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About eleven percent of the world's population is left-handed, yet casual observation has led me to believe that significantly more than eleven percent of librarians are left-handed. The purpose of this research is to explore both the concept of left-handedness and the profession of librarianship, in an attempt to ascertain any similarities between the two that may lead a larger-than-average number of left-handed people to the library profession. To best explore the implications of left-handedness, the paper examines its causes and physiological implications, specifically those related to laterality and hemisphere dominance. Papers that examine thinking styles in librarianship are also discussed. One of the similarities between the cognitive processes of right-hemisphere dominant (and therefore more likely to be left-handed) people and librarians appears to be the issue of greater adaptability and use of the whole brain in problem solving.

Headings:

Cognition

Librarianship/Psychological aspects

Laterality

LIBRARIANS AND LEFT-HANDEDNESS : A SPECULATIVE EXPLORATION

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About eleven percent of the world's population is left-handed, yet casual observation has led me to believe that significantly more than eleven percent of librarians are left-handed. The purpose of this research is to explore both the concept of left-handedness and the profession of librarianship, in an attempt to ascertain any similarities between the two that may lead a larger-than-average number of left-handed people to the library profession.

More than just a curiosity, I believe that an analysis of the possible connection between the attributes of left-handers and the skills used in librarianship could be beneficial to a profession in which the number of practitioners is dwindling, and in which recruitment efforts will become imperative as the baby boomer generation retires. This may help recruiters, who can highlight these traits, and potentially be more attractive to the best qualified professionals for a job, or students for a Master's program. If there is some characteristic (of the people, not of the field) that seems to draw left-handers to the profession, recruiters (to individual jobs as well as to the profession as a whole) can emphasize that this particular characteristic is an asset, and potentially increase the number of recruits for a job, for a program, or for the profession in general.

All that I have stated thus far assumes that there is a reason why I have casually observed an unusually high number of left-handers among practicing librarians, my peers in library science classes, and among those with whom I have worked in libraries. That is, the unusually high percentage of left-handers in the profession is due to some characteristic of left-handedness that fosters a proclivity toward library work. This, in

turn, assumes that there is indeed a set of characteristics that are linked to left-handedness.

How does society view left-handers?

History has not been kind to the left-hander. The English *left* come from the Anglo-Saxon *lyft*, meaning “weak” or “broken,” and the *Oxford English Dictionary* defines left-handed as “crippled,” “defective,” “illegitimate,” as well as several other unfavorable adjectives (Coren 1992). Left-handers have not fared better in other languages: the French *gauche* means “crooked,” “ugly,” “uncouth”; the word for left-hand in Italian, *mancino*, which comes from the word for maimed, also doubles as “deceitful” or dishonest.” And then there is the Latin *sinister* (Coren 1992). In *Left Brain, Right Brain: Perspectives from Cognitive Neuroscience*, Springer and Deutsch provide several anthropological examples of right/left symbolism that equate the left with unfavorable or evil things. One example from native peoples in Morocco is of involuntary eye twitching: a right-side twitch signifies good news, but a left-side twitch is an omen of impending death (Springer and Deutsch 1997). A superstition that I have often heard equates a ringing in the ear with people talking about one. If the ringing is in the right ear, they are saying something favorable; if it is in the left ear, it is unfavorable. In addition to the broad left-side/right-side biases, history has equated left-handedness with evil. Coren’s book discusses artwork and tarot cards in which the Devil is always portrayed as left-handed (Coren 1992). Hand bias in religion abounds: priests always take the wafer in their right hand, people in Islamic countries are forbidden to eat with the “unclean” hand, Buddha described the left-hand road as the wrong way of life, and the

right-hand road as the path to enlightenment. These are just some of the biases found in culture, both historical and contemporary.

Yet I doubt that people today, particularly in the United States would go so far as to say that left-handers are possessed by demons or are evil people. However, negative stereotypes still exist. In his book, Coren describes an experiment in which he had a group of college students interpret the meaning of the following dialogue: “How did it go?” “He acted like a complete left-hander.” Ninety-one percent of the students interpreted the second sentence as saying that the subject was “clumsy,” “rude,” “socially inept” and similar adjectives. The other nine percent stated that it did not make sense, or that they needed more information (Coren 1992). There was not one positive interpretation among 104 responses. Similar experiments with younger children confirm a negative bias toward left-handers and the left in general.

To me, some of these stereotypes seem outlandish (left-handers as rude, for example), yet I can see how others have developed, mainly the perception of left-handers as clumsy. Much of the popular literature on the subject, including Coren’s book, discusses the everyday trials of the left-hander, from eating at a table next to a right-hander, to learning a skill such as playing a guitar, to operating everyday tools like can openers. A search of websites devoted to left-handedness uncovers a myriad of sites with a variety of purposes. Some are outlets for venting frustration with the right-handed world, others share tips on how to perform tasks (such as left-handed knitting), and many sell products designed for the left-hander. Many of these products seem like novelties, but it was the lack of such products that prompted Coren’s controversial claim that left-handers die, on average, earlier than right-handers, partly due to the fact that they are

more prone to accidents, presumably while operating equipment designed for right-handers. (In his book, he also partly attributes the shorter life span to the idea that other problems may have arisen during the birth stress to which left-handers were supposedly subjected) (Coren 1992). While this theory has since been refuted, notably in the “Vulgar Errors” chapter in McManus’s book, it is still a popular myth (McManus 2002).

However, not all statistics and anecdotes point to negative stereotypes and characteristics. Rosenbaum (2000) states that although a disproportionate number of left-handers are criminals (Jack the Ripper is often mentioned in the literature), a large percentage of artists, geniuses and athletes are left handed as well (Einstein, Picasso, and Babe Ruth are mentioned, though McManus claims that their falsely-attributed left-handedness has taken on urban myth proportions). Annett (2002) attempts to find evidence to support the “folk wisdom” that left-handedness is more frequent in certain groups of people, specifically those involved in spatial and mathematical reasoning, art, music, surgery and sports. As she equates speech with the RS+ gene, as most speech functioning occurs in the left hemisphere, Annett reasons that those who are RS- may be “doers” more than “talkers,” which may explain talents in certain areas. Furthermore, strong right-handers have weaker non-dominant hands than strong left-handers, so the greater degree of ambidexterity of the average left-hander may have some advantage here as well (Annett 2002). While the higher percentage of left-handers in some sports may be due to strategic advantage, the high percentage of left-handers in the other areas may be due to other factors. To explain one of these factors, Annett referred to Deutsch’s study of errors made in musical performances, which correlated the prevalence of left-handedness in musicians with the idea that a weaker bias to dextrality correlated with

musical ability. Deutsch and Springer (1997) add that for the thirty percent of left-handers whose speech is in the right-hemisphere, there may be a greater interplay of verbal and non-verbal abilities, due to proximity in the brain.

What Causes left-handedness?

Genetic Theory – One of the earlier proponents of the idea that handedness is genetically determined is Marian Annett, who in decades of research, has continually modified her right shift theory of handedness. This theory suggests that there is a gene, which is labeled as RS+, that predetermines asymmetry in favor of the left-hemisphere, therefore also creating right-hand preferences (Annett 2002). (In the literature review in his article, Corballis notes that Annett's original theory claimed that handedness, rather than cerebral dominance was the result of RS+; stating the result as cerebral dominance, with handedness as a secondary consequence is, as he states, a subtle but important distinction [Corballis 1997]). The cerebral dominance and handedness of those who lack this gene (i.e., RS-) is left to chance. Therefore, with much of the population being predetermined as right handed, and only a portion of the population's handedness determined at random, the distribution bell curve of handedness (with an x-axis of strength of hand preference) is shifted to the right.

Chris McManus's theory that left-handedness is associated with genetics was reaffirmed when his study of the possible link between left-handedness and birth stress showed no association between the two factors (McManus 2002). His model stems from the peculiarity of three facts: 1) identical twins may have different hand dominance, 2) two right-handed parents can have left-handed children, and 3) seventy-five percent of

the children of two left-handed parents are right-handed. His genetic model consists of the alleles C, as in *chance*, and D, for *dexterity*. The possible combinations and results are: CC, fifty percent chance of left-handedness, fifty percent chance of right-handedness; DD, zero percent chance of left-handedness; those with a CD combination are halfway between zero and fifty, and therefore have a twenty-five percent chance of being left-handed. Because this model presents genetics as determining chance rather than actual handedness outcome, it is able to accurately predict all of the aforementioned statistics. In *Right Hand, Left Hand*, he likens the CC combination to a coin toss; if identical twins have the CC genes, it is as though each would toss a coin to determine her handedness, thereby explaining the possibility of different hand dominance among twins.

In his paper “The Genetics and Evolution of Handedness,” Michael C. Corballis notes the similarities between Annett’s and McManus’s models, specifically the correspondence between the RS+ gene and the D allele (Corballis 1997). Both the RS+ and the D allow for a higher presence of right-handedness, rather than an absence of left-handedness. In other words, the focus of these models is not on why there are so few left-handed people, but is an attempt to account for the abundance of right-handed people, which I find to be an interesting and counterintuitive angle of approach. Corballis expands upon McManus’s model (which was originally introduced in 1985), providing scenarios of the evolution and spread of the D allele, with one possibility being that the D allele was a result of a mutation at some point in the evolution of the *Homo* genus, though maybe as late as the emergence of *Homo sapiens*. Additionally, he speculates that the evolutionary dominance of *Homo sapiens* over other *Homo* varieties may correlate with the rise of the mutant D allele that is responsible for strongly

consistent handedness. In other words, he seems to say that the emergence of a dominant handedness may be directly related to the eventual supremacy of *Homo sapiens*.

However, this dominant laterality is not a precursor of humanity; as left-handedness and right hemisphere-based speech are still found in highly competent humans. Regarding this stability of the continual presence of left-handedness among this strongly handedness-consistent species, he states the “heterozygotic advantage” (Corballis 1997) that Annett had also recognized in her work. That is, individuals with the CD combination must have greater “fitness” (contributed offspring) to maintain the continued presence of the C allele. Later in this same article, Corballis presents the theory of the possibility that the C/D laterality gene may be located on the X/Y sex chromosomes.

In their article responding to Corballis, Martin and Jones develop this sex chromosome theory further; however, they modify Corballis’s theory so the chance of being left-handed changes from being additive to recessive (Martin and Jones 2000). In essence, the D allele becomes dominant, so there is a zero percent (as opposed to twenty-five percent) chance of left-handedness among those carrying the CD combination. However, C and D do not correspond exactly to what would be R and L, respectively, because a CC combination still does not guarantee left-handedness. Indeed, their model provides for even less than a fifty percent chance of left-handedness if one has the CC combination. Their studies of data relating to handedness relationships according to the sex effect, twins effect, parent effect, and even grandparent effect leads them to believe that a recessive gene on the X chromosome is responsible for variation in left-handedness. The grandparent effect supports their theory as follows: children of two left-handed parents (LL) must inherit a CC combination according to their model. Even

though a small proportion of these children will become left-handed, they will all pass a C onto their children. Thus, their children have an increased chance of left-handedness, even though their parents are right-handed, because their grandparents are left-handed. Indeed, studies show that children with right-handed parents and left-handed grandparents have similar rates of left-handedness as those children with one left-handed parent.

Current research in this area is taking this idea one step further and searching for specific genes that may be the determinant(s) of handedness. A study by Van Agtmael, Forrest and Williamson (2002) was undertaken in search of this gene. Because handedness correlates with cerebral asymmetry, candidate genes for research were chosen from those involved in developing left-right asymmetry. The article states the strength of this correlation: ninety-seven percent of right-handed people have left-hemisphere dominance, but only seventy percent of left-handers do. Their sample consisted of families in which the parents were right-handed, and two or more children were left-handed. However, their results indicated a small probability that a recessive gene is linked to what was tested in these families. Instead of the analysis of candidate genes that they performed, they recommend a genome scan for future studies, due to the sheer number of possible genes. One interesting point addressed in the paper's conclusions was that there would likely be different results if the data was analyzed in terms of strength of skill rather than direction of handedness. However, they concede that direction is usually what is considered genetically determined, whereas strength of that direction (i.e., how strongly right-or left-handed one is) is what is often thought of as environmentally determined.

Environmental Theories – While the genetic theory of causation may be the “latest word” (Rosenbaum 2000), it is by no means the only theory, and is still controversial. David Rosenbaum’s feature for *The New York Times Science Times* discusses, as does the Van Agtmael article, the friction between genetic and environmental models of the determination of handedness. Rosenbaum quotes neurologist Dr. Daniel H. Geschwind as saying “Handedness is a complex behavior, and no complex behavior has ever been shown to be due to only a single gene without any environmental influences.” A theory of one environmental factor that causes left handedness is Dr. Stanley Coren’s idea that in many cases, left-handedness is due to early brain trauma or birth stress. In his book *The Left-Hander Syndrome*, Coren cites case studies from several researchers, such as the case of the left-handed boy who had a difficult breech birth, and that of a left-handed woman who was born premature and with possible toxemia. Cases that supposedly link left-handedness with brain trauma include that reported by the Neuropsychology Department of the Neuropsychiatric Institute at the University of California at Los Angeles, of a girl who suffered a head injury at age two-and-a-half, and after two days of unconsciousness and five days of loss of speech, her handedness switched from right to left. Another case studied by this same team is that of an eighteen-year-old male with a history of physical abuse, including head injuries, who is now left-handed. Coren links this possibility of pathological left-handedness to the idea that the left-hemisphere may be more susceptible to injury. Thus, if there is birth stress or head trauma early in life, this may signal a switch to right-hemisphere as the dominant side. And as figures stated previously show that only three percent of right-handers have right-brain dominance, it would make sense that a change to left-handedness would follow this shift as well. Coren

states that some factors that make the left hemisphere more vulnerable include a slightly smaller blood supply, therefore facilitating oxygen starvation quicker than the right-hemisphere, should such conditions occur. The most common birthing position places this side of the head at risk for a temporary stoppage of blood supply, due to pressure on the head. Also, it has been claimed by both Corballis and Michael Morgan that the left-hemisphere develops more slowly during pregnancy, and is therefore susceptible to abnormalities for a longer period of time.

However, this environmental theory has its skeptics, and as I mentioned previously, was refuted by McManus in *Right Hand, Left Hand*. As a PhD student, McManus looked at data collected by the British National Child Development Study, which contained detailed information captured at birth, and then at the ages of seven, eleven, and sixteen, for 16,000 children. Among this data, McManus found no correlation between birth complications and left-handedness.

I believe that one of the reasons the debate between genetic and environmental causes is so controversial is that an answer to the question of how one becomes left-handed has a direct impact on what characteristics left-handers portray. If there is a gene that determines handedness, what other traits are found on this gene? And if left-handedness is linked to brain trauma, is it this trauma that accounts for the fact that a larger percentage of left-handers have mental illnesses and language difficulties?

What Does it Mean to be Left-Handed?

Many people assume that right-handers are left-brain dominant, and vice versa for left-handers, but this is not entirely true. As I mentioned previously, ninety-seven percent

of right-handed people have left-hemisphere dominance, and seventy percent of left-handers do as well. Of the remaining thirty percent, fifteen percent had speech and language controlled by the right-hemisphere, and the remaining fifteen percent showed “bilateral speech control,” with speech and language present in both hemispheres. (Springer and Deutsch 1997).

These 1977 findings, still one of the largest studies of its type, with commonly cited data, refuted Broca’s rule that the dominant hemisphere (the one that controlled speech and language) was the one on the side opposite that of one’s dominant hand. Broca is credited, albeit incorrectly, as being the first to discover the relationship between left-hemisphere damage and loss of speech, of which he was certain by the year 1864. The Frenchman Marc Dax had made similar claims thirty years earlier, yet they were not well-documented (Springer and Deutsch 1997). Through his work with persons with loss of speech, Broca was able to isolate an area of the brain, toward the front of the left hemisphere, responsible for speech output. Damage to the Broca’s area can lead to what is now called Broca’s aphasia – a type of aphasia in which the actual physiological act of speech is affected. The patient has difficulty uttering words and the speech is “telegraphic” in nature, often omitting articles and other small parts of speech. In contrast, damage to the posterior region of the first temporal gyrus, or Wernicke’s area, leads to receptive, or Wernicke’s aphasia. This area is also in the left hemisphere, and is responsible for the comprehension of speech. People with this type of aphasia produce fluent speech, but it is made up of gibberish, or at best, very odd constructions (Springer and Deutsch 1997).

The two aphasias are often cited as concrete examples of brain asymmetry. Broca's findings helped firmly establish the idea that the brain was not two symmetrical halves that functioned as a whole, but rather asymmetrical pieces that each had different localized functions (Springer and Deutsch 1997). The idea of cerebral dominance soon emerged, with neurologist John Hughlings Jackson's writings in 1864 of the idea of a "leading" hemisphere (Springer and Deutsch 1997). However, though he reasoned that Broca's evidence suggested a localization of speech in the left-hemisphere, the side of the will, he did not neglect the "automatic" right side, and reasoned that this hemisphere must also possess some localized functions. While this was initially just speculation, his later work with a right-brain tumor patient who had trouble recognizing things led him to believe that the right hemisphere controlled things of a visual nature. Though his findings were eventually reconsidered by twentieth-century scientists, he can be seen as one of the central figures in the initial push for the study of the right hemisphere.

If the two hemispheres are indeed asymmetrical, then what are some of the differences between them? Generally speaking, the left brain is analytical, logical and calculating, while the right brain is holistic, visual, spatial, and emotional. However, in *Mapping the Mind*, Rita Carter warns of popular preconceptions due to "diochotomania" that have created an industry for a myriad of self-help books that "encourage right-brain thinking" (Carter 1998). She adds that there is no simple way to categorize the functions in this very complex structure, which is not as divided as one would think. This interaction between the two hemispheres precludes any certainty about what happens where, and furthermore, these activities are not uniform for all people – she states that a

skill as obviously lateral as language is still atypically organized in about five percent of the population (Carter 1998).

Still, there is some truth to the idea of the analytical, detail-oriented brain, and the holistic, visual side. Studies with split-brain patients, especially those of Nobel-prize winner Roger Sperry, have provided the foundations for advancement toward more knowledge regarding the mysteries of the brain's workings. The split-brain patients that he, and others, worked with were often sufferers of severe epilepsy, whose corpus callosums (the connector "cord" between the two hemispheres) have been severed. One of Sperry's experiments, designed to allow him to isolate the different functions of the two hemispheres, involved having the patient fix her eyes on a dot in the middle of a screen. He would then flash images to one side of the dot, ensuring that if it entered her eyes from the side, it would be sent to only one hemisphere. The image would be on the screen long enough to register with the patient through peripheral vision, but not long enough for the patient to shift her gaze to focus on the object. When an image was flashed on the right side, it went to the left hemisphere, and the subjects were able to correctly identify the object by saying its name. However, when the sides were reversed, and the image entered through the right hemisphere, the subject could not name the object, but would say that she saw nothing. However, if asked to select the object, by touch only, from among a set of objects, the subject was able to choose the correct object. Yet, when the chosen object remained unseen, the patient had difficulty naming this very object that was in her hand (Carter 1998). Neither of these tasks would be difficult for the average person, as one for whom there is no difficulty of communication between the hemispheres. Yet for someone who lacks the ability for whole brain processing, the left-

brain had no trouble naming the object, and the right hemisphere was able to coordinate obtaining the object, but that was the extent of it. Speech and language were localized in the left hemisphere, sensory perception was in the right, and without the corpus callosum, never the 'twain shall meet.

When discussing the analytical functions of the left-hemisphere in *Half-Brain Fables and Figs in Paradise*, Jacques M. Chevalier notes that the left brain focuses on details and differences, and is especially suited for processing distinctions in sounds and letters. It is logical, especially with regard to sequences, and the necessary order of things such as sounds. Furthermore, the left hemisphere is sensitive to grammar. Because of its particular awareness of temporal issues, the left hemisphere is the one that processes information regarding any duration of time, and cause and effect issues. Chevalier's subheading describing the left hemisphere nicely sums up all of these functions: verbal, auditive, analytic, temporal (diachronic), and motive (Chevalier 2002).

In contrast, his adjectives used to describe the right hemisphere include non-verbal, visual, holistic, spatial (synchronic), and emotive. He states that this half of the brain processes information with a gestalt mode, and does particularly well with synchronic features that cannot be decoded by breaking them into discernable, smaller parts, but which must be taken as a whole. This brain reacts to non-verbal stimuli, and has the advantage in tasks such as drawing, doing jigsaw puzzles, manipulating blocks and figures, and matching parts to the whole. The right brain is good at operations of "completion" or "stimulus closure," which involves the construction of configurations from incomplete patterns or elements (Chevalier 2002).

While the numbers regarding the relationships between brain dominance and hand preference are not a perfect 100 percent match, they do suggest that right brain dominance is more likely to be found in a left-hander. If 30% of left-handers are right-brain dominant, but only 3% of right-handers are (Van Agtmael 2002), then statistically, it should hold true that given one right-hander and one left-hander, the left-hander is ten times more likely to have speech localized in the right brain, and exhibit right brain dominance.

Cognitive Functions and Information Processing of Left-Handers

Springer and Deutsch discuss a study of the analysis of hemispheric differences conducted by Jerre Levy, involving split-brain patients who were asked to match wooden blocks held in their right and left hands with two-dimensional images of “opened up” cubes. Generally, the patients performed matches more correctly for the blocks held in their left hand. However, the really interesting finding from this study was that the two hemispheres approached this problem in different ways. Blocks held in the right hand (using the left hemisphere) were matched more successfully on the basis of verbal descriptions. That is, this hemisphere relied on the description of the “opened up” patterns. Left hand, right hemisphere matches were made using the actual appearance of the pattern, and used the visual technique of mentally closing the two-dimensional patterns to see which fit the block in the left hand.

This right-brain emphasis on visualization is also apparent in another study done by Levy, in which different images are flashed in the left and right visual fields, and split-brain patients are given the instructions to match pictures. They were shown to match

stimuli transmitted to the left hemisphere by function, such as matching a cake on a plate with a picture of a spoon and fork. When the same set of images is presented to the right hemisphere, the patients matched them by appearance, now matching the cake with a picture of a brimmed hat (Springer and Deutsch 1997).

Chevalier divides the cognitive processes into the following chart: the right (visual) hemisphere works with gestalt (the whole, big-picture concept), similarities, images and meaning, emotions and intuition, rhythm and flow, humor and mood, and far-sightedness (again, indicative of a big-picture view). The left, auditive, hemisphere takes care of logic (small parts as opposed to the big picture), differences, numbers and letters, reasoning and analysis, sequentiality, literal focus, and details. However, he admits that establishing a left/right chart of brain processes is difficult and influenced by pre-established notions, similar to Carter's idea of "dichotomania" – in other words, the actual left brain, right brain cognitive processes are never as cleanly delineated as a chart would suggest. And Chevalier is quick to point out that some skills, such as reading, are not as lateralized as one would think, but are really more whole-brain processes. While language is a left-brain activity, he states that the act of reading requires both hemispheres, as evidenced by different types of dyslexia, which occurs more frequently among children that demonstrate a very one-sided lateralization, in which one hemisphere may be completely ignored, and the processing of reading only occurs in the other hemisphere. Deep dyslexia, which is the one most people think of when they hear the term, occurs when the left brain is not used, and results in problems related to spelling, pronunciation and categorization – it is more phonological. Because this type of dyslexia is associated with left hemisphere difficulties (i.e., the subject relies more heavily on

right-hemisphere concerns, such as meaning, at the expense of the left-hemisphere's role) (Chevalier 2002), it appears to be more common in left-handers, as many studies suggest (Elias 1997), and its prevalence has become something much noted in the popular literature (Coren 1992). However, there is another type of dyslexia, surface dyslexia, which is caused by the opposite occurrence, when reading is performed largely with the exclusion of the right brain. Surface dyslexics have no difficulty reading words, including nonsense words, as they have a good sense of the relationship between letters and sounds. However, they have problems with reassembling parts to form a whole, or with homophones and words with irregular spelling. This is due to the left-brain tendency to focus on details, at the expense of the big-picture right brain, which is needed to place what is being read into a larger context of meaning. Because surface dyslexia is also known as right-hemisphere dyslexia, it appears that it would be more prevalent among left-brain dominant people. However, Chevalier's statement that right-hemisphere dyslexics often perform better in school than deep dyslexics leads me to surmise that this dyslexia may not always be properly diagnosed, and therefore the population of people (and subsequently their handedness) who have RH dyslexia may be difficult to ascertain.

In a discussion of dyslexia, Annett also brings up interesting points about different learning processes with regard to reading. For quite some time, teachers have divided the process of teaching reading into two methods, which she has termed the "look and say" method, which I have also heard referred to as "whole word," and the "phonic analysis" (or "phonics") method. While her distinction between the two styles only tangentially refers to brain hemispheres, it seems logical to me, from what has been said

in the literature regarding the detailed, analytical left hemisphere and the holistic right hemisphere, that the whole-word method of learning would be associated with the right hemisphere, and the phonics-based method associated with the left. It seems that the two methods oscillate in popularity, and it would be interesting to further research the “when and why” with regard to one or the other method coming into vogue. Furthermore, it would be interesting to study left- and right- hemisphere dominant children in terms of which method is easier for them, or perhaps a study of educators and which methods they prefer, in terms of their own hemispheric dominance. I, who am left-handed, was taught to read by my left-handed father using the whole-word method. Was his choice of this method, or my own facility in using it, chance? Or was he more likely to use this method due to his brain wiring?

Given these different approaches to an information seeking behavior such as reading, how else does laterality manifest itself in “real world” thinking style? Wayne Allen Braffman surveyed 269 students in an attempt to explore the thinking styles of the different hemispheres (2001). Modeling his study on one conducted by Deglin and Kinsbourne in 1996 with a clinical population, Braffman surveyed right-handed undergraduate students using ten true syllogisms and ten syllogisms with one false premise. An example of a false-premise syllogism is “All airplanes fly underwater. The Boeing 747 is an airplane. Can the Boeing 747 fly underwater or not?” An answer similar to “I guess so, since it says that airplanes can fly underwater” was considered a formal/theoretical approach, as it follows the logic presented in the syllogism. An answer similar to “No, planes don’t fly underwater” was scored as an empirical response. His results showed a slight but significant relationship between laterality and cognitive style,

linking left hemisphere use more strongly to formal/theoretical answers, and right hemisphere use to empirical responses.

Skills and Thought Processes Used in Librarianship

Before discussing *what* the library profession does, I want to provide some background information on *who* the profession is, as librarianship is a profession subject to strong stereotypes, namely the schoolmarm with the bun. However, demographic surveys conducted by the American Library Association do not fully refute this stereotype. In particular, seventy-three percent of the respondents were female, and forty-five percent were in the 45-54 age range (Lynch 2000). This is certainly not “old,” but only 6.7% were under 30. It is a well-educated group, as seventy-nine percent have an ALA-accredited Masters of Library Science degree. Almost a third of those people have another Master’s degree in addition to the ALA-accredited MLS. And five percent of those surveyed have a Doctorate.

In which types of libraries do these people work? The top three categories for the ALA respondents were colleges and universities (29%), the public sector (24%), and schools and school districts (16%). However, one caveat is that this only reflects types of libraries as loosely related to ALA membership. If one looks at the total number of employed librarians, there are 25,152 academic librarians, 30,074 public librarians, and 66,47 school librarians (ALA fact sheet).

What do these librarians do? The Bureau of Labor Statistics’ *Occupational Outlook Quarterly* began its Winter 2000 spotlight piece on librarianship with the quotation “Sorting data, finding answers, understanding what we need to know – these

professionals are on the cutting edge. They use technology to manage knowledge” (Crosby 2000). However, the article claims that, despite the emergence of technology, the “core” of librarianship is the same – Reader Services (often referred to as public services, Technical Services, and Management).

Reader services, or public services, is often comprised of reference, reader advisory, teaching and instruction, and often collection development, as in many cases it is the public services librarians who also select books in specific subject areas. Technical services include the people who catalog, or classify, the library materials, so that they are accessible to the public, usually through some sort of physical or electronic catalog. People who work on the technical aspects of running the library, such as with the computer system, or web page creation, are also often considered part of technical services, as are document delivery people. Much of technical services is “behind the scenes” work. The last category discussed in *Occupational Outlook Quarterly* is library management, or administration, which encompasses managing materials and resources, personnel, and community relations (community in the public aspect, but also referring to the community of library users).

Some of the actual skills of librarianship, both traditional and new, are discussed in Kate Sharp’s paper “Internet Librarianship: Traditional Roles in a New Environment.” Sharp (2000) argues that even in this age of digitization, the core skills of librarianship are still as vital as ever. These include: information handling, training, and evaluation. Information handling is a broad term which encompasses such specific skills as the ability to catalog and classify, and conduct inquiries, such as finding the appropriate information to answer reference questions. Searching skills are an important part of this

skill set as well. Training involves the librarian's role as a "user-educator and intermediary" (Sharp 2000), especially with today's emphasis on bibliographic instruction. Finally, the traditional skill of evaluation involves the evaluation of resources appropriate for the user, both from a collection development standpoint, as well as the evaluation and analysis of sources that meet users' reference needs.

In a discussion of the new roles of librarians, Sharp (2000) emphasizes the importance of "transferable skills" such as those relating to management and interpersonal relationships. In light of the information boom of today, she claims that information organization is vital. "The role of the librarian in this context," she expands, "is to help users find the information they require then provide them with the tools to access and use the resources for their individual needs" (Sharp 2000). This role relies on the use of skills highlighted above, from inquiry and evaluation to organization of the material and interpersonal skills. Librarianship, it seems, is a profession that requires a variety of skills.

Regarding some of these very different skill sets, there seems to be a preconceived notion in the profession regarding the differences in personalities between those who choose public service work, technical behind-the-scenes work, and those who desire administrative positions. Indeed, while there is scant literature dealing specifically with the topic of cognitive styles and thinking processes of librarians, Linda Marie Golian, in her article "Thinking Style Preferences Among Academic Librarians: Practical Tips for Effective Working Relationships," explored whether or not fundamental differences in thinking style existed between librarians in public services and those in technical services, among those working at libraries with membership in the Association

of Research Libraries. The participants were grouped into six different thinking styles: synthesist, idealist, pragmatist, analyst, realist, and flat thinking, which combines the first five with near-equal emphasis. (See Figure 1).

After scoring each participant with regard to the five thinking styles, one of her conclusions is the idea that librarians have a natural potential for developing the flat thinking style. Only 57.6% of the sample even showed a moderate to neutral preference for a particular thinking style; the rest had a near-equal distribution between all five. In general, the whole sample appeared well-rounded. According to Golian, this evenness and lack of dominance of any one particular style is an “asset” as it allows for greater flexibility and ability to adapt one’s thinking processes according to applicability to a certain situation.

In her conclusions, she does state that some of the perceived tensions between those in technical and public services is due to different duties, management approaches, etcetera, and that research into thinking styles may alleviate any strained relationships. Yet, she doesn’t provide any data on the specifics of *how* thinking styles differed between professionals in the two areas; indeed, perhaps there was no significant distinction. However, I feel that a follow-up inquiry into thinking style differences as related to what type of specific career path a librarian has chosen would be particularly enlightening. In her paper about collaboration between the media specialist and classroom teacher, Paula Kay Montgomery discusses cognitive style in terms of “field dependence” and “field independence.” Her characteristics that define independence include: perception of objects within the field as separate from the field itself, likeliness to impose one’s own

Figure 1 – Librarian Thinking Styles

	Synthesist	Idealist	Pragmatist	Analyst	Realist
Thinking Styles	Integrative view Speculative Focuses on underlying assumptions May theorize excessively	Holistic view Receptive Focuses on process and relationships May overlook details	Eclectic view Adaptive Focuses on payoffs May rely too much on what “sells”	Deductive view Prescriptive Focuses on method and plan May be inflexible, overly cautious	Empirical view Corrective Focuses on facts and results May overemphasize perceived “facts”
Behavioral Clues	Bounces from topic to topic in conversation Asks “what if” questions	Is a good and interested listener Talks about long-range goals, values and ideals	Interested in a quick payoff Quick-witted and quick on their feet	Insists on technical data Generally appears neat and orderly	Is direct and frank Seems impatient and restless and interrupts a lot
May appear:	Challenging, skeptical, amused	Attentive, receptive, supportive	Open, sociable, humorous	Cool, studious, hard to read	Direct, forceful, quick, non-verbal expression
Apt to use:	Parenthetical expressions, qualifying phrases, adjectives	Indirect questions, aids to agreement	Case examples, illustrations, popular opinions	Long, discursive, well-formulate sentences	Direct, pithy, descriptive statements

structures upon the work environment and set self-defined goals, preference for working along and dealing with abstract subjects, ability to be self-reinforcing, and to rely on one’s own values. Field dependence is characterized by a reliance on the field for information regarding objects within it, a preference for a structure provided by the environment, externally defined goals, and situations that call for working with others,

and a more global experience of the environment. (Montgomery 1991). After providing the background for the two classifications of cognitive style, she presents her hypothesis that difference in cognitive style may affect how people interact with each other, and therefore may be related to the ways in which media specialists and classroom teachers work together and teach collaboratively. She paired media specialists and classroom teachers from her sample set, adjusting the twenty pairs to have every possible combination between the two professions and the two thinking styles. Half of the pairs were of media specialists and teachers who shared thinking style, and the other half of the pairs were “mismatched.” Each pair was given a self-evaluation checklist to determine their perceptions of the collaborative experience. Her findings suggested that the match or mismatch of styles was not statistically significant in determining effectiveness of collaboration, but that the cognitive style of the media specialist *was* significant when dealing with the teaching of library skills, regardless of the style of the collaborating teacher. The groups that contained field-dependent media specialists had higher scores on their checklists than those groups with field-independent media specialists, suggesting that the pairs with the field-dependent media specialists had more positive perceptions of their collaborative experiences. This is consistent with the characteristics of field-dependence, which include sociability, and more of a willingness to work with others (Montgomery 1991). The higher scores of the field-dependent media specialists demonstrate their more positive perception of the cooperative efforts of their library skills instruction efforts.

Thinking styles as they relate to library instruction is the topic explicitly addressed in Randle Gedeon’s article “Accessing the right brain with bibliographic

instruction.” More of an interest or “how to” piece than a research study with tangible results, the article is discussed here for the sole fact that someone (and, subsequently, an established journal), found the topic of brain dominance and its implications for librarianship important enough to merit publishing. The article discusses the benefits of a shift from the left-brained paradigm, with its overemphasis on analysis, to a “holistic” and “global” approach to instruction, with a recognition of the importance of right-brained techniques. The right-brained strategies that are specifically discussed in the paper include: metaphor, visual thinking, direct experience and fantasy. For each strategy, he includes concrete examples of their application in his own instruction methods. Some, such as the fantasy model (“envision yourself at a library terminal . . .”) seem somewhat hokey, but some methods, such as his emphasis on hands-on teaching, certainly seem to merit more use in library settings. His suggestions for the use of these aforementioned right-brain techniques are widely applicable to successful library instruction: keep an open mind, employ a variety of strategies to reach as many students as possible, and plan ahead.

John A. Olson also discusses holistic approaches and creative thinking in librarianship in his article “What academic librarians should know about creative thinking.” He loosely separates people into the categories of non-creative thinkers or “adaptors,” and creative thinkers or “innovators,” and discusses the importance of having a good mix of each in the workplace. While the adaptors tend to be analytical and logical (which I see as having similarities with left-brained thinking), the innovators use the complete knowledge pool (as opposed to focusing on details) for problem solving, which I see as being the holistic, or right-brained way of thought. After his initial

categorizations of types of workplace thinking styles, he discusses some of the reasons for the need for creative thinkers in the library workplace, as well as ways in which this can be encouraged, such as changing institutional culture and empowering employees. One of the benefits of creative thinking in the workplace that he sees is the correlation between creative thinking and evolution of the institutional culture. “Culture needs to evolve and grow,” he states, “or it will stagnate and die” (Olson 1999). Creative thinking will foster positive change in the workplace, which is imperative to a profession in which change is occurring rapidly.

Left-Handedness and Career Paths

On her web site, Lorin Elias provides a compilation of groups with an elevated preference of left-handedness, providing references to the original studies for further research (Elias 1997). Though she provides a few caveats regarding bias and/or legitimacy of the findings, some of the professions mentioned include lawyers, professional tennis players, professional baseball players, and musicians. The following studies discuss the prevalence and/or implications of left-handedness in various professions, and will provide some useful information on other professions that can complement a discussion of left-handedness and right-brain dominance among librarians.

Natalie Towner’s interest piece in *Computer Weekly*, with the catchy title “Do left-handers make good IT professionals?” cites a love for creative outlets such as drama, art and sports as “typical” for left-handers. Though the IT industry is “non-arty, non-sporty,” Towner claims that more than ten percent of Web designers are left-handed,

based on information from Keith Milsom of the Left-Hander's Club, which compiles data on correlations between hand preference and career choices.

Some literature in the biomedical field discusses research studies on this topic, though the careers are limited to those in the medical profession. Henderson, Stevens and Gale researched the prevalence of left-handedness among dental undergraduates and orthodontic specialists, and found that 8.6% of the dental students and 17.2% of the orthodontists were left-handed. They also found a significantly high number of mixed-handedness among the sample group. They claim that the dental profession is one that requires significant dexterity, and that their findings may correlate with the right-shift theory that mixed-handed people are better with spatial tasks. Two questions asked in their research paper can be seen as pertinent to further research on the topic presented in this paper: "Is laterality related to career pathways in dentistry [or another profession]? Are some people channeled into a career path because their handedness is felt to limit them, or because their laterality confers a slight advantage in a particular area?" (Henderson 1997).

Pasinlioglu's study of handedness among nurses had a different scope – instead of testing the prevalence of right- and left-handedness, the study evaluated the test scores of nursing students in terms of their hand use. The left-handed students were significantly more successful than the right-handers on a test of fundamentals that required the use of hand skills. Conclusions of the study included the idea that left-handers should not be forced to convert to right-handedness for the practice of nursing skills.

Discussion

This section will be an attempt to synthesize the information presented in the previous sections regarding the cognitive processes of right-brain dominant people and of librarians, with an examination of the two for any possible correlations. If I were to find similarities between the thinking processes of right-brain dominant (and therefore more likely to be left-handed) people and those of librarians, this would jibe with my casual observations of a prevalence of left-handers in the library profession; it would, after all, seem likely that these people would tend to gravitate toward a profession that often utilized the very traits that these people already possessed.

Initially, one would assume that there is a disparity between the popular notion of right-brained thinking (romanticized by the “dichotomania” and self-help books mentioned by Carter) and the bookish, analytic, language and reading focused, left-brain centered popular idea of what the schoolmarmish librarian does all day. However, much of the library literature discussed above helps dispel this idea by focusing on some of the different thinking approaches, including creative or holistic, used by librarians. After a personal examination of what I have learned in library science coursework, and of my own job duties in various libraries, it is apparent how a closer look at the profession reveals uses for thinking that is not solely analytic or “left-brained.” One example in which the application of a holistic cognitive approach would be useful is in the reference interview. During the initial inquiry process, many patrons are still unaware of the extent of the information which they need, or may still be unsure of what exactly that information is. In situations such as this, it is a useful skill for the librarian to be able to approach the inquiry from a global perspective, rather than focus on the details at that

point. Additionally, the first attempts to find information may prove futile, and flexibility is essential. The librarian must be able to utilize multiple approaches, preferably with an ability to employ a variety of thinking styles. This flexibility echoes both the greater adaptability of the left-hander, discussed by Annette (2002), and the holistic thinking style of right-hemisphere dominant people, posited by Carter (1998).

The skills discussed in Sharp's article also suggest that librarianship encompasses more holistic thinking than one would initially assume. Certainly, she emphasizes the importance of organization, classification of material, analysis of sources, and user-education, which are left-hemisphere skills, using the verbal and analytical strengths of that side of the brain. Yet some of the skills she discusses, such as the ability to conduct reference inquiries and create searching strategies, can certainly benefit from holistic approaches. Searching, especially, seems to be a task for which the big-picture right brain is well-suited, as one must be able to view the problem from many angles; flexibility and adaptability are a must. Skills such as interpersonal skills and those of education/instruction may also benefit from the right-brain gestalt, as non-verbal and visual approaches are often successful, as evidenced by Gedeon's article. It seems as though the successful librarian employs much more than the traditional left-brain organizational and analytical skills.

The library literature also provided information on the characteristics of several thinking styles, which I will (loosely) classify as right-brained or left-brained for the purpose of simplifying the following discussion. Applying what I have learned from the literature on hemisphere dominance, I would group creative, synthesist, and idealist as right-brained modes of thought processing. Keywords like "creative," "integrative,"

“speculative,” and “holistic,” used to describe these modes are similar to (or are exactly) what is used in describing the characteristics of right-brained thought, such as those adjectives used by Chevalier to describe the right hemisphere. Golian’s classification of the analyst as “deductive” and “prescriptive,” and of the realist as “empirical” and “corrective” leads me toward classifying those as left-hemisphere modes of thinking, again using the adjectives offered by Chevalier and others as guidelines. The classification of the pragmatist was a bit more difficult, because despite any different connotations, I tend to equate the terms “pragmatic” and “logical,” which would group the pragmatist with the other left-brained thinkers. However, the pragmatist was also described as being “eclectic” and “adaptive,” which I think of as being right-hemisphere traits. Since those who are right-hemisphere dominant are in the minority, right-hemisphere thinking would naturally seem more eclectic, as it is not the norm. Additionally, those who use this more uncommon thinking style must be somewhat adaptive, as they often must conform to the left-brain majority’s way of doing things. Perhaps the pragmatist utilizes the whole brain, such as those with the “bilateral speech control” discussed by Springer and Deutsch.

Golian’s study found that librarians were apt to use all of these thinking styles more or less equally, as opposed to being strongly classified as one or the other. If there is a prevalence among those in this profession to utilize a flat (flexible) thinking style, it would therefore follow that they are probably almost equally adept at using both left-hemisphere and right-hemisphere cognitive processes. Knowing this, I would deduce that there is a greater prevalence (greater than 10%) of left-handers among librarians from the following line of reasoning:

1 – Librarians are more likely to use their whole brain for cognitive processes, employing both right- and left-hemisphere thinking styles. (Golian's flat structure).

2 – Left-handers are more likely to use their whole brain for cognitive processes because:

a) They are more likely than right-handers to be right-brain dominant

b) If they have speech localized in their right hemisphere, then there is more of a synchronicity between their speech/language (a normally left-hemisphere trait) and the right hemisphere traits, because of the proximity, as this left-hemisphere trait is being housed in the right hemisphere. Thus, these people will seem to be more "whole-brained," due to the advantages they have regarding the "connect time" between speech/language and the visual-spatial traits.

c) Left-handers are more likely to have bilateral speech control. (Springer and Deutsch 1997).

d) It has been often shown that left-handers exhibit a greater degree of ambidexterity than do right-handers, and are less strongly sided, and so may be more adept at using the "weaker" hemisphere, due to a greater degree of adaptability. (Annett 2002).

The evidence seems to suggest a match between the cognitive styles used in librarianship, and those which may be naturally found, to a greater extent, among left-handed, right-brained people. I would surmise that, all things being equal, people are more likely to enter a profession in which they perceive a correlation between skills used on the job and their own personal traits. Therefore, it makes sense that a higher number of right-brained dominant people, who often exhibit a higher tendency of "whole-brain" abilities, would be drawn to a profession in which the use of multiple thinking styles is a particular benefit.

Further Research

I believe that this study would provide groundwork for some interesting future investigations. To begin with, one could test and survey a large sample of librarians to pinpoint an actual percentage of left-handedness in the profession. While there are numerous operational definitions of handedness, for the purpose of this study, handedness would be determined by the hand with which one both wrote and held a spoon for eating, because these are simple parameters. If a different hand were used for each task, the participant would be labeled as mixed-handed. The overall percentage of left-handers would then be determined, and if this number was greater than ten, a statistical test would be run to determine the significance of the difference. Other nominal-data questions could be asked related to gender, race, age, and the type of library in which one worked, as well as the type of job duties one performed. The whole data set would then be coded and various groups (e.g., all the male respondents, or all of the school librarian respondents) would then be tested for a prevalence of left-handedness and a possible significance of this inflated number of left-handers. Once any significant differences between specific aspects of the demographics of both sets have been pinpointed, these can be probed more carefully to see if any causes for the differences can be determined. For example, if it is found that twenty percent of males who work in technical services departments are left-handed, further research can explore why left-handed males are seemingly drawn to this type of work. Is there something about the characteristics attributed to left-handedness that complement this type of work? I would test the participants with a survey not only for the nominal data mentioned above, but for

responses that are more qualitative in nature as well, in an attempt to probe some of the more intangible relationships between left-handedness and the skills used in librarianship to try and ascertain any proclivity on the part of left-handers toward entering the professions.

Of course, this study would be little more than quantitative number crunching if there were no attempt to provide an explanation for any high percentages of left-handers among the various demographic groups of librarians (or among the group as a whole). This is why I suggest the preliminary determination of percentage of left-handers be paired with a qualitative study of the very same participants, to discover the reasons they were drawn to the profession, what skills they feel they successfully utilize as librarians, what cognitive styles they use in their daily work, etcetera. It would be interesting to replicate yet modify Golian's study of any differences in thinking style between public service and technical service librarians, and see how this perhaps correlates with data on handedness.

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