



Current Comments®

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Is Shorthand the Route to Success in Science or Anything Else? Part 1. History and Evolution of Stenographic Languages

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Any experienced journalist can perform a credible job of reporting on almost any subject you can name, but it is reasonable to expect that a writer will perform better or feel more comfortable with those subjects in which he or she has had some personal experience. My choice of topics for *Current Contents*® (CC®) is colored by the random events of my life. In particular, the subject of shorthand systems is one I've wanted to cover for a long time. My reasons are quite varied. As you will observe, shorthand is not only a topic of major scientific and business significance. Its linguistic, historical, sociological, and technological ramifications are fascinating.

Presumably, the two major aims of shorthand are to reduce redundancy and to convey as much information as possible with the smallest amount of writing. These goals are certainly laudable, particularly in this verbiage-ridden age of the "information explosion." In the first part of this essay, I'll discuss the history and development of the major shorthand systems, including stenotypy. The second part will deal with the impact of dictation machines, tape recorders, and other modern technologies on shorthand in the workplace.

My early interest in stenography was accidental. When I graduated from Columbia University, New York, in 1949, with a major in chemistry, there was a significant recession in the US. I tried in vain to find a job as a chemist. Some of the large pharmaceutical and chemical

companies that now use ISI® products regularly were not hiring recent science graduates—at least not those in New York City.

In desperation, I responded to a classified ad for a sales correspondent at the LaSalle University Correspondence School. The basic requirement was typing skill. By another "accident" I had learned typing in high school. Having failed a few courses in history and English, I made up the missing credits by taking a few "easy" subjects, namely, typing, mimeographing, office practice, and bookkeeping. I used these skills to great advantage in college and in business.

As an employee of the school, I not only learned their techniques of mail order and telephone sales but was allowed to take courses offered to students through ads in *Popular Science* and other magazines. One of the courses was stenotypy. I had learned the basics by the time I left that job to return to chemistry. A small consulting lab on the East Side of New York, Evans Research & Development Corporation, needed a chemistry technician to help with "research" on shampoos, denture powders, and other projects. At Evans, I spent the first week doing viscosity measurements. But a few weeks after I arrived, another accident occurred. My boss asked me to take the minutes of a conference with a client. When I turned in my typewritten notes an hour later he was quite surprised. Although I had only

used some of the short forms I had learned in stenotypy, I was a rapid typist and remembered what I had missed. When I suggested they buy me a stenotype machine, it was decided that it would not be practical to push the machine around the lab. More important, they felt that taking notes so conspicuously in the presence of a client would be too disquieting. So I returned to doing titrations. One day, I felt the consequences of an overheated beaker of sulfuric acid. As I was weighing some reagents on the other side of the lab, the beaker exploded. Fortunately, it only burned the back of my lab coat. So I jumped at the opportunity presented by another chance event.

My cousin, Sidney Bernhard, was taking his PhD at Columbia with Louis P. Hammett. He needed a lab assistant. Naturally, I seized the opportunity to return to Columbia. Hammett introduced me not only to physical organic chemistry but also to the world of chemical literature.¹ His personal library included a complete set of *Chemical Abstracts*, and he was also editor of a chemical book series published by McGraw-Hill.

I soon found out that I was more interested in creating an index to the departmental closetful of chemical compounds than in the exhausting, often dangerous job of preparing picrate compounds *de novo* in the lab. After my second or third explosion, Hammett tactfully suggested that I should try another field.

I decided to apply for a job as a secretary to the director of research at the Ethyl Corporation, Detroit, Michigan. He wanted someone who could take traditional dictation, so I quickly enrolled in a stenography course at a business school in downtown New York. I was thus exposed to real shorthand. Were it not for yet another accident, I might have gone to Detroit as a chemical secretary.

It was now 1951, I happened to attend my first American Chemical Society meeting. There I met James W. Perry,

who was pontificating about information retrieval and chemical literature like a fundamentalist preacher.

After listening to his lecture and a few others, I realized that some people were actually *paid* for doing the kind of work I loved. I asked him how I could get a job in this field. That's how I was converted to information science.

From that point on, my life changed, and within a few months I was working at Johns Hopkins University, Baltimore, Maryland. Perry had introduced me not only to the world of punched cards but also to the world of scientific documentation.²

During those early years, I remember how the experiences of Broadway producer Billy Rose impressed me.³ He had advised young men to become stenographers and secretaries in order to prepare themselves for corporate success. Being secretary to the boss was the fastest way to learn all about a business. It was the shorthand route to success. Since then I have often wondered why more young men do not realize this. It is unfortunate that society views secretarial work as somehow demeaning. It certainly lacks the machismo often associated with factory tasks. However, computerization and automation in the factory and office have changed all that. We've all become information technologists of one kind or another.

At the Johns Hopkins University Welch Medical Library Indexing Project, I met many people from the Army Medical Library, now the National Library of Medicine. One of them was Robert Hayne.⁴ He was a remarkable typist and stenographer in addition to being a classicist and linguist. When I became a consultant, I helped recruit Hayne for Smith, Kline and French Labs (SK&F). A short time later, Irv Sher came to SK&F. Sher was a biochemist, but he had also studied Chinese in the army. And he had a special interest in shorthand systems—even those for Chinese. We all shared an interest in

chemical and scientific nomenclature along with other facets of information science. Later on, Hayne and Sher came to work at ISI where we experimented with many systems involving the nomenclature-notation interface. So it is not surprising that ISI was one of the first organizations to use a chemical shorthand system after we started *Index Chemicus*[®] in 1960.

Sher is now director of development and quality control here at ISI. He has maintained his keen interest in shorthand systems. He has even designed a system of his own—Sherhand. He notes that thousands of shorthand methods have been developed throughout history in most languages.⁵ The origins of shorthand, however, are somewhat unclear. John Robert Gregg, author of what is perhaps the best-known shorthand method in the US, was also a shorthand historian. Shorthand was used by the ancient Egyptians and by the Hebrews in Old Testament times.⁶ (p. 1) The Greeks are also known to have used shorthand. For example, Hans Glatte, in his review of world shorthand systems, notes that the philosopher and historian Xenophon used an ancient shorthand system to record the memoirs of Socrates.⁷ (p. 12)

It was the Romans, though, who first made extensive use of shorthand. Marcus Tullius Tiro (b. 103 BC), a former slave of the statesman Cicero, is credited with inventing the first important shorthand system.⁶ (p. 9) Tiro's method for abbreviating words was based on the capital letters of the Latin alphabet. Marks known as "diacriticals"—dots, dashes, and other symbols—supplemented the simplified Latin letters to denote different words. In addition, Tiro devised a method of varying the inclination of a consonant to indicate the vowel that followed.⁶ (p. 10) Tiro's method was *cursive*—that is, based on the same continuous motion as longhand writing.

The Tironian system, with refinements by later authors, flourished in Rome. It was used by the Roman army

to save time as well as to keep written communications secret from the lower ranks and conquered peoples.⁷ (p. 13) In the Roman senate, teams of shorthand writers took turns transcribing the proceedings, writing with metal styli on clay tablets. The system was taught in more than 400 schools, and many emperors and statesmen became accomplished shorthand writers. Leaders of the early Christian church also used shorthand. In fact, the Catholic Church, which used Latin as its primary language, perpetuated Tiro's method for more than a thousand years. However, with the fall of the Roman Empire and the advent of the Dark Ages, the use of shorthand decreased, as did the level of literacy in general. Few references are made to shorthand after the fifth century AD.⁶ (p. 13)

It was not until the 16th century that a major shorthand system was devised in Britain. Unlike Tiro's cursive system, these later methods were *geometrical*—based on a geometric shape such as a circle or ellipse. English physician and parson Timothy Bright published in 1588 his *Characterie: An Art of Short, Swift, and Secret Writing by Character*.⁸ (p. 25) Bright dedicated his system to Queen Elizabeth.⁶ (p. 16) *Characterie* had 500 to 600 symbols, known in shorthand as "arbitraries," each of which was assigned to a common word. Synonyms or antonyms were expressed by attaching alphabetic symbols to the left or right, respectively, of these key words. For example, to write the word "acquaintance," one would use the symbol for the word "friend," and then add the top of the character for *a* on the left side. For "despair," one would use the symbol for "hope" and add a *d* on the right side to indicate an antonym.⁶ (p. 20) Bright's system, although very important in shorthand history, was obviously cumbersome and difficult to use.

In 1602, English clergyman John Willis published his system, called *The Art of Stenographie, or Short-Writing*.⁸

(p. 26) Willis was the first to use the term "stenography" (from the Greek *stenos*, meaning "narrow" or "little") for shorthand. Willis used diacriticals (dots, in this case) in a descending scale to express the omitted vowels. The placement of the dot indicated the vowel being represented.⁷ (p. 17) Willis's system was phonetic, based on the sounds of consonants, vowels, and diphthongs. Another popular English system of the early 1600s was designed by Thomas Shelton. Shelton's method, *Short Writing*, was heavily influenced by Willis's stenography. Shelton, however, improved the Willis method by devising signs for such frequently occurring digraphs as *ng*, *sh*, and *th*.⁷ (p. 19)

The main impetus for the widespread proliferation of shorthand systems came during the Reformation, the popular movement for religious reform that began in the 16th century.⁵ In this time of intensive religious activity and upheaval, the public was eager to capture the words of the religious reformers of the day. Shorthand systems arose to fill this need—to provide for the *verbatim* recording of the preachings and discourses on religious matters of great importance.⁶ (p. 39)

In addition to recording religious oratory, people found other uses for shorthand. For example, public plays were often taken down by shorthand writers in the audience. Some scholars even suggest that the inaccurate, "bad" quartos of some of Shakespeare's plays were the result of faulty transcriptions of shorthand notes. But other scholars have argued that the only systems that could have been used at the time, Bright's or Willis's, were completely inadequate for recording the richness and complexity of Shakespearean language.⁹

Shorthand was also used to make entries in personal diaries. One such example is the shorthand diary of Samuel Pepys (1633-1703), the English scholar, politician, and naval administrator. Us-

ing Shelton's system, Pepys recorded in his diary his observations of the Great Plague and the Great Fire of London.⁷

(p. 19) Apparently confident of the secrecy of his shorthand, Pepys also included accounts of his own excessive behavior, including drunkenness, wife abuse, and bribe-taking. The diary was discovered, deciphered, and published in 1825, providing historians with a key document from that period.⁶ (p. 42)

Throughout the 17th and 18th centuries, many authors invented and published their own systems of shorthand. It was not uncommon for these authors to borrow rather heavily from their predecessors. Englishman William Mason, for example, whom one historian calls "the most celebrated shorthand writer of the 17th century,"⁸ (p. 29) published his system in 1672, with subsequent refinements in later years. When another Englishman, Thomas Gurney, published his own system in 1750, it was basically the 1707 edition of Mason's system. Gurney's method, *brachygraphy* (from the Greek *brachys*, meaning "short") added a few alterations and improvements, but was largely a wholesale appropriation of Mason's system.⁶ (p. 60)

By 1750, Gurney was already well on his way to establishing a dynasty of official shorthand reporters. He had secured the title of Official Shorthand Reporter to London's Old Bailey Criminal Court in 1748. This is the first known permanent appointment of an official court stenographer.⁶ (p. 60) After Gurney's death in 1770, his son took over the position, and obtained an informal appointment as official stenographer to the two Houses of Parliament in 1806. Seven years later, the appointment of the Gurney firm as exclusive reporters of Parliament was made official.

One famous student of the Gurney method was the novelist Charles Dickens. Aspiring to a career in journalism, the young Dickens undertook to learn the Gurney system, and spent some 18

months in the pursuit.¹⁰ Later, he would write of his difficulties in learning the system: "The unaccountable consequences that resulted from marks like fly's legs; the tremendous effects of a curve in the wrong place—not only troubled my waking hours, but reappeared before me in my sleep...."¹¹ (p. 25) But Dickens became an able shorthand writer, and was hired as a parliamentary reporter for the London *True Sun* in 1832. His daily work, reporting and transcribing parliamentary proceedings, provided him with plenty of material for his later novels, especially an abiding disdain for politicians. Despite the difficulty of the work, Dickens later in life would speak fondly of his days as a "faithful stenographer."¹⁰

Another influential British system was invented by John Byrom and published in 1767. Byrom's method was geometrical, and his alphabet was based on the various segments of a circle. Vowels were expressed as dots placed in any of five positions around the characters. Each position, of course, denoted a different sound. Byrom was also the first to devise consonant characters on the basis of their affinity of sound, taking into account the similarity in such sounds as *p*, *b*, and *v*.⁶ (p. 81)

Popular systems were also being created outside the UK in Europe. For example, Franz Gabelsberger, a German, published a cursive system in 1834 that dispensed with diacriticals in favor of more fluid writing. His system was very popular in Germany and spread to Russia and Scandinavia in the mid-19th century. Other popular systems, some based on the work of Byrom and his followers, were also being invented in France. Shorthand had also found its way to America. Such prominent Americans as Increase Mather, Benjamin Franklin, and Thomas Jefferson used shorthand. The skill was also prized by the early presidents of Harvard University.⁶ (p. 45)

Throughout the early history of shorthand, the authors were generally men of considerable intellect and erudition, and the systems they devised required a great deal of time and study to master.⁶ (p. 66) As industrialization increased in the 19th century, a new need arose for shorthand—in the office. With businesses growing larger and more complex, there was a rise in the volume of record-keeping, correspondence, and other paperwork, and a subsequent expansion in the clerical work force.¹² Stenographers who could quickly perform dictation and transcription duties were a central part of this expansion. To fill the growing need for office stenographers, shorthand inventors set out to create systems that would be easier to learn and more accessible to those who were not extensively educated.

Samuel Taylor, an Englishman, had noted the complexity of previous shorthand systems. Basing his work on Byrom's system, he attempted to devise a method that would employ better, more distinct characters with fewer arbitraries than previous methods. Taylor reduced to 20 the number of sounds for which characters would be provided.⁸ (p. 35) His system, published in 1786, was called the *Universal System of Stenography or Short Hand Writing*. This method particularly influenced shorthand authors in continental Europe.⁷ (p. 24)

In England, Taylor's system influenced a teacher named Isaac Pitman, who had a particular interest in spelling reform. Pitman favored the abandonment of traditional spelling in favor of phonetic spelling.¹³ In 1837, Pitman published his *Stenographic Sound Hand*, which was later called, "phonography," and then simply "Pitman's shorthand."⁶ (p. 85) Pitman used *shading*, the technique of expressing similar-sounding consonants by varying the thickness of the written stroke. For example, the Pitman method expresses the *p* sound, a

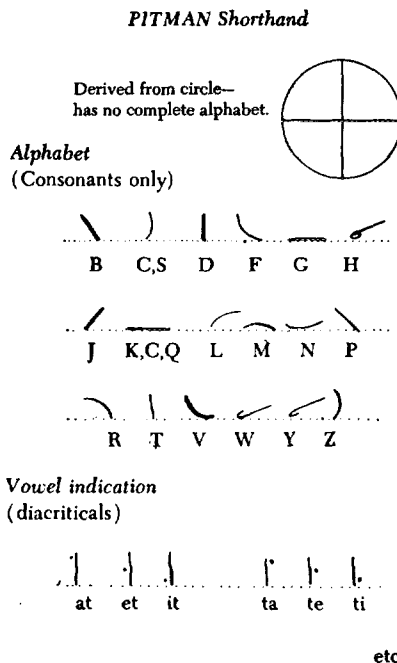
whispered consonant, as a single diagonal stroke. The *b* sound is depicted by the same symbol, only the stroke is drawn thicker. The heavier stroke corresponds to the "thicker," voiced sound of the *b*.⁷ (p. 34) To express vowels, Pitman used diacritical dots in 16 variations around the consonants, written at the beginning, middle, or end of the stroke. Pitman also used *positioning*, which meant that characters expressed different meanings depending upon whether they were written above, on, or through the ruled line.

By 1880, the Pitman system was predominant in Great Britain—not only for court reporting and personal use, but for the growing numbers of clerical workers learning shorthand for use in office jobs. About 140,000 students a year were beginning to study the Pitman system.⁶ (p. 86) Figure 1 shows the basic Pitman alphabet.

But other authors continued to develop systems of their own. One such author was John Robert Gregg, born in Ireland in 1867. As a child, Gregg had taken up the study of the Pitman method, but had found it too complex to master.¹⁴ (p. 32) After moving with his family to Scotland at the age of 11, Gregg began to study other systems. Fascinated with the theories and principles of shorthand methods, Gregg soon began to tinker with a system of his own. He worked as a clerk in a one-man law office. Since his employer was frequently absent, Gregg had plenty of time to devise his own shorthand system.

Gregg sought to develop a method that would incorporate the simplicity of longhand writing and avoid the awkward shading, positioning, and "obtuse angles" of the Pitman system.¹⁴ (p. 38) He formed his alphabet by assigning the most easily drawn characters to the most frequently occurring sounds. He also sought to express vowels more naturally by connecting them with the consonant characters, rather than using disjointed

Figure 1: Example of the basic Pitman shorthand alphabet.

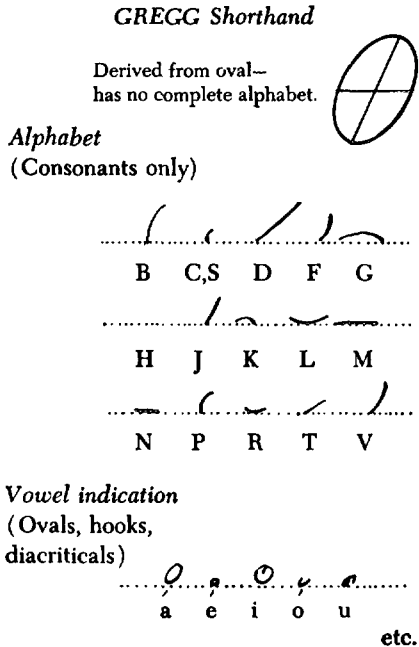


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diacritical symbols. In sum, Gregg's curvilinear system was based on the curvilinear motion of writing in longhand—the easy, continuous flow along the line in one thickness.¹⁴ (p. 67) The basic Gregg alphabet is shown in Figure 2.

Gregg published his system, *Light-Line Phonography*, in 1888. He had moved to Liverpool, England, by that time, and he began looking for students. The well-entrenched Pitman organization provided formidable competition, and it mounted an extensive advertising campaign to quash Gregg's new system. A widely circulated Pitman poster featured a large black circle with a small white wedge cut into it. The black part, claimed Pitman, represented the writers of Pitman shorthand, while the small white slice represented writers of all other systems combined. Gregg, whose

Figure 2: Example of the basic Gregg shorthand alphabet.



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pamphlets advertised his "Shorthand for the Million," parodied this approach. The large black field in *his* poster represented those multitudes who had begun the study of Pitman, while the tiny white wedge stood for those few who were able to make the slightest practical use of it after years of tedious study.⁶ (p. 86) Despite his hard work, Gregg found himself struggling for students and barely able to make a living. In 1893, he left England for America.

Unfortunately, when Gregg arrived in Boston he found that the Pitman system had preceded him. As Roger B. Landroth, Department of Education, Baruch College, New York, points out, an American named Stephen Pearl Andrews had brought the Pitman material back from a trip to England in 1842. Andrews set up a headquarters for the Pitman system in Boston.¹⁵ Seven years

later, Andrew's partner, Oliver Dyer, settled in Philadelphia and established the first American periodical devoted to shorthand, the *American Phonographic Journal*. He also began the first experimental high school classes in shorthand at Philadelphia's Central High School.¹⁵ Through the 1860s and 1870s, as more states enacted laws establishing appointments for official court reporters, the Pitman system gained prominence.

In Boston, Gregg set up his first school in an office he shared with a number of shady businesses, including crooked realtors. Gregg also taught his method at the Boys' Institute of Industry, a Boston vocational school. In 1898, after moving to Chicago, Gregg acquired enough capital to publish a book on his system. "By 1900," as Gregg wrote, "it began to sweep all over the country."¹⁴ (p. 57)

In 1910, Pitman's system was still the most widely taught in the US, but Gregg was making inroads. For one thing, his method was easier to learn than Pitman's. So it was better suited to fill the fast-growing need for office stenographers. The Pitman method, on the other hand, was almost exclusively associated with court reporting. Gregg constantly improved and refined his system, while Pitman's American followers failed to do the same for theirs. By 1919, 80 percent of shorthand students in the US were learning Gregg's system.¹⁵

Around 1906, an American named Ward Stone Ireland invented the stenotype machine for court reporting. Consequently, the Pitman system began to lose its implicit monopoly on courtroom stenography. The stenotype machine, resembling a small combination typewriter-adding machine, uses combinations of conventional capital letters rather than obscure symbols. Usually, these combinations will signify different consonant sounds. "TP," for example, is used for the initial *f* sound, so that in stenotypy "TPAT" would denote the

word "fat." The stenotype machine, in the hands of a skilled operator, could record proceedings much more quickly and efficiently than could a manual shorthand writer. In part two of this essay, I'll discuss stenotypy in greater detail.

By 1930, the Pitman method was taught exclusively in only 5 of the 100 major US cities. Today the Gregg system is the most widely taught in the US, while the Pitman method is still popular in the UK and wherever else the English language predominates.⁵

As I mentioned at the start of this essay, the show-business impresario Billy Rose was a great believer in the value of shorthand skills. Before he became the producer of such extravaganzas as the "Aquacade," and before his celebrated marriage to comedienne Fanny Brice, young William Rosenberg had mastered Gregg shorthand.¹⁶ He won the high-school speed championship in his native New York City at the age of 16 and went on to become the interscholastic champion of New York state. He had broken his writing hand on the eve of the state competition but managed to win anyway, clutching in his swollen fist a potato through which he'd stuck a pen.¹⁶ A few years later, Rose won the world championship. During World War I, he was hired as personal stenographer to Bernard Baruch, the financier and presidential adviser who was then serving as chairman of the War Industries Board. Shortly afterward, Rose gave up shorthand reporting to embark on the show-business career that would bring him success and celebrity. I vividly remember attending the "Aquacade" he created at the World's Fair in New York in 1939.

Of course, not all 20th century shorthand systems were designed for court reporting or office stenography. Other, simpler systems have been devised that do not require a great deal of time or intensive study to master. These methods

were designed for students, journalists, or anyone who needs to take detailed notes on spoken or written material. Unlike the more complex systems, which substitute abstract characters for consonant and vowel sounds, the simpler methods retain the normal alphabet and usually omit silent letters and internal vowels, not unlike written forms of Hebrew and other languages. *A.B.C. Shorthand*, designed in 1933 by William A. Brooks, replaces commonly used words with contractions: "easy" becomes *ez*, and "cannot" shrinks to *knt*. The system also presents rules for abbreviation, such as switching a capital *v* for the suffixes "ive," "sive," and "tive." A comma denotes the suffix "ing," while a large plus sign denotes suffixes with the "end" or "ant" sound. The author claims his system can be mastered in 12 hours.¹⁷

A similar system is *Notescript*, by Lawrence F. Hawkins, which, like *A.B.C. Shorthand*, omits internal vowels and silent letters and presents contractions and symbols for commonly used words. For example, in *Notescript* the *t* is drawn as an uncrossed vertical line with a small stem at the base. The word "that" becomes a shape resembling a capital *u*. An apostrophe-like slash, combined with the proper letter, can substitute for a common prefix, such as "hyper," "para," or "every."¹⁸ Obviously, the writer must depend on memory and context in deciphering notes and should transcribe notes at the first opportunity. Other, similar systems include *Briefhand*,¹⁹ *Forkner Alphabetic Shorthand*,²⁰ and *Hy-Speed Longhand*.²¹ All these methods, while not suited for sustained verbatim recording, do provide for quicker, more efficient note-taking.

Not all shorthand systems have been designed solely for use with words. Others have been developed for mathematics and other disciplines in science and technology. Exponential notation, for example, is a form of shorthand.

Originally devised by the French mathematician René Descartes in the 17th century, exponential notation is a means of expressing very large or very small numbers as powers of 10. Also, because names for numbers above a million signify different values in different countries, exponential notation helps prevent ambiguity when results are published internationally.²²

On the other hand, one must be wary of confusing mathematical notation with more conventional forms of shorthand. In his book, *The Development of Mathematics*, E.T. Bell, California Institute of Technology, Pasadena, refers to the statement "mathematics is a shorthand" as a "quarter-truth."²³ In a shorthand system such as Gregg, each line and curve corresponds to a spoken sound. In mathematical notation, however, the signs and symbols may not have any precise verbal origin, or the origin may have been lost over time. Mathematical notation operates at a more symbolic, abstract level.

Another system of scientific shorthand is the *Symbolic Shorthand System (SSS) for physiology and medicine*. Devised by the late Hans Selye, famous for the general adaptation syndrome, and George Ember, University of Montreal, SSS is a system of mnemonic symbols and signs that the authors used to catalog their research on stress and endocrinology. The authors note, however, that the system is perfectly adaptable to other areas of medicine.²⁴ In SSS, the symbols and abbreviations are reminiscent of the subjects they denote. For example, "Cr" stands for "cardiac," "R" for "renal," "Hep" for "hepatic," "Tr" for "thyroid," and so on. SSS can also express diseases and other medical conditions. One of the SSS's general symbols is an upward-pointing arrow, which denotes an increase. Therefore, combining "Tr" with this arrow expresses the condition "hyperthyroidism."²⁴ This combination of characters and graphics is remi-

niscient of the science of signage, which I considered in a previous essay.²⁵

Other systems have been developed for use by chemists. One method, designed by Evan Baltazzi, Evanel Associates, Northfield, Ohio, presents a simplified method of expressing chemical procedures. Graphic symbols represent most of the apparatus and operations so that the procedure, in shorthand form, resembles an extended equation. There are signs for beakers, flasks, condensers, and so on. Other symbols, such as a small triangle meaning "heat" and a small "x" meaning "crystallize," describe each procedure in detail.²⁶

Perhaps one of the best-known chemical shorthand systems is Wiswesser Line Notation (WLN). Introduced in 1950 by the chemist William J. Wiswesser, US Department of Agriculture, Frederick, Maryland, the system provides a compact, unambiguous method for representing the structure of a chemical molecule.²⁷ WLN uses the 10 numerals, 26 capital letters of the alphabet, the blank space, and a few punctuation marks. In most cases, WLN atomic symbols correspond to those with which the chemist is familiar. When WLN symbols—each denoting a particular structural fragment—are combined in a precise linear sequence, the result is a unique and unambiguous structural formula.²⁸ Aspirin, for example, is represented as QVR B0V1. Since all WLN symbols can be found on typewriter and computer keyboards, the system has become an invaluable tool for online indexing and retrieval of information on chemical compounds. ISI has made extensive, pioneering use of WLN. With *Index Chemicus Online*, for example, WLN can be used to perform many types of substructure or parent compound searches. According to Wendy A. Warr, ICI Ltd., Macclesfield, England, WLN is taught and used widely, and has been adapted to French, German, and even Japanese.²⁹ After the development of the

DARC system by J.E. Dubois, CNRS, Paris, programs were developed that permit WLN notations to be converted to structural diagrams.³⁰

Considering the stress placed on lectures in high school and college, it is ironic that we do not teach students shorthand so that they can take proper notes. This is a skill that will serve them as much as typing and computer programming. If nothing else, shorthand teaches you to listen.

Not all shorthand systems have been able to adapt and survive in the face of

technological advances. In the next part of this essay, I'll discuss technology's impact on shorthand, including that of tape recorders and dictation machines, and the possible impact of voice-recognition systems in the future.

* * * * *

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