I am writing this article in bold, retroexperimental fashion, using a technique found rarely in the modern publishing world: handwriting, using pen and paper, those dead-tree tools seen by technophiles as historical curiosities, like clay tablets or Remington typewriters.

Why do such a thing in a keystroke age? In part I do so because handwriting is becoming a marginal activity, in society and in my life. We type more than ever before, and it’s not uncommon to meet people who have ceased writing by hand altogether, their scripts withering like vestigial limbs.

I can’t shake the feeling that my thinking is different—more measured, more rich—when mediated by hand rather than machine. People whom I ask often tell similar stories. The bulk of their words are delivered by keyboard, but they still make lists, take notes, outline texts or compose their thoughts by hand. They, too, feel handwriting engages the mind differently.

The feeling alone is certainly unscientific. It could be an illusion or confounded by factors, such as the difficulty of checking e-mail on paper, that have nothing to with handwriting’s cognitive properties. Skeptics might contend that modern children, weaned on keys and screens, will wield their devices to equal effect. As long as we write, what does it matter how?

So goes the conventional wisdom. Every other major millennial technological shift has occasioned hand-wringing concern: we worry about Internet addiction, friendships trivialized by social media, e-readers supplanting physical books, screens turning kids into stimulation junkies. Yet apart from writer Philip Hensher’s lovely The Missing Ink, a book that plumbs handwriting’s cultural history, the dwindling of this technology, central to civilization’s rise, has gone largely unremarked.

As it turns out, only a few researchers have studied handwriting’s relation to thought, and their findings are in early-draft
form—but the draft suggests that us pen-clutching holdouts may be on to something. Pens and pencils do seem to engage things. The geometries are so rich that forensic analysis can be very challenging. But the draft suggests that us pen-clutching holdouts may be on to something. Pens and pencils do seem to engage things. The geometries are so rich that forensic analysis can be very challenging. But the draft suggests that us pen-clutching holdouts may be on to something. Pens and pencils do seem to engage things. The geometries are so rich that forensic analysis can be very challenging. But the draft suggests that us pen-clutching holdouts may be on to something. Pens and pencils do seem to engage things. The geometries are so rich that forensic analysis can be very challenging.
The Scientific Letter

The beginnings of an answer lie, appropriately, with letter perception. Seeing either handwritten or typed letters naturally stimulates visual activity, but the former also produces motor activity, although we remain physically motionless. At the neurological level, a scripted letter is both visual and physical.

Marieke Longcamp, a cognitive scientist at Aix-Marseille University in France, refers to this phenomenon as an embodiment of perception and has investigated its consequences in a series of experiments that test children on their ability to recognize letters, a task of deceptive simplicity to a literate adult. Discerning b and d or understanding that A and a are the same characters is only easy because we have practiced for so long.

When Longcamp trained children still learning the alphabet to write letters by hand, they more readily recognized the letters than when she taught them the appropriate keystrokes, as she described in a 2005 study. A year later Longcamp saw a similar pattern in adults, but with an interesting twist. Over several weeks she taught adults to handwrite or type unfamiliar Bengali letterforms. Immediately after training, handwriters and typers were equally adept at recognition tests. After several more weeks, though, dramatic differences in recall emerged. Letterform knowledge accumulated by hand persisted, whereas typed learning dissipated.

Longcamp attributes this difference to the motor activity that seeing handwritten letters triggers. Because reading a scrawled character seems to activate the neurological instructions for penning it, the mere act of reading the letter replays it anew in our mind. “This memory doesn’t exist in the keyboard,” Longcamp says.

Those studies are not definitive; they involved just a few dozen participants, and the inevitable caveats attend. Yet they fit into a continuum of complementary findings, the next of which come from cognitive neuroscientist Karin James of Indiana University Bloomington. James is interested in functional specialization, which is the way parts of the human brain are fine-tuned to process faces, colors and motion without conscious thought.

Letters also attain specialization, but unlike colors and motion they are almost certainly not evolutionarily hardwired. Instead, James surmises, letter specializations develop during childhood, through exposure to language, raising the question of whether different types of exposure affect specialization.

James observed people’s brains as they looked at letters and letterlike shapes in a pair of experiments in 2008 and 2010. When they have been taught to write those forms by hand, activity in functionally specialized letter areas is greater than when they have learned the keystrokes. Moreover, as she described in a 2012 paper, seeing handwritten letters not only triggers the expected motor activity but even heightens activity in purely visual areas. Hands help us see.

James attributes this facility not to Longcamp’s mental-letter-replay mechanisms but to the way our hands produce subtly differing letterforms with
every iteration. Even a practiced writer rarely produces two identical letters, and the effect is more pronounced in children. As James describes it, child letterforms are still “noisy relative to the model” and in aggregate make up a mental library of the many variations a single letter can take.

Letter recognition is a fundament of reading. It is also crucial to spelling, an ability that predicts many high-level language skills, such as translating ideas into text or expressing concepts clearly. “If this process is different according to writing mode, it can affect the whole reading process,” Longcamp says.

Such millisecond-level neurological processing can cross into real-world relevance, as the work of Berninger at the University of Washington reveals. Berninger led an exceptionally thorough, five-year-long study of 128 children as they learned to write. She and her colleagues tracked their subjects on various cognitive and academic measures, from how their fingers tapped in sequence to spelling ability, memory and communication skills.

Key to a 2009 publication emerging from this study were the serially coordi-

ated finger movements, which renowned psychologist Karl Lashley proposed, in the mid-20th century, as a foundation for basic cognitive functions. In the 1990s they were shown to underlie handwriting as well. While performing them, students showed marked differences in brain activity usually related to language and working memory. The latter—one’s capacity for keeping and organizing information in mind, such as an essay writer simultaneously grasping facts she intends to convey, her overall argument and a just completed sentence—is indispensable to complex reading and writing.

Outside the scanner, these activations in turn tracked with letter-forming ability, handwriting legibility and ultimately the students’ fluency of expression. “It’s legible, automatic handwriting, when you just ask kids to write the alphabet from memory, that was the single best predictor of not only spelling accuracy, but the quality and amount they composed,” Berninger says. She considers hands to be “the end organ of the language system.”

The Next Chapter

Berninger emphasizes that her findings need to be replicated, but the studies consistently point to the importance of handwriting in child development. The message comes at an opportune time: the so-called Common Core standards, a set of guidelines issued in 2010 to unify state curricula in the U.S., has set off a national discussion about handwriting’s place in school.

Much of the discussion involves cursive education, which went unmentioned in the standards, leading to its formal abandonment by Indiana and Florida. The ensuing backlash prompted eight states, including California and a chastened Indiana, to affirm cursive’s importance. Cursive aside, the educational trend is nonetheless away from handwriting. It is taught less rigorously than in the past, and typing is ever more common in ever lower grades, a drift reflective of handwriting’s dwindling in society at large. Kathleen S. Wright, handwriting product manager at Ohio-based education company Zaner-Bloser, says teachers often tell her about children who start school without ever having seen an adult write by hand.

“Everybody in the writing community says it’s better to begin writing by hand,” says behavioral scientist Thierry Olive of the University of Poitiers in France. “When you type, you don’t have movement.” Yet once students are old
enough, can pens and pencils be dropped, like training wheels on the way to typing’s 10-speed bicycle? On this question, research goes fuzzy. Writing in the adult sense is more than letterform and character recognition. It is a mentally recursive process, an ever shifting, feedback-looping interplay between thoughts and knowledge.

In some circumstances, the text-manipulating powers of word-processing programs seem to aid complex thought. The programs also offer a sheer speed that, for some people, ultimately feels more true to mind than handwriting. David Slomp, a literacy education instructor at the University of Lethbridge in Alberta, thinks this automaticity is what matters: as long as the letters flow, keyboarding is just fine. And just as Stephen Peverny, an educational psychologist at Columbia University’s Teachers College, can offer anecdotes about students swapping laptops for notebooks because they better remember handwritten notes, some studies suggest the opposite.

There is, however, one aspect of writing that hints at a unique role for hands. Writing also seems to have spatial properties, a dimension revealed in experiments on writing with distractions. Texts composed while writers trace shapes with one hand, for example, engaging their brain’s spatial processes, are uniquely disorganized compared with texts composed with background noise flashing on a screen and contain fewer new ideas. Minds encode the relative locations of words and paragraphs, a blueprint of thought without which text may be less differentiated, a pile of beams rather than a scaffold.

Here, it seems, is a possible intersection for handwriting’s physical aspects and higher-level properties. Perhaps hand-formed letters, inscribed more deeply in our mind, are building blocks for sturdier mental architectures. However speculative and untested a hypothesis, it resonates with many people’s experiences. Often, Haas says, students reported that “somehow with the computer, I can’t get a sense of my text. They used that term, over and over. Maybe they were not understanding the structure of their text.” The benefits of pen and paper may then be traced, at least in part, to what they offer as interfaces: the ability to easily make squiggles and arrows, to write between lines, to integrate text with diagram. For all the effort expended on programs for brainstorming and mind-mapping and outlining, those functions remain clumsy on computers.

One’s writing experiences and preferences are ultimately personal, varying by situation and mental habits. Such is the case with people I interviewed for this article: Marieke Longcamp types documents that can be annotated reference material. I feel that I know the text more than usual. Years from now I will likely remember this story more fully than those I have typed, which sometimes I encounter online with no memory at all of writing.

Is that sentiment scientific? Not in the least. Would you have the same experience? Not necessarily. Could it be ascribed in part to the extra days that handwriting required or the subject’s closeness to my heart? Quite possibly. But I can report, in this nonconclusive, N of 1 study, with no controls or standardized metrics or objective behavioral outcomes, that writing by hand felt good, even right. M

**PERHAPS HAND-FORMED LETTERS, INSCRIBED MORE DEEPLY IN OUR MIND, ARE BUILDING BLOCKS FOR STURDIER MENTAL ARCHITECTURES.**

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