheshire cheese had become a very refined good, much sought after by the British gentlemen and women. It was simultaneously an object of knowledge, a sign of status, a commercial good, the embodiment of complex skills and technologies, and an object of desire. Significantly, in 1650 the first regular service of shipment of Cheshire cheese to London took place. London markets responded enthusiastically to that whole milk cheese. By 1664, around 874,000 pounds (440 kg) of Cheshire cheese arrived in London by ship after a 14-day trip; by the mid-1670s: 2,4 million pounds (1,1 million kg); by the mid-1680s: 4,8 million pounds (2,2 million kg); in 1725: 13,8 million pounds (6,3 million kg).[52] It has been argued that such popularity – caused by the floods and cattle disease plaguing the region of Suffolk, up until then the major source of cheese provision for London – changed farming practices in Cheshire. This change was characterized by a shift from a system of landowners to one of land investors and tenants specializing in dairy products, the increase of the herds of cows (now of 10 or more cows), the employment of a stable class of dairy-women, often jealous of their skills and their "gestural knowledge."[53]

Cheesemaking and fighting against rottenness were two sides of the same coin, and the history of cheesemaking can also be described as the history of "experiments in controlling rotting"[54] and decay. A few details regarding the cheesemaking process show that these practices required a remarkable degree of tacit knowledge, or "vernacular science" of matter. Modelling and salting the surface of cheese, for example, was not just a matter of aesthetics. In fact, the function of the surface of cheese was both to limit excessive evaporative moisture loss – the rottening from the inside – at the same time being porous enough to prevent excessive dehydration; and to protect the cheese from cracks and maggot infestation. While small cheeses had a salted rind which prevented excessive evaporation and the spoiling of cheese during aging, in contrast, large cheeses had much less surface area relative to their volumes. Large cheeses with high initial moisture could not dry out enough via surface evaporation

52 Kindstedt, *Cheese and Culture* (cit. note 25), p. 165.

53 Charles F. Foster, *Cheshire Cheese and Farming in the North West in the 17th & 18th Centuries* (Arley: Arley Hall Press, 1998), p. 14. Otto Sibum defined gestural knowledge as "knowledge united with the actor's performance or work," proper of people who were part of "gestural collectives" and "communities of skill." These artisans possessed a kind of non-written knowledge of how to operate on the natural processes, a type of knowledge that could be gained by observing and experiencing, mainly through bodily skills, the particularities of nature; see Otto Sibum, "Working Experiments: A History of Gestural Knowledge," *Cambridge Review*, 1995, *116*:25–37.

54 Kindstedt, *Cheese and Culture* (cit. note 25), p. 131.

before the rind formed and slowed down moisture loss. Salt was diffused less easily on large cheeses: this combination of high moisture and less saltiness could lead to fermentations and rotting. So large cheeses had to have, right after coagulation, lower initial moisture. This could be gained by squeezing most of the whey out of the curds during cheesemaking, either by cooking the milk at higher temperature, or by pressing the curds with large presses. Another way of making low-moisture cheese was to salt the curds, break them down into pieces, and then to salt them again when they are pressed. This second way of doing was adopted by the Cheshire cheese-makers described by Jackson. London cheese-mongers preferred the Cheshire cheese to be large-sized, in order to avoid reduction in size and deterioration in the complex itinerary from the farm to their warehouses. Cheshire cheese-makers "responded by producing cheeses of the same diameter but thicker and heavier." This meant that cheese had to be lower in moisture, that more salt had to be employed, and that more time was needed for the salt to be well distributed. One major technological breakthrough was the development of big presses with small holes to facilitate the exit of the whey such as the one described in the report.[55]

8 A New Science of Cheese

Parallel to this interest in observing and recording cheesemaking practices, a new ontology of matter emerged. Cheese was used already as a cosmological metaphor of generation from chaos as early as the fifteenth century by Florentine Neoplatonists and then by natural philosopher and reformer of Aristotelianism Pietro Pomponazzi in the early sixteenth century.[56] It is now widely known that alchemy played a very important part in the "scientific revolution." Alchemy could take two forms, one more "mainstream" and another one more "fringe" in the seventeenth century. On the fringe side, someone like Jean Baptiste Van Helmont, building on the Paracelsian chemical ontology, crafted a cosmological theory based on the notion of "Ferment," the universal and spiritual essence of all transformations he called *archeus*.[57] This archetypal Ferment

55 Ibid., pp. 168–170.

56 Paola Zambelli, "From Menocchio to Piero della Francesca: The Work of Carlo Ginzburg," *The Historical Journal*, 1985, *28*/4:983–999.

57 Walter Pagel, *Joan Baptista Van Helmont: Reformer of Science and Medicine* (Cambridge: Cambridge University Press, 1982), pp. 79–87; John Rogers, *The Matter of Revolution: Science, Poetry, and Politics in the Age of Milton* (Ithaca: Cornell University Press, 2018), pp. 118–119.

was based on multiple models, but Van Helmont explained its action through the analogies of making bread with yeast, fermenting beer, and curdling milk.[58] Paracelsus already talked about cheese as a "mysterium" – the spiritual principle of generation – and of the worms born within rotting cheese as one example of the universal cosmological process. For both Paracelsus and Van Helmont the Wild Man, or the *Idiota*, was the real and original knowledge maker, the man who transforms nature with his hands.[59]

According to Van Helmont, all kinds of mineral, human, and animal generations were fermentations. These ideas were picked up and made more "respectable" by a number of reformers of medicine and natural philosophy, among them Thomas Willis, professor at Oxford and future member of the Royal Society, who in his *De fermentatione* (1659) claimed that nature was full of fermentations, and all the things were both generated and generative thanks to the action of ferments, or better, to the movement of the fermenting particles composing nature. People like Willis understood the action of ferments materialistically, as the action of the small atoms of matter.[60]

Seventeenth-century chemically-inclined natural philosophers and experimenters, including Robert Boyle, transformed the spiritual elements Van Helmont talked about into material units, invisible to the naked eye – atoms, corpuscles, particles.[61] A new conception of matter slowly emerged from this, in which cheesemaking figured prominently. Gabriele Nardi had written that the only thing singular and unified in milk was its name.[62] The very influential German physician Daniel Sennert had written in 1636: "even though milk may seem one body, its whey, butter, and cheese reveal [the existence] of diverse parts mixed per minima, when they are separated. So, too, even if the blood of animals appears to be one homogeneous body, not only are diverse parts found to exist in it which supply food to the various members of the body, but if it should be distilled, a volatile salt which was not in evidence before adheres in great quantity to the flask."[63] Before the middle of the seventeenth century,

58 Jean Baptista Van Helmont, *The Image of the Ferment, Workes* (London: Printed for Lodowick Lloyd, 1664), pp. 111–112.

59 Pagel, *Joan Baptista Van Helmont* (cit. note 57), pp. 26–27.

60 Ibid., pp. 83–86.

61 Antonio Clericuzio, "Chemistry of Life: Ferments and Fermentation in 17th-century Iatrochemistry," *Medicina nei Secoli*, 2003, *15*/2:227–245.

62 Nardi, *Lactis physica analysis* (cit. note 36), pp. 168–171.

63 Daniel Sennert, *Hypomnemata physica* (Frankfurt: sumptibus Clementis Schleichii et consortum, 1636), pp. 113–114 (translation by William R. Newman); on this passage see William R. Newman, *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution* (Chicago: The University of Chicago Press, 2006), p. 165.

several natural philosophers believed that there was no such thing as milk as a whole, if composed, substance, but only combinations of particles.[64]

As Robert Boyle summarized in *The Usefulnesse of Experimental Philosophy*: "I shall not dare to think my self a true naturalist, till my skill can make my garden yield better herbs and flowers, or my orchard better fruit, or my fields better corn, or my dairy better cheese then theirs that are strangers to physiology."[65] Duclos' memoir to the *Académie* of Paris exhibits this new explanation of cheesemaking in its clearest form. In all the coagulations he experimented with, Duclos found two different separating substances: curdled milk, and whey. Curdled milk did not appear to be a new product, as it formed whenever milk was kept in a warm place through the movement – that warmness merely helped out – of separation of the solid and the liquid parts. Among the solid parts, Duclos called some "more sulphureous," others "more earthly." The liquid was the whey (*serum*), the sulphureous solid was butter, and the more earthly was curdled milk. As we can see, Duclos translated the traditional Aristotelian-Galenic threefold distinction into "chemical" terms. Butter went up to the surface of milk before curdled milk was ready; curdled milk coagulated then under the cream, and the whey appeared at the sides of milk. This separation was brought about by the mere warmness that helped out the movement of the parts, movement by which all juices separated themselves from the heterogeneous parts, and joined the homogeneous parts: it was a "spontaneous separation of the solid from the liquid." This meant that adding external substances, like rennet, only helped out and speeded up *the movement of the parts*, which was now the core of the coagulation process. For Duclos, the coagulation of milk was nothing but condensation of the solid particles of milk dispersed and floating in the white fluid. Curdling happened through the union of the solid parts which were "discontinuous, rarefied, and scattered" in the whey.[66] Here too, milk was not a unique substance, but a composite one.

Duclos described different qualities of the substances facilitating curdling. Some were so sharp that they helped out the movement of the parts of milk; others were astringent and therefore helped the particles to join together. Rennet was a kind of homogeneous yeast which could excite the movement of

64 On the importance of milk and its transformations for seventeenth-century chemically inclined natural philosophy, see James Riddick Partington, *A History of Chemistry* (London: MacMillan, 1969), vol. 2, pp. 156, 246, 445.

65 Robert Boyle, *The Usefulnesse of Natural Philosophy*, in Id., *The Works of Robert Boyle*, edited by Michael Hunter, Edward B. Davis (London: Pickering & Chatto, 1999), vol. 3, p. 295.

66 Académie royale des sciences, *Procès-verbaux*, T5 (1669, Registre de mathématique), fol. 64^{v}.

the parts, just as the yeast of bread excited the movement of the parts of the dough. Therefore, for Duclos, milk alteration – both when it curdled and when it putrefied – came from the internal movement of its parts. This movement was excited either by the air surrounding the liquid, or by the substances, like rennet, that were put in it. The mere warmness of the surrounding air makes milk to curdle because it excited the movement of the parts: the "cheese particles" (*partes fromageres*) join each other and separate from the *serum*.[67] This movement of the internal parts could either bring milk to corruption, or to coagulation.[68]

Cheesemaking ceased to be a process of separation and re-composition of milk's macro-components, but micro-molecules reacting to acid parts and recombinating while releasing gases and sugars. This will be more fully described by French and German chemists working in their new eighteenth-century laboratories,[69] but seventeenth-century cheesemakers, as they appeared in the learned observers' records, played a fundamental role in the process. Of course, a certain degree of speculation is needed here, since these artisans left nothing in written form and left no object and almost no material traces behind themselves – in this respect, they are different from both Zilsel's superior artisans and Smith's artisan/epistemologists, and their legacy much more difficult to capture.

9 Conclusion

The case of the history of cheesemaking highlights the powerful connections between emotion, the senses, and cognition. The material transformations of milk and cheese, and of milk into cheese, where the object of a complex combination of feelings: fear of putrefaction and pollution, fascination for the cosmological cycle of generation, and the economic interests of the makers of an increasingly valuable product. Piero Camporesi thus described this attitude towards cheese: "Pre-modern thought was puzzled by the coagulation of milk, amazed by its transformative processes, by the alchemical procedures of change, by the amalgam of those substances that hid the most intimate

67 Ibid., fol. 65^{v}.

68 Ibid., fol. 66^{r}.

69 Barbara Orland, "Enlightened Milk: Reshaping a Bodily Substance into a Chemical Object," in *Materials and Expertise in Early Modern Europe: Between Market and Laboratory*, edited by Ursula Klein, Emma C. Spary (Chicago: The University of Chicago Press, 2010), pp. 163–197.

secrets of life within their very composition, by the unknown mechanisms of decomposition and re-composition into new solid morphologies of that primary element."[70]

Cosmological threats and feelings of fascination posed by dairy products could also be linked with the systematic scheme of Galenic humoralism and dietetics. On this point, Isa Kuriyama persuasively argued that in order to understand pre-modern medicine – and science – we have to track the historically specific forms of emotions that silently sustained the Galenic humoralist framework.[71] The prevailing hostility showed by Galenic dietetic tradition towards cheese and dairy products probably favourite and intensified the scrutiny and the investigations of such products; in turn, these inquiries, combined with increasing cultural fascination and market value of dairy products, contributed to opening up the way to new – chemically based and corpuscular – ontologies of nature. This could also be described as a process of moving away from disgust towards curiosity and wonder.

Finally, the new early modern scientific habits of description, observation, and experimentation also contributed to a science based on the observation of the superficial features of matter, of processes happening on the surface of nature. This was also a process of translation, and appropriation, of household, farm, and vernacular knowledge into, and from, natural philosophy.

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70 Piero Camporesi, "Il formaggio maledetto" (cit. note 43), p. 47.

71 Shigehisa Kuriyama, "The Forgotten Fear of Excrement," *Journal of Medieval and Early Modern Studies*, 2008, *38*/3:413–442.

Royal Society, CI.P/3i/22

"On the Making of cheese, etc." by William Jackson
[*Diplomatic transcription, without orthographic corrections*]

[1] Our huswifes depending much on the runnett (which in this country we call stoop) for the proof of their cheese I shall think it necessary to lett a discription of the preparation of the stoop (or Runnett) precede the other of the cheese.

Runnet or Stoop: here made first to prepare the Baggs

Take the calves bagg, when tis newly killd, (the calf having suckt about an hour before he be killd) and hang it by till next morning: then, open it at the mouth, take out the curds, putt them in a bowl, pick them clean, and salt them all, and putt to them about 12 cloves, to the curds of one bagg, let the cloves be a little bruised in a mortar: mix them with the curds. Noat that if the curds be very foul (as in some calves they will be) they must be washd in a little milke, and pickt clean before you salt them. Then have in readiness the bagg, which as the taking out of the curds was to be turned the Inner side outmost, and so rubbed well with salt, and cleansed off with a cleane course cloathe, which done, whilst your curds were preparing, turne your bagg again that, that side may be inwards again, that was at first before it was opened; then putt in the curds, pickt and season'd as aforesaid, and fasten the mouth of the bagg with a stuett or packhthredd,[72] salt the outside of the bagg, and hang it by in the Chimny where a fire is constantly kept, keeping each bagg well covered with a white paper, or hang a clean cloath for about them as may defend them from dust food etc.: In this manner, a dayry woman must have many baggs prepared, which at London are known by the Name of Calves Road's or Runnett baggs: And our dayry woman will not willingly use these baggs till they are neer upon halfe a year old, nay some will not use them the same yeare they are prepared:

Queryes about the cause of the hollowness of Cheeses

And many are of opinion that if the Stoop be made of new baggs, it will be apt to make the cheese heave and be full of eyes; Others thinke that the baggs of bull Calves are apter to cause these mischeifes in cheeses; but I can not find out that there is a certainty what is the cause of it, or whither the cause lye in the baggs: I remember I have heard the huswifes in Kent impute it to the time of the Cows going to bull; and affirm that at such a time, the milke had such a working in it that was impossible to prevent cheese having eyes in it, more

72 A pack thread is a thick wine used to fasten things together. Thanks to Kathleen Walker-Meikle for the information.

than at other times: which is not alltogether without a seeming reason: for tis possible when the beast is driven with such a propensity, that it must be promoted by a strong fermentation in the blood and nervous juice; which can not but have some influence on the milke at that time, sufficient to continue it in the Curds, more than at other times.

[2] Those baggs may be used to make the Stoop 4 or 5 times, butt will be something feebler every time than other, after every time they are used they must be salted well on their outside and then hangd up to dry out and as first, and they are not to be used againe till they are thoughly dryed, which will scarcily be in 6 weekes.

To prepare the Stoop it selfe

Out of those baggs the stoop or Runnett is thus made. Take about 4 quarts of faire running water, boyle it with a good hand full of salt about a minute or 2: Then sett it by in an earthen pott till it be Thoroughly Cold; in this Water lay 3 of the aforesaid Baggs, let them stoop together 4 dayes; then take out the baggs, salt them on the outside, and hang them up to drye as aforesaid. The liquor in which they were stoop't is the stoop or runnett, of which they make their cheese, which ought not to be kept about a fortnight, for if it be kept longer will make theyr cheese have a strong sent; Therefore they prepare a bigger or lesser quantity, attending to the proportion of their dairy; as they may spend in that time, and against that time, allways have new ready prepar'd: but I have sett down the aforesaid preparation as a rule for all: –

The putting of the Stoop to the milk

Take a tubb full (that holds about 30 gallons) of milk when your milk is putt in (which you must be carefull to order so that all your milke be milkt as neer as may be together, to be of a due heat), That some part be not over Coold to Check the rest) I say to such a proportion of milk (yett pretty warme from the Cowes) putt in 3 spoonfulls of the aforesaid Stoop or Runnett: then stirr it about with a clean wooden bowle, that it may be well mixt with the milke so lett it stand about halfe an houre, with the wooden dish or bowl aforesaid in it turned the upside downwards: The Tubb in the meant time being close coverd with a wooden Cover: ffig:2: for the purpose: About half an hour after this aforesaid putting to of the stoop, tis time to try whither the cheese become enough (as they call it), which they know, if all the milk be embodyed pretty firmly together, like one entire jelly; and may easily be discerned by proofing the dish with your hand; if it be not sufficiently jellyed, tis a sign the stoop is too weake: therefore the next time you may putt in a spoonfull more, but for the present there is no other helpe than by hanging cloathes about the tubb to expect longer till it be sufficiently Comd.

Breaking the Cheese

Then lett the Dairy Woman with very cleane hands and the bowle, breake the Jelly all into pieces by stirring it about somewhat confusedly, which breaking of the curds will make way for the Issuing of the whey; Then lett her with her hands and the dish gently gather the curds together; To facilitate which, after a little while she may with her dish empty out part of the whey; and then by gently pressing with her hands by degrees lett her gather the curds into a narrower compass, and when they are better sadned empty out all the whey, and cutt the lump of curds in fewer plates cross with a knife; laying the Cheese ladder over the tubb preparing your vatt on it, begin to fill the vatt with the curds by parts,

[3] till half of your curds be layd on; but still as you lay each particle of the curds, lett your Thrutcheres[73] (so we call the helpers) breake each particle with their hands and fingers very well that the whey may issue well from the curds, and still as they breake, be sure to have them pressed with as many hands as can be imploy'd in the compass of the vatt: (for you must have 3.4:5:or 6 helpers according as your cheese is bigger or less) with helpers because they press upon the cheese with their hands with their whole weight (we call here Thrutchers) These as I sayd must continue pressing and Thrutching with their hands on the first halfe of your curds, till it be well closed, and have almost lost dropping any whey. Then turne this halfe cheese on one of their hands, and shake the vatt the bottom upward to have the Cheese there; then take of the Vatt, and see to the unstopping the whey holds in the vatt, and putt the cheese into it again gently, but the wrong side upwards: Then let your Thrutchers with their fingers as it were to scratch the top of the Cheese, and loosen much of the Curds on the smooth side, that the other halfe of the curds may close with the cheese in the vatt: on these loosned curds lay on the rest of your curds by parcells thoroughly breaking them in the laying on, then lett them thrutch as before till they have well prest out the whey, which in great cheese will be near 2 hours worke with their hands, thrutching with their whole weight till it have near done be dropping; and that the curds be everywhere with the weight and warmth of their hands entirely closed; Then turne the Cheese vatt upon one end of a cleane cloath large enough to cover it on both sides; and gently shake out the cheese on the cloath; then take it up by the cloath and lay it into the vatt: the smooth side upmost: which you must cover with the other end of the cloath, and with

73 From the middle-English "to thrutch": to press. Thanks to Kathleen Walker-Meikle for the information.

a thinn splent of wood (made like the blade of a knife) tuck in the edges of the cloath round about very well, and straightly;

Pressing the cheese

so carry it to the press * [*laying on a cheese board so much broader than the vatt], which usually bears about 300 weight, but more in bigger Cheeses; there lett it stand about two hours; Then take it out and turn it as before into another clean dry cloath, (with care, lest it receive some cracks) and putt it into the vatt, the upside down as before; so to the press with it again, there lett it stand about:4: hours; then in a new cloathe as before turne it against the upside downe (still in the same Cheese vatt) and sett it in the press: 4: hours longer;

Salting of Cheese

then take it out and salt it; stroking on salt on all sides gently, for fear of cracking, so salt it morning and evening with fresh salt turning the cheese every time the upside downe, and keep it in its vatt, to preserve the ffassion the better; and this course must be observd with cheeses of a mean bigness: (viz: of about 30: lb weight more or less) about: 4: dayes; but cheeses of 50 or 60: lb weight, must have both a hand full of salt mixt with their curds in the midst of them, at the laying on the latter halfe of the curds; and also be kept in this way of salting (but with much more care) at least.6. dayes; during this time, and also whilst it is in the press, as much of the cheese as

[4] is above the vatt, (for your cheese vatt should be fitted to your dayry that neer half your Cheese should be above the brims of your vatt) must be straightly bound about with a long narrow peice of cloath, as it were a swath; which keeps it to its fashion; and secures it from cracking (which great cheeses are subject to) till that side be turned downe againe into the vatt, at which time the same course must be taken with that side which is turned upward, as long as they are in the salt:

When their time of their salting sufficiently is past you must wash off the salt with a cloath wett in water, a very little warme, [illegible word] off the salt with plenty of water, then drye the outside of the cheese again with a drye cloath and lay it into your cheese chamber on broad smooth boards; [lay your Cheeses single the first yeare for if you lay them upon one another they will be apt to heat] then only remember that the dayrywoman turns this with with the other Cheeses every day anew, the upside downe; about a month or 5 weeks after, the Cheese will have cast out a hoary salt coat, which should be washt off as before, and then the cheese being dry'd again as before, needs no further care then to be turned, upside down with the rest of your dairy [on to every day]; which your dayrywoman must be carefull to doo as long as you keep them:

Note also that the Greater sort of Cheeses must be turned more in the press than your small Cheeses, and be suffered to stand in all night, (for noebody makes a great Cheese but in the morning) so much business, and care goes to the attending them;

Note that the cheeses should be salted in a coole place, which much prevents the heaving of them;

Annoyantes: sun, winds, raine

Your cheese chamber should be shaded from the extremity of the sun; for the same reason, and be fitted with shutts to keep out wipping cracking winds: and should be very safe from dripping of raine which quite spoiles your cheese:

Mice, ratts, catts

Mice or ratts also an annoyance, for which, besides trapps, nothing is better than a good catt or 2. provided you can prevent the catts from playing the theife themselves (which some catts will very much doo): but to prevent that if you hand a good she catt that is free from that fault; make her nest when she is great with young in a corner of your Cheese chamber, and lett her kittle there; and those kittlings being bred in the Chamber amongst the Cheeses will never feed on Cheese, provided you prevent their extremity of hunger with a small quantity of milke which your dayrywomen are aptly carefull to doo every milking time, for that helps the catts in heart, and prevents their ravening; and this is so considerable, that she which neglects it is, shall never be fre from having much damage in her cheese, both by ratts and mice;

The multitude of whey that is yearly made in this towne serves many or most of the poore for drinke, and besides for many sorts of pottages and puddings which they make of it; besides it serves the huswifes for butter for ordinary uses, and feeds their swine which are here kept in great plenty without any annoyance, for they are constantly kept up in stigh's never rambling abroad to doo any great prejudice: many make a certaine quirk sort of drinke of the clarified whey and sage, which drinks as brisk as botled beer; and it is good summer drinke:

Thus I have it made a long harvest of a little corne: for which I begg your excuse.

William Jacskon

[5]

ffig:1st: The draught of the Shape of the Cheese Tubb.

AA: the.2. eares whereof end hath a hole A* into which when covered: goes the :c. Pegg end of the handle of the cover: ffig:2: This needs no further explaining: tis usually from the ground to the brim: about a foot and half high: or an inch or 2. more or less: and in breadth about .2. foot and greater over: well girt with large broad plaind ashen hoops:

ffig:2: the Cover of the Cheese tubb: where A. noates the handle to take it off and on by: BB: the .2. nitches fitted to the eares of the tubb: C: the small pegg end of the handle fitted to fasten in to the hole A* in ffig: 1st

ffig:3: is a Cheese ladder as they call it, this they lay over the tubb, to support the cheese vatt whilst they thrutch the cheese: [milking pailes here, are the same that are used in Laundery]

ffig:4: is the form of a Cheese vatt of which a dayry woman should have severall of diverse sizes, and 2. or 3. of each size:

ffig:5: is the Cover of the cheese vat, which is only an inch oaken board turned round in a lath, and must be broader than the vatt: 2 or 3 of these are enough:

ffig:6: a schiagraff of the manner how the Thrutchers thrutch the Cheese:

ffig:7: is the scheme of a Cheese press which from topp to bottom you must imagin about .6. foot high: which is the most usuiall and convenient height for that purpose: wherein observe that A is the wooden winch that hath a strong forkett of iron for the making a forme by turning which about you raise all that weight of the press; B: the top of the press which is bored through for the serve: D: and hath in it 2. little holes d.d. to stick your peggs in, to stop the winch (when you have it at the height you please) till you can place your cheese in the press: this top of your press ought to be a very strong one for this bears the whole weight very often:

C.C: the 2. supporters, through the midst of each of which is cutt a niche to give roome to the armes of the pressing plank: ff:g: to slide up and down every time the press is moved: –

D: a strong iron warm serve which by the turning of the winch A: is by vertue of the screw forkett .a. before mentioned drawn up at pleasure, which Iron warm serve, hath at the lower end a strong hook which linking into the staple :e: strongly fastened into the pressing plank :ff: drawesh up with it the weight if the press:

E: the staple afore mentioned: H:H:ff: the pressing plank, which hath .2. armes ff:g: lett through the hanging planks II:II which armes slide up and downe through the Niches CC:CC:

G: the Cheese in press:

H:H: the Bearing planke which must be neer .4. inches thick: and cutt with cavity to lett the hanging planks I:I slip up and down through it:

I:I are the hanging planks which being as you see fastened to the bottom plank K:K which bears what weight you think fitt to use in the press: and putt over the armes ffig: of the pressing plank ff: draw that down upon the cheese:

H:H. be the hundred and half hundred weights placed as pleasure, as your caution requires:–

FIGURE 2 Royal Society, CI.P/3i/22: drawings accompanying William Jackson's report by an unknown author

L.L.L.L: are the .4. Leggs that support the whole:

K:K: the weight planke which does not reach the ground when the press is at the lowest:–

A thorough dayrywoman should have .2. of these presses else she will be at loss some times [fig. 2].