And they asked Baruch, saying, Tell us now, How didst thou write all these words at his mouth? Then Baruch answered them, He pronounced all these words unto me with his mouth, and I wrote them with ink in the book.

Jeremiah 36: 16–18

Don Felipe Avadoro was the most methodical man in early eighteenth-century Spain, or so the Polish writer Jan Potocki would have us believe. Every day he lived by the same routine. Even when his beloved young wife died in childbirth and he lost himself in grief, Avadoro continued to manifest an extraordinary devotion to an intricately precise daily routine of theater-going, greetings to the neighbors, and tobacco. Ten years of this “hypochondria” produced a home life distinctly strange. And the oddest element of all was that Avadoro took to making vast amounts of ink. The habit had been incurred after a conversation in a bookshop with some lawyers, who had been bemoaning the impossibility of getting good ink anywhere; several vouched that they had tried themselves to make the stuff. The bookseller, one Moreno, had then declared that he possessed a book of recipes that contained the solution to the problem. It took Moreno long enough to find the book that when he returned nobody except Avadoro was still interested. Avadoro immediately seized the book, found the appropriate page, and “was amazed to discover that he could easily understand something which the greatest minds in Spain considered to be very difficult.” All that was needful was to add a nutgall tincture to a solution of vitriol, and then mix in some gum, and a little alcohol to prevent the gum putrefying. But the text cautioned that the ink must be made in large quantities and kept hot. It must also be stirred frequently.

Avadoro bought the book and the very next day went out and got the ingredients. He bought scales, too, for weighing the proportions, and a huge flask—the largest in Madrid—to hold the ink. To his satisfaction, the process worked the first time. He brought a bottle of his ink back to Moreno’s shop, where the lawyers all avowed it “excellent.” From then on, gratified by the
praise, he devoted himself to making ever more of this precious liquid. He obtained a large Barcelona demijohn to hold his ink, which Madrid’s literati consumed as fast as he could produce it. Then, when the glassware proved too fragile, he sent to Tobosco for a clay jar (of a type used in saltpeter manufacturing) taller than a man; it could sit atop his continuously hot stove. A valve at the base of the jar allowed ink to be drawn off at will. If he clambered to the top of this assembly, he found that he could stir the mixture as much as necessary. Men of letters sent their servants to obtain his ink—and when notable books were published, Avadoro would reflect with pride on his own contributions. He was soon known far and wide as Don Felipe del Tintero Largo—Philip of the Huge Inkpot.

Meanwhile, Avadoro’s eleven-year-old son—whose birth had precipitated his mother’s death and his father’s grief—heard of the ink making and decided to come and see it. Elaborate arrangements were made, and the son was warned not to touch anything in the room. He duly arrived one Sunday, dressed finely and in a state of nervous excitement. He could barely sit still, and especially noticed the huge jar in one corner, alongside a glass-fronted cabinet containing the other equipment. He impulsively decided to climb on top of the cabinet. Dodging his aunt, he jumped on the stove and ascended to the top. But then word came that Avadoro was coming. Panicking, the son fell headlong into the jar of ink. Only the quick wits of the aunt saved him from drowning; she grabbed the pestle and smashed the jar. Ink and fragments of earthenware sprayed across the room. Avadoro, entering at that very moment, saw a black demon destroying his prized achievement, fled, and fainted. As for the son, he endured a long convalescence and then left the shameful scene for exile in Burgos. On the way, he declared his determination to travel as an armed gentleman. This he did—and on the first day, he became so enamored of the itinerant life that he became a gypsy, taking the name Pandesowna. By the time Potocki’s hero, the Walloon officer Alphonse van Worden, ran into him, Pandesowna was the leader of a bandit troupe, living the very antithesis of his father’s time-tabled and circumscribed city life.

This brief episode introduces only one of the hundred-odd interleaved tales that make up Potocki’s gothic/erotic/Shandeian masterpiece of the 1790s–1810s that goes by the title The Manuscript Found in Saragossa. Compared to the others, in fact, it is rather tame—it contains no incestuously sluttish vampires, no cabalists, no ghosts or zombies, no grave-robbing neo-Paracelsians, no Wandering Jew, no Inquisition torture chambers, and no

1. Potocki 1996, 134–40. MacLean’s introduction makes clear that no firm dating can be established.
grand Muslim conspiracy. Still, even lacking these features, the incident is an appealing one to introduce the topics of the present chapter. It may even be the case that Potocki had a point of his own to make with it—he was, in fact, responsible for launching a free press in Warsaw in the 1780s and quite possibly would have had to know about ink to do so. Certainly, as we shall see, he was prepared to have his ink-making patriarch bear a lot of allegorical weight.

But what attracts me about the episode here is the image of Pandesowna emerging from his near-drowning as, in effect, the Obelix of the Enlightenment. Every reader of today must surely recognize the reference to Goscinny and Uderzo’s French hero. Asterix’s friend famously fell into a cauldron of magic potion as a baby and incurred permanent superhuman strength, allowing him to contribute, albeit rather unawares, to a resistance movement against centralizing Roman authority. Pandesowna fell into a cauldron of the eighteenth-century equivalent to magic potion, namely, ink. Apparently it lent him a counterpart rebellious prowess, to which he was equally insouciant. The first question the tale raises for us, therefore, is this: What was so magical about ink in that era?

**Invisible Ink**

Ink has been an essential component of publicity, self-awareness, learning, culture, and knowledge for most of the last two millennia. In its different forms—and some of them are so different as to make the use of one term misleading—it has been one of the foundations of human culture in almost every civilization now remembered. It is more ancient than paper, although not as ancient as writing itself (which was first inscribed by a stylus rather than traced out with a pen). Every significant turning point or achievement of culture since antiquity has been at least registered, and often created, by deploying ink. And, digital innovations notwithstanding, this has not quite ceased to be the case yet.

And yet ink is all but invisible in history. This most basic of “media,” to call it that, seems merely a medium—it merits no attention in its own right as the trends and events it mediates flow freely. A striking example is the recent book by a colleague of mine at Chicago, Rebecca Zorach. Zorach’s *Blood, Milk, Ink, Gold: Abundance and Excess in the French Renaissance* uses the term *ink* as a synonym for *print*, and in particular for printed images. It does not

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2. Hobsbawm’s *Bandits* (2000) is the essential introduction to characters like Pandesowna.
examine ink itself at all. I say this not to criticize the book, but merely to note it as an outstanding instance of what is, in fact, universally true across the historical profession. Most remarkable of all, if we examine the burgeoning historiography of print culture, of the book, and of writing and reading—those suddenly fashionable fields, prone to extravagant claims for their ubiquitous significance—it is hard to find ink mentioned even there. This is not a disciplinary cluster that neglects subjects traditionally seen as antiquarian or marginal—including margins themselves. Yet ink does not seem to merit attention in, for example, Elizabeth Eisenstein’s *The Printing Press as an Agent of Change* (which is entirely silent on the subject, unless I nodded), or in my own *The Nature of the Book* (except for a few almost inconsequential references), or in Lucien Febvre and Henri-Jean Martin’s *l’Apparition du Livre* (where it is dismissed in a few words), or in Roger Chartier, or in Donald McKenzie, or in Marshall McLuhan, or in Walter Ong. The entire canon of this field, despite its announced focus, ignores the stuff. Yet what is being passed over is a substance without which not a single character of a single line of a single page of a single book could ever have existed. It is as though one were to write about the industrial revolution without mentioning coal or iron.

In part, the reason for the historiographic invisibility of ink is that we are all nowadays Pandesownas. We are submerged in a world of ink at an early age, with the result that we tend not to notice it as remarkable any more, nor to notice distinctions within the category *ink* itself. Moreover, in adult life we almost never see ink in, as it were, its natural state, as a liquid, let alone as a liquid in the making. It is always safely hidden away in some kind of cartridge, refill, or ballpoint pen. Unlike paint, we see it only in the form of the traces it makes. In sum, historians of our own era would no more appeal to ink in their accounts and explanations than they would to air. Ink is merely a constituent of the cultural atmosphere, a given, and not a subject in its own right. Like air—and unlike, say, paper, printing, or coal—ink seems to have existed in all distinct cultures we tend to think about in comparative terms (such as China, Japan, Russia, and the Ottoman Empire). Furthermore, ink seems to have been to all intents and purposes the same thing for long periods and across large distances. It is simply a black—or at least dark—fluid that makes a permanent—or effectively permanent—trace. What does it matter if the trace is more or less black, exactly how permanent it will prove, or what its chemical composition might be? The question need detain only antiquarians, connoisseurs, technicians, and artisans—all of them social species from

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which the modern historical profession has assiduously distinguished itself. To attend to ink would be to mark oneself as something other, and less, than a historian.

The result is rather ironic. The essential medium of all communication and openness is itself a mysterious, closed, secret substance. But this is not only a product of our own divisions of academic labor. It also derives in part from the early modern period itself, when ink recipes were peddled in books of secrets and of natural magic or else swapped in manuscript as valuable hints, and when successful practical knacks for making it were jealously guarded. As such, in the Renaissance ink was a powerful substance associated with chemical medicines, Paracelsian solvents, and the like.

This condition of invisibility nevertheless can and, I would argue, should be changed. In fact, ink has been not only an essential element in virtually all human practices of reasoning, recording, creating, and communicating, but a distinctly changeable one. It is even arguable that there is no one thing properly denoted by the word ink, for its properties vary enormously and it has historically enjoyed no common chemical or cultural composition. Some early inks were vegetable or animal in origin; some were mineral. Some inks were prized for the clarity and evenness of their black, while others were valued for their ability to be absolutely invisible (until conjured into opacity by some knowledgeable reader). The Renaissance knew “sympathetic” inks that used the powers of natural magic in the service of espionage and statecraft. The inks applied to textiles—a vast industry spanning the colonial world—differed entirely from those applied to paper. Among those applied to paper, printers’ inks differed entirely from writers’. Woodcut techniques required different inks from copperplate engraving, and letterpress different inks again. In each case, moreover, the kind of ink employed—its constitution, hue, viscosity, and so on—carried implications for the practices to which it could be subjected. The history of inks is the history of this variety—a variety not just of substances and colors, but of places, skills, personnel, and attitudes.

Making Ink

How and where was ink made before the industrial era? It is hard to answer that question because, if we went by textual records, we might well conclude that ink was scarcely made at all. There were no ink manufactories to speak of until the mid-seventeenth century and no sustained industry of ink making until quite late in the eighteenth. So there is no equivalent in this enterprise to

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4. For such collections of secrets, see Eamon 1994.
the profusion of records allowing us to reconstruct the daily life of workers in the Elzevir, Plantin, or Aldus printing houses. In practice, of course, ink making did occur and must have done so on a large and diverse scale. But it took place in settings primarily devoted to other practices and crafts. In particular, after the invention of printing in the mid-fifteenth century, printers’ ink was largely produced by printers themselves. But until the eighteenth century, when ink fell under the gaze of natural philosophers interested in the study of arts and trades, formal records of their processes remained extremely scanty, piecemeal, and sometimes even deliberately vague.

The records we do have take the form of recipes. They are enough to convey that making ink was not a straightforward business and that its associations were not those we might now assume. It was notorious among workers well into the nineteenth century that making ink involved long, arduous, “filthy,” and stinking labor and that it was highly dangerous; it might also take months of waiting to produce a cask of the good-quality stuff. We can see why from the receipts that circulated in the Renaissance as “secrets.”

Here is an early and rather involved example, taken from Theophilus’s *On divers arts*:

> When you are going to make ink, cut some pieces of [haw]thorn wood in April or in May, before they grow blossoms or leaves. Make little bundles of them and let them lie in the shade for two, three, or four weeks, until they are dried out a little. Then you should have wooden mallets with which you have completely removed the bark. Put this immediately into a barrel full of water. Fill two, three, four, or five barrels with bark and water and so let them stand for eight days, until the water absorbs all the sap of the bark into itself. Next, pour this water into a very clean pan or cauldron, put fire under it and boil it. From time to time also put some of the bark itself into the pan so that, if any sap has remained in it, it will be boiled out. After boiling it a little, take out the bark and again put more in. After this is done, boil the remaining water down to a third, take it out of that pan and put it into a smaller one. Boil it until it grows black and is beginning to thicken, being absolutely careful not to add any water except that which is mixed with sap. When you see it begin to thicken, add a third part of pure wine, put it into two or three new pots, and continue boiling it until you see that it forms a sort of skin on top. Then take the pots off the fire and put them in the sun until the black ink purges itself from the red dregs. Next, take some small, carefully sewn parchment

5. A good sampling of these is in Bloy 1967. In fact, the recipe remained the standard genre for information on printers’ inks too, at least until the nineteenth century. William Savage reprinted a series of them in his *On the Preparation of Printing Ink*, while proclaiming that “these recommendations would mislead every one who placed confidence in them” (Savage 1832, 21).
bags with bladders inside, pour the pure ink into them, and hang them in the sun until [the ink] is completely dry. Whenever you want, take some of the dry material, temper it with wine over the fire, add a little green vitriol [atramentum] and write. If it happens through carelessness that the ink is not black enough, take a piece of iron a finger thick, put it into the fire, let it get red-hot, and immediately throw it in the ink.⁶

In its specifics, this was rather more exact than the similar recipes that appeared in Baptista della Porta, in Antonio Neri, and in Pietro Caneparius’s De Atrametis (1612), but the broad process it describes was similar. The conjunction of a familiarity with rural nature’s timetables, an arbitrary precision in terms of quantities and periods, and an appeal to specific equipment and knacks (consider what is not said in this recipe) all resemble natural-magical receipts. Generally, these ink “secrets” invoked the use of minerals, soot, and vegetable and animal colorings. One from as early as the eighth century mentioned the use of the dregs from winemaking and the rind of a pomegranate, and these ingredients were widely repeated. Such old methods survived until about the early nineteenth century. But Gutenberg’s invention of the press demanded new, oil-based printing inks, and later the demands of mechanized printing machines would create another demand for innovation because of a shortage of ingredients, especially lamp-black. So a proliferation of techniques took place. Still, it remained the case that ink makers would put bread or onions into the mix, and as late as the nineteenth century a recipe testified that engravers’ ink was made from “stones of peaches and apricots, the bones of sheep, and ivory, all well burnt.”⁷

The variety of ingredients and protocols recorded in these “secrets” arose for a variety of reasons. Some may have been climatic—inks, as fluids, behaved differently in different temperatures and humidities, and printers knew well that their compositions must be adapted to their specific location of use (something that might extend to using different inks on the ground and upper floors of the same building). Moreover, “good” ink ought ideally to display a diverse range of qualities, some at odds with others: fineness of black, softness of varnish, thoroughness of mixing, clarity, mellowness, tone, strength of color, stiffness, resistance to filming or decomposition, and so on. The ink must have an “affinity” for paper so as to adhere, but not such as to tear off the paper’s surface. (Printers apparently often complained of inks on this score when the real culprit was poorly made paper). “Many efforts have

⁷. Plant 1974, 186; Carvalho 1904, 63.
been made to conquer these difficulties,” Hansard would remark in the 1820s; “many printers have thought themselves possessed of this *aurum potabile*.” But almost always an advance on one front meant a retreat on another. Certainly, no one published recipe ever fit the bill. It all depended on how, where, and by whom the recipe was put into effect.8

As secrets, ink recipes were typically juxtaposed to instructions for producing pigments for painting or colors for illuminating manuscripts, with dyes for textiles, and with medicines.9 Like making pigments, making ink was hard, unpleasant, long labor; and it was labor that imputed a certain grappling with nature’s powers and propensities. For artisans and alchemists, color was a sign of substance, and ink making partook of this conviction.10 Moreover, the oil-based ink required for printing originated, in all likelihood, in the experiments of artists with oil paints.11 Ingredients—including some remarkably exotic ones—were shared with the large dye industry. And in the ancient world both Pliny and Dioscorides had given recipes for ink that explicitly aligned it with pharmaceuticals, Pliny remarking that ink “may be set down among the artificial drugs,” and Dioscorides saying that his preferred mixture of smoke black from burned resin was also a good medicament against gangrene.12 All these realms were commercially important in the period, and all bore associations with magic and practical chymistry. And the association with medicines, too, was old and shared: lapis lazuli, which illuminators had used to furnish a brilliant blue in medieval manuscripts, was an apothecary’s exotic medicament. Michael Camille says that the illuminator was “part alchemist, part cook, and part botanist”; the ink maker for a long time had a similar, albeit not identical, constitution (that later evocation of the philosopher’s stone was not entirely warrantless).13 And there might even be a similar exoticism to the craft, ingredients for which might originate far afield in the realms of empire; an edition of the *Encyclopédie* was once seriously delayed because one of Paris’s two monopoly ink makers found his ingredients interrupted by the war of American Independence.14

One aspect of the association of ink with medicaments and chymistry deserves to be highlighted here. This was the concern for adulteration. If there

9. For example, see Wecker 1660, 328 –30.
10. See the chapters by Smith and Shell in this volume.
12. Carvalho 1904, 34, 76; Bloy 1967, 8.
was a pathology attending early modern materials in general, adulteration was it. It was everywhere suspected. Adulteration was a problem—of knowledge as much as of substances—that pervaded the worlds of reagents and pigments. It was most evident, perhaps, in the world of medicine, where it was a major incentive driving the production and policing of printed pharmacopoeias and a leitmotif of the struggles between physicians and apothecaries. But remarkably similar issues attended pigments and inks. If you bought a medicine from an apothecary, how did you know it was the genuine article, and of proper purity, and that it was not stale? If you bought ink, how did you know it was made to the correct recipe, had been prepared properly, and had stood for the requisite period? Answering that question might well be all-important, and especially so for the most prominent, high-profile publishing projects.

In large part the proliferation of these concerns reflected the dispersal of knowledge and skills. When ink making was done outside the printing house or home, a problem of trust necessarily arose, just as it did for patients and physicians requesting a remedy of an apothecary. Even a good recipe could be ineffective if the ink maker chose to dilute the ink down, reduce the intensity of its boiling, or decant it prematurely. If complaints of adulteration pervaded the world of ink in the eighteenth century, therefore, as they certainly did that of medicine, then this was largely because of a major change in the venue and personnel of ink making. Writing ink had long been produced within the household, this being one of the skills of “housewifery.” Peddlers also sold ink for writing, along with pens to use it. But printers demanded a completely different substance. The early ones, of Gutenberg’s generation, did make their own, either individually or in collaboration with other printers (there is some evidence in the Amerbach correspondence for this latter practice). There is evidence that ink making became the focus of chapel customs, including feasting on bread that had been fried in the hot linseed oil. But in many European cities by the late sixteenth century the enterprise had begun to be carried out separately on a sustained basis. The new University Press at Cambridge, for example, did buy equipment and raw materials to make its own ink, but for the most part had supplies shipped in from London or further afield; in around 1700 Louis XIV’s Imprimérie Royale tried to negotiate for the formula, only to be told that the Press’s ink was produced to a secret recipe by a firm in Antwerp.

15. There will be a longer discussion of this in my Piracy when it eventually appears.
production and outsourcing, and of commerce and secrecy, obtained toward the beginning of what was a long process of disaggregation. It occurred at a different pace in different cities. Paris had the first known dedicated ink maker in 1522. London may have had one (now anonymous) by 1660 or so, and certainly William Blackwell’s plant was operational in Clerkenwell by 1755. Dublin got its first only in 1765. In pre-Independence America, Isaiah Thomas recorded, most printers imported casks of ink from London, and Rogers and Fowle in Boston were “the only printers, I believe, who at that time [the 1740s] could make good ink.” The bad printing in the revolutionary war, Thomas continued, “was occasioned by the wretched ink, . . . which printers were then under the necessity of using.” More or less everywhere, the separation was complete by the early nineteenth century. At that point, as Hansard averred, “few printers, of any eminence . . . attempt to be entire makers of their own ink.”

Joseph Moxon, whose *Mechanick Exercises* (1683–1684) was the first comprehensive account of printing-house practices, outlined the unpleasantness, demanding character, and complexity of ink making that gave rise to this trend. Ink’s manufacture, he wrote, was “as well laborious to the Body, as noysom and ungrateful to the Sence.” It demanded bespoke equipment, long attention, and dedicated space in what were often cramped quarters. And above all, perhaps, it was dangerous. The fire boiling the oil had to be kept hot constantly for very long periods, but if the oil itself ignited, then it would burn eagerly; several recipes actually stipulated that the varnish should be deliberately ignited. The combination of oil, fire, and paper in close proximity was not an auspicious one, especially in a city like London, where the booksellers’ quarter stood alongside the smoldering ruins of St. Paul’s Cathedral, burned down in 1666. In Germany, at least, printers used to make an excursion outside the town itself and turn ink-making day into a twice-yearly festival (the bread fried in the oil was considered a delicacy and even medicinal, if patients could stand its smell). In France, we know that the eighteenth-century authorities actually forced one maker to stop working in a residential precinct. Master printers thus increasingly sought to abandon the work and instead buy their ink from ink makers. Still, even in the nineteenth century, Hansard could testify that “one of the most tremendous fires that hap-

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19. Thomas 1810, 121, see also 408–9.
20. Hansard 1825, 716.
22. Moxon 1683–1684, 82.
pened in this metropolis a few years since” had been caused by an unwary ink maker.23

As this separation occurred, so ink makers became a group—albeit a small one—in their own right. They began to be noticed as such and invited severally to the journeymen printers’ annual wayzgoose feasts. But at the same time the scope for adulteration arose and increased with the separation of ink making from printing. Ink makers, who were largely anonymous still at this time, became in effect the apothecaries of print—or, perhaps better, the druggists.24 They were relied on by the master printers but at the same time suspected of all kinds of underhanded and perilous malpractice. But good ink, Moxon said, depended on them. To be exact, the quality of ink was a reflection of “the Conscience of the Inck-maker.” And as the division of labor and knowledge became firmer, so that reliance grew more entrenched. Decades later it was still being said by those in the know that ink’s quality “must depend entirely upon the judgment of the printer, the liberality of the employer, and the honour of the ink-maker.”25 Conscience and honor: in other words, throughout the early modern period and on into the industrial, the permanence and readability of ink was based on the moral virtues of its maker. And this, again, was for much the same reason that the efficacy and safety of medicaments depended on the moral virtues of their makers. The first official standards for inks—ink pharmacopoeias, as it were—appeared in the United States in the mid- to late nineteenth century, by which time an ink manufacturer might advertise over a hundred pigments designed for specific conditions and machines, and no printer could hope to tell by inspection any more the properties of an ink.

There were various ways in which ink makers could produce poor quality ink, and Moxon listed some of them.26 They might use inferior linseed oil, or adulterate the oil with rosin and other substances. They might use new linseed oil that had not been allowed to sit for months to separate. They might not boil or burn it for long enough, in a bid to save on fuel and time, and to produce more ink (because less fluid would have boiled away). This risked producing an ink that was “smeary” and reluctant to dry. They might not

23. Hansard 1825, 723n.

24. A druggist was a wholesaler of common medical substances, on whom the apothecaries relied for some of their ingredients. Just as the apothecaries were distrusted by physicians, so the druggists were accused by apothecaries of sharp practices. The druggists were also more anonymous figures, based in the peripheries of the metropolis, and with little contact with the population of patients.

25. Hansard 1825, 620.

26. There is also a modern summary in Bloy 1967, 88–91.
clear the ink properly. They might introduce the blacking prematurely into the still-hot varnish, which ruined its quality. Or they stinted on the blacking itself, producing an anemically pale result. Each of these, Moxon stipulated, had real consequences for the resulting printed pages. It impinged on printability, and readers—especially the most influential readers—noticed poor quality work and remembered it. The *mise en page* of the Enlightenment depended on ink as well as paper, type, and composition.

In the period from Moxon to Hansard in the early nineteenth century, ink became the subject of eager efforts by natural philosophers and lecturers to analyze and improve it. For the first time, publications included not just “secrets” and recipes, but chemical arguments about the composition of inks and suggestions for how they might be improved. Don Felipe Avadoro was presumably a fictionalized manifestation of this interest, which gave rise to a series of publications. One of the most remarkable came from the experimental lecturer William Lewis. Lewis, a Fellow of the Royal Society, was one among several writers to take on the subject of ink as part of efforts to revive the long-desired links between experimentalism, commerce, and the arts. Proposing his work in 1748, he anticipated “no less than to lay the foundation of a philosophical and experimental history of arts,” based on a survey of their “capital ingredients and materials.” An analysis of ink was to play a major part in this project, the intent of which was to identify cases in which cheaper materials could be substituted for more expensive ones traditionally used, or domestic ingredients adopted in place of imported ones, perhaps thereby also creating new trades. And above all Lewis believed that identifying, reducing, and reusing “refuse” from certain trades, dyeing and ink making being his leading instances, would create substantial new value. “Experiments to improve printers’ ink” were explicitly offered. On the other side, the genre of printers’ grammars launched by Caleb Stower and Philip Luckombe (inheriting many of Moxon’s discussions) made the problems and opportunities of ink more visible. The first work devoted solely to printing ink appeared only in 1832, when the Printer to the Royal Institution, William Savage, issued his *On the Preparation of Printing Ink*.

The story of the establishment of industrial ink making is interesting partly because it shows that industrialization began in this field, before it moved to the far more familiar fields of papermaking and, at length, printing itself. T. C. Hansard, a champion of the changes then occurring, described

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27. Lewis 1748; 1763, 371ff.
28. Stower 1808; Luckombe 1771.
29. Savage 1832.
how. For centuries ink had relied on poor-quality lampblack, Hansard re-
called, until about 1760, when John Baskerville came up with a purer black.
Baskerville became widely famous for the quality of his printing, but that
quality rested not on his typography (as everyone thought) so much as on
his ink. His achievement spurred many rival attempts, with the first maker of
ink to establish a large manufactory in England being Beale Blackwell, who
did so in the mid-1780s. But the new techniques were not widely adopted
until the 1790s. At that point Baskerville’s old apprentice and foreman, a man
named Robert Martin, began his own ink-making operation in Birmingham.
Martin started buying up high-quality black from glass-pinchers and solder-
ers, whose lamps produced it as waste, in order to produce good-quality ink
for fine printing. For such printing, it proved unsurpassed—Hansard singled
out Forster’s Anacreontis Odaria, 1802, as the supreme exemplar, as well as
Dibdin’s Decameron. (Figure 5.1 is a sample sheet.) But the supply was too
small for Martin to extend his operations. Worse still, once workmen realized
that there was a demand, they began to adulterate the black itself.

These early attempts to reform the making of ink thus ran headlong into
the problem of artisanal adulteration.30 Another venturesome operator, Wil-
liam Bulmer, tried to get around this problem by making black himself, but
he found it too slow and arduous. Bulmer’s efforts inspired a “rage” for ink
making among printers. Suddenly, generations of resentment at the apparent
complacency of the ink makers boiled over: they acted as if they already had
achieved perfection, the printers complained, and, rather than conducting
research into improvements, preferred to put obstacles ahead of potential
rivals. A conflict between the master printers and the ink makers was inau-
gurated. It opened the whole realm of ink to entrepreneurial competition, in
an arena where an existing reputation might now be of no help at all. Sev-
eral new ink makers launched enterprises, assured of at least a sympathetic
welcome. Thomas Martin of Birmingham, nephew to the original Martin,
proved the most successful of them. Martin, like Bulmer, resolved to make
his own black. This he did using a custom-made set of glazed earthenware
vessels arranged in a large premises and operating on a massive scale. Martin’s
new technique took the black from a specially purified coal tar, which was
burned in this apparatus of tubes to yield a smoke that the apparatus col-
lected in seventy to eighty canvas bags (see figure 5.2). He declared that the
entire machine was a product of extensive experimentation and that only an
operator experienced in printing itself would have seen its virtues. Ink was
often the cause of “destroying the excellency of the work,” Martin pointed

30. See also Klein’s chapter in this volume.
Figure 5.1. Specimen of six-shilling ink, from the plant of T. Martin and Co., Birmingham. This specimen was intended to demonstrate the "exact shade" that the ink could produce "when worked with proper care" (Hansard 1825, appendix, no. 3).
Figure 5.2. Martin's ink-making plant. This patent specification shows an apparatus for burning refined coal tar to produce “spirit black,” from which ink is made. The coal tar is held in the tube BB, 19 feet long, and burns at the small outlets marked a. Smoke flows through the apparatus (GG is 30 feet long), depositing its coarser particles, until fine black collects in a series of at least 70 canvas bags 3 feet in diameter and 18 feet long, marked K (Martin and Grafton 1823, facing p. 260).
out in an address to the trade, because it could tear at the fiber of the paper, or not dry properly, or even turn the paper yellow. His manufacturing process was patented, and Hansard, who was a supporter, declined to say more, as it would not be proper “to lay open to the world an invention which has cost so much expense, time, and labour to perfect.”

Yet avoiding adulteration and uniting printers’ and ink makers’ skills in this one machine were not sufficient of themselves to free Martin from the combinations that were so much a feature of the printing industry in this era. (Charles Babbage would fall afoul of them shortly after Martin.) His address culminated in a warning of what Martin called the “insinuations” of other newcomers to ink making, who were apparently desperate to get his secret process “by the most despicable means.” This apparently meant luring his workers away from his plant and into their rival operations, so that they could launch their own ink-making enterprises. But “though they may succeed in getting our men away,” Martin cautioned, “still their knowledge of the business cannot by that means become enlarged.” Their problem was that they were “totally unacquainted with the nature of printing.” And this was the message that he sought to convey: progress in making ink must rely on master printers and ink makers cooperating in “research,” rather than “endeavouring to render every part of their respective knowledge mysterious and undefined.”

Martin did have a local rival for a while—an ex-druggist named Samuel Thornley—but his real targets here were practices that the trade had long tolerated more generally. He denounced what he called a “system of bribery and corrupt influence” that had obtained for years between ink makers and journeymen and that added as much as 7½ percent to the cost of printed pages. It was, he and Hansard agreed, an “evil” to which the whole trade must attend. And there is independent evidence for it, for it was much discussed by printers and craftsmen in these years. It does indeed seem that journeymen expected to be paid a “royalty” or “chapel money” by the ink maker and, if such payment were not forthcoming, would retaliate by alleging that the ink was poor or adulterated or even by sending it back (on one occasion adding a dead cat inside the cask). Martin’s and Hansard’s charges thus brought claims for progress in ink itself into alliance with those for utility and political economy in printing. And these were battles that had to be fought; the

31. Hansard 1825, 721, 928–31; Martin and Grafton 1823 (filed in 1821).
33. Hansard 1825, 929.
practices and customs they were assailing were widely honored and of long standing in the chapels. The same conflict thus raged over ink in these years that Babbage would encounter in the publishing industry more generally. At stake were both the role of progress in print and that of print in progress.

In short, ink as a substance in this period serves as something of a proxy for many aspects of modernization. It reflected the shifts from craft to industry, from domestic production to manufacturing, and from natural magic to collaborative research. The concerns for credit that attended pharmacy in its own development also attended ink throughout the period. For a printer (or a reader) preparing to use ink, these concerns might become critically important—a major project like an edition of Shakespeare might stand or fall in the market according to the quality of its printing, and ink, printers knew warily, was crucial to achieving the requisite standard.

Using Ink

Printers testified frequently from the mid-seventeenth century onward about the paramount importance, not so much of ink itself, as of ink and skill conjoined. The achievement of a printed page depended on both being deployed harmoniously, in a specific location that might affect each. This elaborately choreographed scene is actually better documented for us than the practices of ink making, because master printers from Moxon onward repeatedly portrayed it, and modern historians have done much to restore to view the work that pressmen did.

Briefly, the part of the pressman’s work that is relevant here began with the “rubbing out” of old leftover ink from the top of the vessel, where it formed a film. This must be done carefully, because residual particles of film could otherwise spoil the impression in various ways (of which printers had a taxonomy). This done, the pressman could proceed to “beating”—the application of ink itself. This seems to have been a highly refined skill. Its tools were two balls. Printers’ balls resembled round-headed mallets, but with broad and round surfaces that allowed for the uniform application of a layer of ink. They were made from sheepskin by the printers themselves, using skins from which the hair had only just been removed. The skin must be thoroughly soaked in chamber-lye (urine) before being removed and “curried”—that is, stretched backward and forward around a “currying iron” to remove water and lime and make the skin pliable. It was then trodden on until it stuck to the printer’s foot, and spread out as thinly as possible on a convenient

press–stone. A used skin was put on top as a lining, using old ink to make them adhere. Wool cardings were laid atop this pairing, one by one, “knocking up” the ball itself. The ball was finally dipped in lye again, and scraped with a ball knife to clean it. It was then dried on paper until it would take up ink uniformly. The whole thing was by common consent a “filthy, troublesome, uncertain process.” One contemporary described it as one of “the nastiest processes imaginable, which converted the press room into a stinking cloaca”—testimony that may have been more than metaphorical, given that printers’ balls were often left to soak in urine overnight.36

Pressmen used balls in pairs. The ink was spread onto a stone and then taken up in the balls and dabbed onto the type in the form. There was a distinct skill to this, such that just enough ink was applied, and with the requisite uniformity. Moxon remarked that it required “a craft (acquired by use) in the Handling of the Balls” such that in taking up the ink they could be rotated from right to left hands so as to get a an equal distribution. “This is Hand-craft,” he added, “which by continued use and practice, becomes familiar to his Hands.” In beating, the balls were dabbed sequentially up and down the form, being held with their handles almost vertically upward in another complex but habituated motion designed to prevent nonuniform application.37 And all this was done as part of a routinized set of “Formal Postures and Gestures of the Body” performed at high speed in synchronization with the pulls of the other pressman on the press itself, to make impressions.

In short, the application of ink was a finely tuned, exquisitely timed practice. The appearance of pages depended on the quality of the skill with which it was conducted. But this was precisely the kind of craft phenomenon, along with its counterparts in ink making, that came under sustained pressure in the later eighteenth century from ascendant convictions about political economy, laissez faire, and the division of labor. A key component of those convictions was that progress would lie in the replacement of human skills—seen now as capricious and replete with potential for monopoly and combination—with machinery, even to the extent of automata.38 In the case of printers’ balls, there was an additional focus of criticism in that they were seen as central to a practice that was wasteful. Long before the Victorians made such a virtue of analyzing factory systems in terms of “work and waste,” Lewis’s analysis of ink concentrated precisely on the reduction and reuse of waste products in that process. In the printing house, likewise, the use of balls involved a

38. For example, Schaffer 1999.
substantial amount of ink being scraped off as dried crust and discarded. So when a new device, the roller, appeared toward the end of the century and swiftly supplanted balls in many printing offices (partly because they were less smelly), the abandonment was hailed in the light of political economy as an elimination of waste. None other than Babbage would try to elevate it into a major moment in the development of a modern communications economy.

But Babbage was not the first to see things this way. Charles Mahon, Third Earl of Stanhope, is now recalled as the inventor of an iron press (among many other devices); but in fact his printing experiments began with the desire to reduce the waste associated with the use of balls to apply ink. Stanhope carried out extensive experiments, seeking some way of using a roller to do the same job. The idea was simple (and not original), but making it work in practice was fiendishly difficult for want of a smooth material out of which to fashion the roller itself such that it had exactly the right properties of retaining and releasing ink. He reportedly tried every kind of substance imaginable, and all failed. In the end, the solution was discovered by chance coating a device then used in the Staffordshire potteries called a dabber. From this, printers adopted a “composition” of glue and molasses. Various recipes soon appeared for this “compo,” some boasting, as Hansard dryly noted, “the recommendations which distinguish the recipes of ancient physicians; namely, a vast variety of articles with counteracting properties.” Hansard himself added a virulent poisonous substance called Paris-white to his own compo. At that point, it became an artful compound of “vegetable substance,” “animal substance,” and “earthy substance,” allowing it to display the necessary contradictory properties. This substance was then coated on a wooden roller by a special process, and permitted the replacement of the old printers’ balls. It seemed an entirely progressive change, from caprice, filth, and waste to reliability, cleanliness, and efficiency, and it was widely adopted very quickly. The invention, Hansard reported, had freed the printing house from “offensive effluvia,” saved large costs in wool, skins, and time, and eliminated most of the waste in ink. But it was not entirely unambiguous in practice. John Johnson, a devotee of fine printing, still pronounced judgment decisively for printers’ balls and against rollers. And printers found that the compo would sometimes become “sick” with some mysterious but presumably climatic “ailment” that prevented its use. At that point the predictability of the machine could only be sustained by the intervention of the craftsmen. Even the layout of the printing house could affect the susceptibility of the

tool to this sickness; Hansard himself found that being on the ground floor changed the composition he needed.\(^{40}\) Still, he insisted on its positively epochal significance. Without the roller, “no machine-printing would ever have succeeded.”\(^{41}\)

This was very much Charles Babbage’s view. In his *On the Economy of Machinery and Manufactures*—the most influential and wide-ranging account of the new age published in late Georgian Britain—Babbage made printing into the archetype of all industry. The ability of machines to produce exact duplicates, he argued, was the basis for all prosperity and progress to come. Repeatedly he returned to printing processes to make this point, nowhere more impressively than when he described an experiment undertaken at a London printing house to prove the essential importance of machinery in making economic efficiency possible.\(^{42}\) “The rapid improvements which have taken place in the printing-press during the last twenty years,” he began, “afford another instance of saving in the materials consumed, which has been well ascertained by measurement, and is interesting from its connection with literature.” But in fact what he described was not so much an improvement in the press as a change in the use of ink. He recalled how pressmen had traditionally used balls to spread ink, but this had generated waste that had to be scraped off the balls as a crust; it had also meant that the ink layer itself was never uniform, since it varied with the skills of the men. Babbage claimed to have measured the waste with a modern press using rollers at half the level of the old process. Furthermore, this new machine was admirably suited to the introduction of steam power; it therefore had the potential to add a vast economy of time to that of material. “The most perfect economy,” Babbage concluded, could only be produced “by mechanism.”

**Substance and System**

One industrial ink maker of the twentieth century insisted that ink is not a *substance*, properly considered, but a *system*.\(^{43}\) It has a chemistry and a physics; moreover, it exists and takes effect only in symbiosis with people, places, processes, and papers. There should ideally be a kind of dynamic equilibrium between these various components of a creative industry, but the equilibrium

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41. Ibid., 623.
42. Babbage 1989, 8:44 – 46.
43. Voet 1952, vii. (In point of fact, by declaring that inks were “physical systems,” Voet was drawing attention to their physical properties, fluid dynamics, energetics, and the like; so I am stretching his point here.)
is in practice inevitably unstable and has to be shored up all the time by those most closely involved. Change the paper used in a press (or in handwriting, for that matter), and the ink and equipment might well have to be changed too if the consequences are not to be ghastly—and very costly. And this is not just a point about the relativity of perceptions. The viscosity, opacity, and color of ink varies with humidity and air temperature, and different inks have very different “affinities”—to put it in eighteenth-century terms—for different papers. So constant corrections are needed even for an unchanging quality to be the result.

In consequence, far more could and should be said about inks historically. More needs to be said about colors, for example, and about the aesthetics of the page in the Enlightenment. To cite a minor example, in 1764 a Dublin printer announced a pamphlet printed entirely in a green ink which, apparently, was “not only a Preservative, but also a Restorative to Sight.” From roughly that decade onward, an increasing panoply of color theories can be found aimed at printers and ink makers, and (slightly later) emerging from them. The quest was to find color combinations that would endure, that were aesthetically harmonious (on a scientific basis), and that facilitated reading. Such efforts still persist in different forms today.

More could also be said about the various diversifications that took place in inks with the creation of new arts—arts like lithography, stereotyping, linotype, typewriting, and the various forms of digital printing. In each case there is a tale to be told about the problems and opportunities furnished by the adaptation of inks in new settings. The tale severally requires elements of intellectual history, the history of technology, the history of chemistry, and even the history of aesthetics. In this realm these are inseparable constituents.

Furthermore, the traces made by ink can, of course, be read in different ways themselves. In the eighteenth century, the first attempts were made at chemical analyses of ancient inks, aimed at determining whether they were the same as those currently in use (and hoping to explain in some cases their apparent superiority). Papyri recovered from Herculaneum were closely examined in this spirit, not least by Humphry Davy, who spent months at the site seeking ways to unroll the ancient documents and took the opportunity to examine their ink too. Later in the nineteenth century, inks were subsumed into the forensic gaze of the law in its bid for scientific evidence, and

46. Davy 1821, 204–5.
a new armory of techniques was brought to bear to read them as evidence about fraud, forgery, or worse crimes. Inks became the equivalent in the domains of recording and communication of fingerprints in the domain of the body.\textsuperscript{47} As with the making and use of ink, its construal too has a history that tracks—and perhaps underpins?—what historians have come to recognize as major currents of development in the modern era.

It is appropriate in this light to conclude by returning briefly to the bandit Pandesowna, our Enlightenment Obelix. At intervals in later life—when not being imprisoned in underground torture chambers by sadistic ducal widows, leading gangs of gypsy desperadoes in battle, cutting a dash on the king’s galleys, dealing with mad Newtonian system-builders, and so on—the youth would hear tell of the continued devotion of Don Felipe del Tintero Largo to his ink making.\textsuperscript{48} Eventually it came to a climax. Some new neighbors moved in next door to the old man—an aunt and niece named Cimiento. Avadoro found to his delight and wonder that the daughter had a glazed cupboard filled with “the brightest colours,” as well as gold dust, silver dust, and lapis lazuli—in short, all the materials for an illuminator. Eventually, curiosity about this broke through the man’s routine and reserve, and he discovered that she was engaged in making wax seals from these colors. A symbiosis beckoned: he could write letters in his ink, and they could be sealed with her seals! He went back to Moreno’s bookshop and found the local literati equally enthused. That night, in a kind of eroticized appeal to traditional sensation theory, “he dreamed about sealing-wax.”

Then the daughter gave Don Felipe three bottles of red, green, and blue ink that she had apparently made herself. At Moreno’s once more, the colors impressed a finance ministry official who was accustomed to using special secret inks of these very hues in official documents. Don Felipe left in high excitement. “Once home, he fetched his recipe book and found three recipes for green ink, seven for red, and two for blue. They all became confused in his head, but the beautiful arms of Señorita Cimiento were clearly etched in his imagination. His dormant senses were aroused and made him aware of their power.” To cut a long story short, he married the niece. But the Cimientos proved to be tools of an unscrupulous manipulator, who harangued Don Felipe with a diatribe about the evils that ink like his had caused in the world, broke his precious ink-making bottle—dousing Don Felipe and flooding his home in the process—and jollied him into going through with the wedding. The new Señora Avadoro immediately revealed herself to be, in fact, a

\textsuperscript{47} Compare the very general comments in Ginzburg 1986, 96–125.

\textsuperscript{48} For example, Potocki 1996, 333, 347.
“flibbertigibbet,” and the manipulative relative got hold of Avadoro’s savings. Faced with such disruption to his routine, and no longer able to make ink, the devastated old man fell into a fatal lethargy. He recovered only temporarily when Pandesowna himself—whom he failed to recognize—stole into the house to rebuild the precious ink flask. Don Felipe expired.

“That is the end,” Pandesowna concludes, “of the story of my childhood.” It is a story of ink making, reason, and passion, and what is compelling about it is just how much it evokes at once: the bureaucratization of the state—registered here in its special colored inks; the bookshop as proxy for the public sphere, and Don Felipe’s imagination that, in fueling that sphere with his ink, he is in some sense a substantial contributor to its culture; the rebellion of the gypsy and bandit; the storm of sensation and sensibility, in the imagery of eroticized impressions and seals; and the sempiternal debate about the moral status of ink and print themselves, voiced with no subtlety whatsoever by the unscrupulous interlocutor. All the principal cultural currents of the age converged at once. When they did, they culminated in a smashed bottle, a tragic-comic death, and an unstauchable flood of ink that washed away all tradition, honor, and decorum in its path.

**Primary Sources**

Secondary sources can be found in the cumulative bibliography at the end of the book.


