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## Handwritten Entry Research

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The document examiner will infrequently encounter a handwritten entry problem. When such a problem does arise, it is usually to determine if an entry is spurious. Generally, the problem is to prove that a group of diaries, logs, or similar entries were not written on several different occasions over an extended period as purported but rather were all written at the same time. Most examiners, because of the lack of experience and published reference literature dealing with such problems, find they know neither how to approach such problems nor how to develop or interpret the value of possible latent evidence. The problem as stated cannot always be answered in a satisfactory fashion, even by examiners with extensive experience. A lot of valuable information dealing with such problems, most of which was not published, has been exchanged. In many instances, the information formulated has been a direct result of examination of cases. Many of these cases did not have adequate contemporary reference diaries, logs, calendars, or similar exemplars on which to base an opinion. This is not to say that a reliable opinion on a set of questioned entries cannot be given without comparable exemplars. In many instances, the opinion rendered depends a great deal on the evidence in each case. However, the scientific process dictates that opinions concerning an unknown be based on its deviation from a compatible known or reference.

Thus, the purpose of this research was to examine voluminous known nonspurious handwritten entries with the intention of proving characteristic trends, generalities, or telltale signs. Once documented, these could then be used as reference observations in the future examination and differentiation of questioned handwritten entries.

A literature search for published papers specifically written on handwritten entries was not very lucrative. The search did, however, yield two related papers. One by Harris and Mills [1] dealt with the examination and detection of alterations and additions to some medical records. The other article, by Keeler [2], related to characteristics of connecting marks and unnatural regularity of fraudulent tally marks in an election fraud case. There were two formal papers that more specifically addressed the subject of handwritten diary entries. One paper, presented by Doud [3], related details for the evaluation of natural letter form variations as opposed to unnatural uniformity in calendar and diary entries. Beck [4] presented a very informative paper on the evaluation of handwritten diary entries. His paper described details such as line quality, form, and arrangement that led him to form an opinion concerning handwritten entries. His paper also included a number of case histories. Hilton [5] mentioned an unnatural regularity of tally marks in ballot frauds. Harrison [6] also related the regularity seen in fraudulent diary and notebook entries as well as the use of unnatural regular pen patterns in forged account books.

The typical handwritten entry problem may involve expense accounts, time sheets or cards, log books, ledger sheets, mortgage and credit accounts, medical records, calendars, diaries, and any other documents upon which entries or notations are made.

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Source materials used in this research consisted of more than 500 known exemplars of handwritten entries collected from a number of private and governmental agencies. Sources included gas, water, and sewage payment ledgers, long distance telephone call logs, laboratory case entry logs, court docket logs, weekly receipts, expense account records, tax account books (both private and governmental), payroll logs, duty lists, medical records, calendars, diaries, voting records, and many other similar records. These exemplars were of known origin and circumstances and most of the material was written during normal business hours. The writers were not aware that their writing would be used for comparison at a later date. Sex, age, and educational backgrounds were not considered to be pertinent to this research.

There are obviously numerous forms and formats of entries. Most of the handwritten entries examined in this research consisted primarily of vertical columns and short notations. Each column generally consisted of a single data item such as date, time, amount, item number, quantity, initials, name, and notation. Two basic types of handwritten entries were encountered: single entries and multientries.

A single entry consists of any one piece or line of information written during a single setting. Each entry is written at a completely separate time (independent) from any of the preceding or following entries. This type of entry requires that the hand, arm, and writing position be completely disrupted before the writing of a subsequent entry.

A multientry is a series of entries consisting of two or more entries written during a single setting. The writer does not completely alter his hand, arm, or writing position between each individual entry but maintains his general writing position until the entire series has been completed.

### **Writing Form and Quality**

Single entries generally exhibited slower, more deliberate execution than did multientries. There were certain extremes of speed obtained in multientries that were not evident in single entries. Each single entry required the writer to reposition his body, arm, and hand. The slower writing would generally exemplify one or a combination of some of the classical signs of deliberation: more abrupt beginning and terminating strokes, upright slant, larger letters, shorter word length, occasional embossing, heavier and wider ink lines, and increased consistency and legibility.

Once the first entry of a multientry series has been written, the writing position, alignment, orientation, and familiarization (if required) have been established. The writer could then concentrate on increasing his speed in the recording of subsequent entries. When voluminous information had to be recorded, the thought of laborious repetition seemed to be a major contributor to increased speed and carelessness. Increased speed was often exemplified by increased slant, poor letter construction, feathering of beginning and terminating strokes, decreased pressure, flatter and longer word lengths, increased variation, and decreased legibility.

### **Alignment and Arrangement**

There were basically two types of single entry and multientry vertical alignment relationships observed. One method was to align the entry directly under the preceding column entry with the previous entries serving as the aligning guide for all subsequent entries. The other method completely ignored previous entry alignment and realigned the new entry with the real or imaginary margin. It was found that the previous column alignment method was most often used in multientries and that margin alignment was used with single entries. Determining why the column alignment was mostly seen in multientries is beyond the scope of this research. However, one cannot help but ponder that it may be

related mechanically, psychologically, or both. The arm, hand, elbow, and writing position are well established and generally maintained throughout the entire multientry series. The elbow becomes the primary pivot point for each entry in the series. As a result, the series will exhibit an inherent consistency and regularity. The regularity is reflected in the uniform arrangement and alignment of the entries with respect to one another. The series will have a fluid, even baseline and marginal deviation. This deviation will often appear as an uphill-downhill slope, or a side-to-side sway, or both. This deviation is depicted in a group of multientries shown in Fig. 1. Interruptions are evident at Points 4483, 4467, and 4507.

In contrast, single entries are not written as a series and consequently usually manifest more irregularity and randomness with respect to one another.

The regularity was more apparent in those cases where the data were not bound by adjacent printed column guide lines.

### Writing Instrument

A single entry line will generally contain writing by the same hand and writing instrument. If a log is maintained in an office where several people make entries in it, the log will contain written entries by several hands and several writing instruments. A few ex-

4474	Harold Macaie	0.0970
4475	Albert Hall, Jr.	0.1770
4476	Harvey Sebery, Jr.	0.2090
4477	Robert E. Banker	0.2670
4478	David Froust	0.1770
4479	Leslie Taylor	0.2270
4481	Eddie Jackson	0.2370
4482	Franklin Campbell	0.2570
4483	Raymond Criner	0.1570
4468	Essel Payton	0.1770
4469	Gordon Montgomery	0.2170
4467	James E. Coleman	0.0870
4453	James E. Hughes	0.0770
4480	James L. Henry	0.3170
4492	Kenneth D. Smith	0.1970
4513	Charles Maker	0.0370 <sup>7</sup>
4514	Kenneth Harrison	free 70
4503	Cordell King	free
4504	Lee Mack	0.1770
4505	Robert E. Limer, Jr.	0.1500
4506	David Massengill	0.2770
4507	James Taylor	0.1770
4508	Vester Clay	0.2070
4509	Derwood Hollie	0.1170
4510	Donald Kirby	0.2570
4511	Edward Burt	0.1270
4512	Thomas Watson	0.1770

FIG. 1—Marginal deviation typical of a multientry series. Interruptions at 4483, 4467, and 4507 signal the beginnings of new series.

ceptions to the variety of writing instruments may be that the office purchases the same brand and color of pen by the hundreds or thousands. Other exceptions may be that the same pen is always stationed by the log or that an individual always uses a favored pen. A single entry log, maintained by the same writer over an extended period of time, will generally contain writing by the same hand using a variety of writing instruments. The order of using writing instruments in logs containing single entries was found to be random and inconsistent. Patterns of different pen usage did not exist. In contrast, a multientry series was generally written by the same hand using the same writing instrument.

Single entries and multientries written by the same hand are shown in Fig. 2. The entries from Jackson through Cook are single entries that manifest randomness in both writing instrument and alignment. Entries from Arnold through Vaught constitute a multientry showing uniformity in alignment and a single writing instrument.

### Letter Form Variations

Doud [3] observed several cases in which letter form variations had some relevancy in determining whether or not entries were written at or about the same time rather than on separate dates. These variations were related statistically as to the frequency of occurrence in standard writings as compared to the frequency of occurrence in questioned entries. This variation is based on the premise that one or the other letter form would be more consistently used (a higher probability of occurrence) in a set of multientries than in single entries.

Doud [3] found that in one case dealing with time card entries a triangular figure 4 was used in 98% of the questioned entries whereas it occurred in only 40% of the entries in the standard time cards.

The known source material in this research was examined to see if the letter form variation hypothesis applied. It was found that the hypothesis did indeed prove to be reliable in most cases where there were enough single entries and multientries to make an adequate comparison. Not all of the cases examined contained letter form variations that

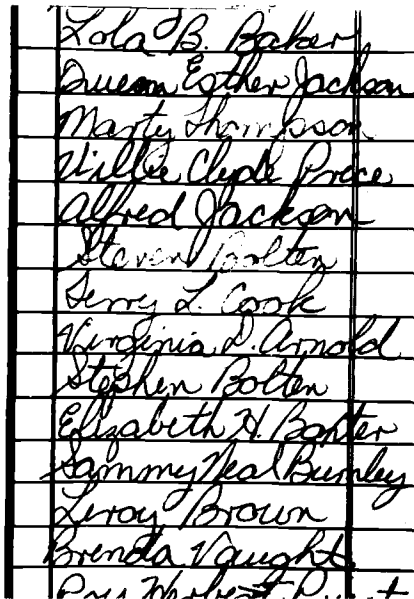


FIG. 2.—A series of single entries and multientries written by the same hand.

were considered significant enough to count as being something other than normal variation. However, where applicable, it was found that there was a greater occurrence of optional form usage in single entries. It appears that when a number of entries are written on or about the same time, the writer will be more consistent with the use of one form or the other. Table 1 shows several of the letters and numbers encountered that had optional letter forms. The use of the optional *S* form is depicted in a single-entry series in Fig. 3.

### Sequence of Recording

Several ledgers were found to contain fine pen drag marks connecting the column data vertically rather than horizontally as expected. The column data also consistently dropped below the baseline and revealed a striking uniformity. Errors and corrections occurred vertically and in clusters. When the writers were questioned, it was found that this method of recording was preferred when large amounts of precompiled column data were being transcribed from one ledger to another. It was a common consensus that vertical recording of column data required less head, hand, and arm movement and fewer eye contact interruptions than did horizontal recording. In contrast, the horizontal recording method was preferred when dealing with a multientry series of short, closely arranged, abrupt strokes. Such was shown in a fraudulent vote tallying case [2] and *X* marks on fabricated work sheets [4]. In these cases, the objective was to place a number of marks across from a name or date as quickly as possible rather than to copy data from one source to another. The vertical recording method is depicted in Fig. 4. The direction of pen drag mark is apparent at the bottom of the 7 in 3517. The numbers consistently drop below the baseline. There appears to be a uniformity in the vertical rather than horizontal direction. A copy error at 3509 was made and corrected vertically.

### Fraudulent Entries

Most entry problems brought to the attention of the document examiner are spurious in nature. A number of these cases have been examined and commented on, and generally references are made concerning only isolated cases. Thus it was thought appropriate to devote a section of this paper to the accumulation of evidence that has led document examiners to form opinions concerning handwritten entries in past cases. The following is a list of such evidence with corresponding references:

- (a) writing form and quality of entries [1-4];
- (b) entry alignment and arrangement [1-6];

TABLE 1—Occurrence of letters and numbers with optional forms.

Letter or Number	Occurrence of Optional Form, %	
	Single Entries	Multientries
S	38	5
F	43	15
4	22	1
2	35	2
t	31	3
r	29	5
o	15	2
8	33	10
B	38	24
3	41	12

enoll	W. M. P. D.
ta	L. S. P.
ta	S/O
ta	L. S. P.
ta	L. S. P.
ta	S/O
ta	L. S. P.
ta	S/O
ta	L. S. P.
ta	L. S. P.
ta	S/O
ta	L. S. P.

FIG. 3—Optional S forms used in a single-entry series.

3500	6-30
3510	6-30
3517	6-30
3512	6-30
3514	6-30
3516	6-30
3515	6-30
3518	6-30
3518	7-2
3518	7-2
3520	7-2

FIG. 4—Correction sequence and direction of drag marks (bottom of 7) indicate vertical recording.

- (c) writing instrument [1, 2, 4, 6, 7];
- (d) letter form variations [3];
- (e) sequence of recording entries [1, 2, 4];
- (f) the mistaken use of the existing date for a previous purported date (1978 for 1977) (it may occur several times or may be corrected) [1];
- (g) Physical condition of log or diary (a well-handled document will usually show signs of wear and soiling. If these signs are natural, it is a good indication of genuineness. The absence of these signs would have to be evaluated based on the environment and circumstances to which the log has been subjected) [4];
- (h) improper sequence of intersecting lines [1];
- (i) presence of erasure, eradications, obliterations, or some combination of these [1, 2, 4, 6];
- (j) crowding of writing or squeezing in [1];
- (k) use of forms or logs not printed or purchased until after purported date of entries [1, 6];
- (l) placement of notations on calendars with similar location and arrangement;<sup>2</sup>
- (m) connecting strokes revealing progression of written entries contrary to the norm [2, 4];
- (n) consistent alterations of different writing instruments or repeating data forming unnatural patterns [1, 2, 4, 5, 7, 8];
- (o) long-standing pencil entries showing evidence of smudging resulting from motion of the pages rubbing together in a diary that was carried in a pocket [6];
- (p) dating problems [6]; and
- (q) a list of multientries often showing an increase or decrease in word length or number size as they are written down a column (Footnote 2).

The above list is not complete nor was it intended to be.

### Summary

Each handwritten entry case presents its own unique problems. Accurate solutions require knowing the normal entry writing procedure and searching for deviations from that norm. Sometimes the smallest subtleties can signal the beginning or end of a multientry series.

This study examined numerous known entries with the purpose of discovering and delineating current hypotheses concerning any generalities or trends that may be associated with the differentiation of single entries and multientries. These characteristics can be used as references in the examination of future handwritten entry problems. Also included in this paper is a short list of evidence that has previously led some examiners to form opinions concerning spurious handwritten entries.

### References

- [1] Harris, J. J. and Mills, D. H., "Medical Records and the Questioned Document Examiner," *Journal of Forensic Sciences*, Vol. 8, No. 3, July 1963, pp. 453-461.
- [2] Keeler, K., "A Study of Documentary Evidence in Election Frauds," *Journal of Criminal Law, Criminology and Police Science*, Vol. 25, No. 3, 1934-1935, pp. 324-337.
- [3] Doud, D. B., "Letter Form Variations as Related to Suspect Calendar and Diary Entries," report presented at a meeting of the American Society of Questioned Document Examiners, San Francisco, Calif., 1976.
- [4] Beck, J., "Evaluation of Handwritten Diary Entries," report presented at a meeting of the American Society of Questioned Document Examiners, Milwaukee, Wis., 1974.

<sup>2</sup>J. H. Kelly, chief document examiner, Georgia State Crime Laboratory, Atlanta, personal communication, 9 Feb. 1978.

- [5] Hilton, O., *Scientific Examination of Questioned Documents*, Callaghan and Co., Chicago, 1956, p. 134.
- [6] Harrison, W. R., *Suspect Documents: Their Scientific Examination*, Sweet and Maxwell Ltd., London, 1966, pp. 60-61, 208.
- [7] Osborn, A. S., *Questioned Documents*, 2nd ed., Boyd Printing Co., New York, 1929, p. 556.
- [8] Baker, J. N., *Law of Disputed and Forged Documents*, Michie Co., Charlottesville, Va., 1955, p. 304.

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