



## Questioned Documents Section - 2012

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### J8 Determining Reliability and Frequency of Trough Pattern in Gel Ink Pens

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After attending this presentation, attendees will understand the frequency of trough patterns in blue and black gel ink pens, their reliability, and value as a physical characteristic when influenced by various substrates.

This presentation will impact the forensic science community by providing further knowledge to the Forensic Document Examiner (FDE), by enhancing their non-destructive examination techniques in casework where the determination and differentiation of a writing instrument is vital.

To become a FDE, a two year minimum training program must be completed under the tutelage of a trained FDE. The training program includes a multitude of tasks that must be successfully mastered. One of those tasks is the ability to classify the type of writing instrument used in the preparation of a document; for example, a ball point pen from a roller ball pen or a roller ball pen from a gel ink pen.

When examining the earliest gel pen lines, an acceptable assumption (at initial inspection) was that a visible trough in the ink line was indicative of a gel pen being used. The term "trough" is described as a "long narrow or shallow channel" according to the dictionary. Over the course of numerous examinations, it was discovered that this visual identification is not always reliable. Some gel ink pens do not demonstrate a trough pattern. Consequently, research had to be conducted to determine the reliability and frequency of trough patterns produced by gel ink pens.

In forensic document examination, both destructive and non-destructive techniques can be used to determine and differentiate writing instruments and inks. For the purpose of this research, only non-destructive techniques were utilized. Eighteen gel ink samples were handwritten on three types of substrates using multiple brands of blue and black gel pens. After careful examination of the samples, the trough observations were documented and divided into four categories based on trough presence. These categories were: no trough observed, trough observed some of the time, trough observed most of the time, and trough observed all of the time. The observations from all three substrates were used to calculate the trough frequencies. In addition to observing how the substrate may have influenced the trough pattern, the gel pen brand and ink color were considered and the frequency was calculated as well.

An analysis of the results determined that the substrate influenced the presence of a trough pattern, and that a trough pattern was unreliable as the only physical feature to differentiate gel ink pens from other types of writing instruments. Therefore, it is recommended that trough patterns, only in conjunction with other physical characteristics, be used to successfully classify gel ink pens.

**Frequency, Trough, Gel**