

IN THE SUPREME COURT OF PENNSYLVANIA

**IN RE NOVEMBER 3, 2020
GENERAL ELECTION**

Petition of Kathy Boockvar, Secretary
of the Commonwealth of Pennsylvania

No. 149 MM 2020

**ANSWER OF THE PENNSYLVANIA ALLIANCE FOR RETIRED
AMERICANS**

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INTRODUCTION

The Pennsylvania Alliance for Retired Americans is an intervenor-defendant in *Trump for President, et al. v. Boockvar, et al.*, No. 20-966 (W.D. Pa.). In that case, it has urged the federal district court to reject the efforts of the Republican National Committee, Donald J. Trump for President, Inc., and several Republican Congressman (the “Republicans”) to graft a new signature match law onto Pennsylvania’s existing Election Code. The Alliance now joins Secretary Boockvar’s petition to this Court to invoke its King’s Bench powers to resolve this issue of critical importance.

“This isn’t golf: there are no mulligans.” *Fla. Democratic Party v. Scott*, 215 F. Supp. 3d 1250, 1258 (N.D. Fla. 2016). “[O]nce the election occurs, there can be no do-over.” *League of Women Voters of N.C. v. North Carolina*, 769 F.3d 224, 247 (4th Cir. 2014). The litigation in *Trump for President* has revealed disagreement among the counties over whether signature matching is permitted, and the Republicans’ position in that case has sowed further confusion. The Secretary’s petition gives this Court an opportunity to deal with this contested issue before it comes back to haunt the Commonwealth in the days following the election.

STATEMENT OF SUPPORT FOR THE PETITION

I. Exercise of King’s Bench powers is appropriate in this case.

There is an epidemic in this country of rejected mail ballots. Over half a million mail ballots were rejected in the spring primaries: those ballots represent

hundreds of thousands of voters who were disenfranchised. Many of these rejections are the result of signature match laws such as the one Republicans seek to invent under Pennsylvania law. But Pennsylvania’s election laws, which requires election officials to confirm the information on a mail-in or absentee ballot application or ballot return envelope, do not include a signature matching requirement. 25 P.S. § 3146.2b(c) (absentee applications); 25 P.S. § 3150.12b(a) (mail-in applications); 25 P.S. § 3146.8(g)(3) (ballots). In fact, those statutes do not even mention signature matching.

That is likely because laws that task lay election officials with “matching” the signature on a ballot return envelope or application with registration records are inherently flawed and result in the arbitrary rejection of a large number of validly cast ballots. As Dr. Linton Mohammed explains in his attached declaration, even individuals trained in signature matching make significant errors when forced to operate “under the conditions that most signature matching occurs in the contest of elections.” Mohammed Decl. ¶ 36. Thus, when *lay* officials are made responsible for performing signature matching, they are “highly likely to make” errors. *Id.* ¶ 38.

Lay officials routinely fail to account for the many reasons individuals’ signatures naturally vary, which causes them to reject ballots erroneously far more often than they accept a ballot erroneously. *Id.* ¶¶ 39–42. A voter’s signature varies for a host of reasons such as her health, the time of day, her level of concentration,

nervousness, the writing instrument she uses, her stance, the surface she uses, and her level of stress. *Id.* ¶ 42. And because certain subgroups of voters—such as younger voters and voters for whom English is a second language—tend to experience wider signature variation, lay officials erroneously reject those voters’ ballots at a significantly higher rate. *Id.* ¶¶ 31–33, 43–45.

Even when election officials are trained in signature matching, they still tend to reject valid ballots erroneously because election-related signature matching involves too few samples. Although proper signature matching “require[s] multiple specimen signature for comparison with a questioned signature,” election officials normally have just one sample, which itself is usually inadequate because it was captured digitally. *Id.* ¶¶ 48–51.¹ Nor are they given adequate equipment for inspecting signatures. *Id.* ¶¶ 52–53.

Fortunately, the Supreme Court of Pennsylvania has recourse against the Republicans’ attempt to subject Pennsylvanians to this inherently flawed system. By exercising its King’s Bench powers to confirm that the relevant statutes mean what they say—absentee or mail-in ballots or ballot applications may not be trashed based on the amateur divination of election workers poring over undotted *i*’s and crookedly

¹ For example, many voters in Pennsylvania have signatures imported from the PennDot database, which often are of poor quality.

crossed *t*'s—this Court can inoculate the “free and equal election” demanded by Pennsylvania’s Constitution against this latest peril. *See* Pa. Const. Art. I, § 5.

The Court may exercise its King’s Bench authority under 42 P.S. § 502 “to review an issue of public importance that requires timely intervention by the court of last resort to avoid the deleterious effects arising from delays incident to the ordinary process of law.” *Friends of Danny DeVito v. Wolf*, 227 A.3d 872, 884 (Pa. 2020). “[T]he power of King’s Bench allow[s] the Court to innovate a swift process and remedy appropriate to the exigencies of the event.” *In re Bruno*, 101 A.3d 635, 672 (Pa. 2014). That power contemplates controversies just like this one, where a political party is seeking to enforce an imaginative reading of the Election Code in federal court just before voting begins. But this Court is the authoritative arbiter of state law, and so this Court must provide timely resolution of the dispute to ensure the Secretary of State, 67 county election boards, hundreds of candidates and their affiliated parties, and millions of Pennsylvania voters—including those represented by the Alliance—understand and abide by the appropriate procedures for the imminent election.

II. This Court should grant the requested declaratory relief.

The Secretary asks this Court to entertain two related questions: (1) whether county election boards can reject absentee or mail-in ballots, or applications for the same, based on the untrained determination of a county election official that the

signature on the application or ballot return envelope does not match the voter's signature in their voter registration records; and (2) whether third-party observers, namely individuals who represent political parties and candidates, may challenge an absentee or mail-in ballot, or application for the same, based on their untrained judgment that the signature does not match. The Secretary urges this Court to answer “no” to both. The Alliance agrees for the following reasons.

A. The Secretary is correct that Pennsylvania law does not require or permit an absentee or mail-in ballot or application to be rejected based on signature matching.

The Pennsylvania Election Code is clear: county election boards do not have authority to reject voted absentee or mail-in ballots or ballot applications based on signature matching. As the Alliance explains below, this conclusion is compelled by all applicable principles of statutory construction, ranging from the plain meaning of the language adopted by the General Assembly to the principle that statutes should be construed to avoid significant constitutional questions.

1. *The statutory text is clear and unambiguous: signature matching is neither required nor permitted.*

The purpose of statutory interpretation is to “ascertain and effectuate the intent of the General Assembly.” *A.S. v. Penn. State Police*, 143 A.3d 896, 903 (Pa. 2016) (citing 1 Pa. C.S. § 1921(a)). The starting point of the Court’s analysis is the plain language of the statute. *See id.* When the statutory text is clear and unambiguous, the Court’s inquiry stops. *See id.*; *see also* 1 Pa. C.S. § 1921(b) (“When the words

of a statute are clear and free from all ambiguity, the letter of it is not to be disregarded under the pretext of pursuing its spirit.”).

The statutes at issue here, 25 P.S. § 3146.8(g), 25 P.S. § 3146.2b, and 25 P.S. § 3150.12b, are clear and unambiguous—signature matching is *not* part of the comprehensive regime the General Assembly has constructed when absentee and mail-in voters request and vote their ballots. In fact, nowhere do these three statutes even *mention* signature matching, much less require it. Instead, the statutes require the county board of elections to determine the qualifications of an applicant by “verifying the proof of identification and comparing the information” on the application to the voter’s registration. 25 P.S. § 3146.2b(c) (absentee applications); 25 P.S. § 3150.12b(a) (mail-in applications); 25 P.S. § 3146.8(g)(3) (ballots).

The use of the word “comparison” in the statute clearly and directly relates to “the *information*” provided by the application, it does *not* authorize the comparison of *signatures*. The plain and ordinary meaning of “information” is “knowledge obtained from investigation, study, or instruction,” “facts,” and “data.” *See* Information, Merriam-Webster Online, Definition 1(a)(1), (3), <https://www.merriam-webster.com/dictionary/information>.

Signatures, on the other hand, do not function as an identifier under the Pennsylvania Election Code. Instead, a voter signs a *declaration* on the application

or ballot return envelope.² Thus, the signature’s purpose is familiar to anyone who has ever signed a contract, oath, or affirmation: to memorialize that the signer makes certain promises and is bound to certain terms.

The remainder of the Pennsylvania Election Code shows that, if the General Assembly had wanted to require signature comparison, it would have said so explicitly. The General Assembly has imposed signature matching requirements in some parts of the Election Code, *see* 25 P.S. § 3050(a.3)(2) (election officers “*shall compare the elector’s signature* on his voter’s certificate with his signature in the district register” and, if the signature “appears to be genuine,” the voter will be allowed to vote); *see also* 25 Pa. C. S. A. § 1402(f), but not here despite having twice amended the vote by mail laws in the past two years. Basic canons of construction direct courts to presume that the legislature has “act[ed] intentionally when it uses particular language in one section of a statute but omits it in another.” *Republic of Sudan v. Harrison*, 139 S. Ct. 1048, 1058 (2019). Because the General Assembly

² For example, the mail-in ballot application includes the following declaration:

I declare that I am eligible to vote by mail-in ballot at the forthcoming primary or election; that I am requesting the ballot of the party with which I am enrolled according to my voter registration record; and that all of the information which I have listed on this mail-in ballot application is true and correct.

Pennsylvania Application for Mail-In Ballot, available at https://www.votespa.com/Register-to-Vote/Documents/PADOS_mailInapplication.pdf.

chose to include a signature comparison requirement only in other sections of the Election Code, the Court should “resist the suggestion to read that language” into 25 P.S. § 3146.8(g)(3).

2. *Reading a signature match regime into the existing statute would create significant constitutional concerns.*

If the Republicans imaginative reading of the statute is correct, and Pennsylvania law requires signature matching, then what the Commonwealth is left with is a statute that allows counties to reject lawfully cast ballots while providing no standard for when signatures should be rejected and offering no cure process for voters whose ballots are wrongfully rejected. Each county would be left “to apply its own standards and procedures for executing the signature-match requirement, virtually guaranteeing a crazy quilt of enforcement of the requirement from county to county.” *Dem. Exec. Committee v. Lee*, 915 F. 3d 1312, 1320 (11th Cir. 2019). A signature match regime designed in this manner would be patently unconstitutional. Indeed, courts across this country have struck down similar laws as an infringement on the right to vote or a violation of due process. *Id.*³

³ See also *Frederick v. Lawson*, No. 1:19-cv-1959-SEB-MJD, 2020 U.S. Dist. LEXIS 150995, at 2 (S.D. Ind. Aug. 20, 2020) (permanently enjoining Indiana election officials from rejecting any absentee ballot because of perceived signature mismatch absent adequate notice and cure procedures to the affected voter); *League of Women Voters of N.J. et al. v. Tahesha Way*, No. 20-cv-05990, Dkt. 34 (E.D.N.J. June 17, 2020) (granting preliminary injunction and ordering New Jersey election officials to allow voters to cure absentee ballots with missing or mismatched

This backdrop informs the statutory analysis in two ways. First, the General Assembly passed Act 77, which does not include a signature match law, in October 2019. That closely followed a rash of cases striking down signature match laws. *See Lee*, 915 F.3d at 1315; *Martin v. Kemp*, 341 F. Supp. 3d 1326 (N.D. Ga. 2018), *appeal dismissed sub nom. Martin v. Sec’y of State of Georgia*, No. 18-14503-GG, 2018 WL 7139247 (11th Cir. Dec. 11, 2018); *Saucedo v. Gardner*, 335 F. Supp. 3d 202 (D.N.H. 2018); *LULAC v. Pate*, No. CVCV056403, 2019 WL 6358335 (Ia. Dist. Ct. Sept. 30, 2019). This Court must presume that the General Assembly knew about the constitutional concerns raised by these decisions and did “not intend to violate the Constitution of the United States or of this Commonwealth” in its legislation. 1 Pa. C.S. § 1922(3); *id.* § 1921(c)(6) (directing courts to consider the “consequences of a particular interpretation”).

signatures for sixteen days after Election Day); *Self Advocacy Sols. N.D. v. Jaeger*, No. 3:20-CV-00071, 2020 U.S. Dist. LEXIS 108854 (D.N.D. June 5, 2020) (holding North Dakota’s cure procedures for absentee ballots violated due process and ordering North Dakota’s election officials to allow voters six days after Election Day to cure their absentee ballot); *Martin*, 341 F. Supp. 3d at 1342 (granting preliminary injunction directing Georgia election officials to implement cure process for signature matching); *Saucedo v. Gardner*, 335 F. Supp. 3d 202, 222 (D. N.H. 2018) (declaring signature match law unconstitutional because it did not include a cure process); *see also League of Women Voters of the United States et al. v. Kosinski*, et al., No. 1:20-cv-05238, Dkt. 37 (S.D.N.Y. Sept. 17, 2020) (consent decree requiring New York election officials to provide five days for voters to cure absentee ballot after voter is notified of the need to cure the ballot).

Second, the canon of constitutional avoidance urges interpreting the statute to not include a signature matching law. *Commonwealth v. Veon*, 637 Pa. 442, 433, 455 (2016); *see also* 1 Pa. C.S. § 1922(3). The canon of constitutional avoidance is a well-established tool that courts use to interpret statutory texts. Under the doctrine, “when a statute is susceptible of two constructions, by one of which grave and doubtful constitutional questions arise and by the other of which such questions are avoided, our duty is to adopt the latter.” *Veon*, 637 Pa. at 443 (citation omitted); *accord Clark v. Martinez*, 543 U.S. 371, 381 (2005). It is already the case in Pennsylvania that “statutes tending to limit the citizen in his exercise of the right of suffrage should be liberally construed in his favor.” *In re James Appeal*, 377 Pa. 405, 105 A.2d 54, 65–66 (1954). But this principle is especially true here where a contrary interpretation of the statute—one that imposes a signature matching regime—would raise serious constitutional concerns.

B. The Secretary is correct that Pennsylvania law does not allow third party challenges to ballots for signature mismatch.

The Secretary is also correct that absentee and mail-in ballots themselves cannot be challenged for signature mismatch for one obvious reason: they cannot be challenged at all.⁴

⁴ Absentee and mail-in ballot applications *are* subject to third party challenges. But those challenges are governed by the very same statutes, just discussed, which do not provide for signature matching. *See* 25 P.S. § 3146.2b (absentee applications); 25 P.S. § 3150.12b(a) (mail-in applications).

Section 3146.8 governs the canvassing of absentee and mail-in ballots, and previously included an explicit challenge process for ballots. Prior to March 2020, Section 3146.8(g) provided an unambiguous right for third parties to challenge an absentee or mail-in ballot. *See* 25 P.S. § 3146.8(g)(2)-(3) (2019) (“Representatives shall be permitted to challenge any absentee elector or mail-in elector in accordance with the provisions of paragraph (3)” and “the county board . . . shall give any candidate representative or party representative present an opportunity to challenge any absentee elector or mail-in elector”).

When the General Assembly passed Act 12 of 2020, however, it deleted this language, thereby deliberately removing any opportunity to challenge voted absentee and mail-in ballots. Act of Mar. 27, 2020, P.L. 41, No. 12 (“Act 12”). Section 3146.8(g)(4) now directs that [a]ll absentee ballots which have not been challenged under section [3146.2b] and all mail-in ballots which have not been challenged under [3150.12b] . . . ***shall be counted and included with the returns of the applicable election district . . .***) (emphasis added).⁵ The two provisions referenced in Section 3146.8(g)(4)—sections 3146.2b and 3150.12b only allow

⁵ Mail-in and absentee ballots are still issued to voters before, and sometimes after, their applications are challenged. In those instances, the ballot itself will be set aside while the challenge to the application is pending. 25 P.S. § 3146.8(g)(5)-(7). Thus, some parts of the Election Code still refer to challenging a “ballot.” 25 P.S. § 3146.8(f). In light of the clear statutory history, however, those references should be understood to refer to the ballot associated with a challenged application.

challenges to absentee and mail-in ballot *applications* and require that such challenges be entered no later than 5 p.m. on the Friday before the election. This Court has already held the word “shall” will not be interpreted as “anything less than mandatory.” *Penn. Dem. Party v. Boockvar*, No. 133 MM 2020, 2020 WL 5554644, at *25 (Pa. Sept. 17, 2020). And the same applies here. Presumably, the General Assembly concluded that allowing challenges to applications, which play a gatekeeper function in absentee and mail-in voting, provided adequate protections against the rare occurrence of voter fraud, while still ensuring that election results are known in a timely manner. This unambiguous language and statutory history make clear that the General Assembly did not intend to include a challenge process for voted absentee and mail-in ballots.

This reading of the statute is consistent not only with the text and statutory history but with the legislative history as well. Act 12 was introduced to ensure the timely resolution of the election results in Pennsylvania and avoid the pitfalls of the 2000 General Election in Florida, and the Iowa Primary this year, where results were delayed several weeks. Second consideration of SB 422 (Act 12), Remarks From House Journal, March 24, 2020 <https://www.legis.state.pa.us/WU01/LI/HJ/2020/0/20200324.pdf#page=21>.⁶ A

⁶ Representative Kevin Boyle explained, “And furthermore, in relation to the change of canvassing, I know some members, particularly on the other side of the aisle, had

challenge process for mail in and absentee ballots, of course, threatens to delay election results significantly, especially when layered on top of an application challenge process.

CONCLUSION

The task before this Court is urgent: the hourglass measuring time until the election is quickly running out of sand. To prevent bedlam and confusion—and the potential disenfranchisement of a large swath of Pennsylvania voters in a hotly contested election—every stakeholder and participant requires clear and certain guidance from this Court. Fortunately, the task is uncomplicated because the statutes are clear. The Pennsylvania Alliance for Retired Americans respectfully requests this Court to assume jurisdiction under its King’s Bench power and declare that the Election Code does not permit absentee or mail-in applications or ballots to be challenged or rejected based on signature analysis.

wondered why we are doing that. I think it can best be described that we do not want to be Iowa. We do not want to be the Iowa Democratic Party in February in 2020 during their caucuses. And we do not want to be Florida back in 2000. When we have our election, whether it is the primary or the general election permanently, we do not want a delay of several weeks before there is actually a result. I do not think any of our constituents want that, and I do not think any Americans want to see that because in 2020 Pennsylvania is supposed to be a critical swing State. So no matter whether you support the Democratic nominee or the Republican nominee, I think as Pennsylvanians and Americans we should be able to agree that we want the winner to be known in a timely manner.”

Dated: October 7, 2020

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IN THE SUPREME COURT OF PENNSYLVANIA

**IN RE NOVEMBER 3, 2020 GENERAL
ELECTION**

Petition of Kathy Boockvar, Secretary of the
Commonwealth of Pennsylvania

No. 149 MM 2020

I, Dr. Linton Mohammed, hereby declare:

1. I am a Forensic Document Examiner (“FDE”), certified by the American Board of Forensic Document Examiners, Inc. I have been engaged in this matter on behalf of Pennsylvania Alliance of Retired Americans to opine on the reliability of signature matching as it often occurs in the context of elections.

QUALIFICATIONS

2. I am a U.S. certified and internationally recognized FDE, and the focus of my research and professional experience is on handwriting and signature identification, and the scientific approach to analyzing questioned signatures. I am, and since 1998 continuously, have been, certified by the American Board of Forensic Document Examiners, Inc. (ABFDE), a certifying board for FDEs in North Americathat is accredited by the Forensic Specialities Accreditation Board. I am also certified in document examination by the Chartered Society of Forensic Sciences (United Kingdom). I specialize in the forensic science of analyzing genuine, disguised, and simulated signatures.

3. I co-founded and I am currently the principal at Forensic Science Consultants, Inc., where I conduct forensic document examination casework and research on handwriting and signature examination as well as other forensic document examination (e.g., document alterations, obliterations, indented impressions, or pages added or removed). I am also an adjunct professor at

Oklahoma State University, where I teach graduate courses on the scientific examination of questioned documents.

4. During and prior to my time with Forensic Science Consultants, Inc., and for nearly fourteen years, I worked as Forensic Document Examiner and Senior Document Examiner for the San Diego Sheriff's Department Regional Crime Laboratory. There, I conducted examinations of signatures and handwriting for cases investigated by San Diego County agencies as well as by local police, state, and federal agencies. I also served as Technical Lead of the Questioned Documents Section of the Regional Crime Laboratory, trained junior FDEs, investigators, and attorneys, provided expert testimony, conducted research, and produced the Questioned Documents Section Quality Manuals. Prior to that, I worked internationally as an FDE at the Laboratory of the Government Chemist (England), the Caribbean Institute of Forensic Investigations Ltd. (West Indies), and the Trinidad and Tobago Forensic Science Center (West Indies). In those roles, I conducted forensic document examinations and testified in criminal and civil cases for multiple police forces and other government agencies.

5. I am a Fellow of the Questioned Documents Section of the American Academy of Forensic Sciences ("AAFS"), a Fellow and diplomate of the Chartered Society of Forensic Sciences, and a member of the Canadian Society of Forensic Science. I served as the Chair of the AAFS Questioned Documents Section from 2016 to 2018. I am an appointed member and Chair of the Academy Standards Board, which was formed by the AAFS to develop consensus standards for the forensic sciences. I served as a member of the National Institute of Standards and Technology's Expert Working Group on Human Factors in Handwriting Examination, the National Institute of Standards and Technology Organization of Scientific Area Committees' Physics/Pattern Interpretation Scientific Area Committee, and the Scientific Working Group on

Documents. I have previously served as President, Vice President, Treasurer, and Director of the American Society of Questioned Document Examiners (“ASQDE”).

6. I am the editor of the Journal of the American Society of Questioned Document Examiners. I served on the editorial review board of the Journal of Forensic Sciences from 2005-2020 . I am a guest reviewer for the following journals: Forensic Science International, Science & Justice, Australian Journal of Forensic Science, Egyptian Journal of Forensic Sciences, and IEEE Transactions on Cybernetics.

7. I have published sixteen peer-reviewed articles on signature and handwriting examination, and forensic document examination. Many of my articles focus on the analysis of genuine and forged signatures, and handwriting examination. I have also given numerous presentations and workshops on signature and document examination worldwide, including the United States, Australia, Brazil, Canada, China, Latvia, Poland, Saudi Arabia, Scotland, and Turkey.

8. In 2019, I authored a book titled *Forensic Examination of Signatures*, which describes and discusses state of the art techniques and research in signature examination.¹ I co-authored a book in 2012 titled *The Neuroscience of Handwriting: Applications for Forensic Document Examination*, which integrates research in the fields of motor control, neuroscience, kinematics, and robotics to evaluate questioned signatures and handwriting.² The book sets forth, among other things, the scientific fundamentals of motor control as relevant to handwriting; the impact of age, disease, and medication on handwriting; and a quantitative approach to signature

¹ Mohammed, L. (2019). *Forensic Examination of Signatures*. San Diego: Elsevier.

² Caligiuri, M.P., & Mohammed, L.A. (2012). *The Neuroscience of Handwriting: Applications for Forensic Document Examination*. Boca Raton: CRC Press/Taylor & Francis Group.

authentication, including kinematic and laboratory analyses of genuine versus disguised versus forged signatures.

9. In 2012, I received the American Board of Forensic Document Examiners' New Horizon Award "In Recognition of His Exceptional Contributions in Scientific Research for the Advancement of Forensic Document Examination." In 2019, I received the American Academy of Forensic Sciences Questioned Documents Section Ordway Hilton Award "In Recognition of Outstanding Contributions to Forensic Document Examination."

10. I have testified as an expert witness in court and depositions more than 150 times on issues of signature, handwriting, and document examination in both civil and criminal cases, including cases in the United States, England, Trinidad & Tobago, and St. Vincent. A subset of these cases have involved the use of signature matching in election administration.

11. I received a Ph.D. from La Trobe University in Melbourne, Australia in human biosciences, where I wrote my thesis on signature identification: "Elucidating static and dynamic features to discriminate between signature disguise and signature forgery behavior." Prior to that, I received my undergraduate degree in science at the University of West Indies; underwent a two-year training program in document examination at the Trinidad and Tobago Forensic Science Center; and received a master's degree in forensic sciences at National University in San Diego, California.

12. My *curriculum vitae* is attached as Exhibit A. I am being compensated at a rate of \$400.00 per hour. My compensation in this matter is not in any way contingent on the content of my opinion or the outcome of this matter.

ANALYSIS AND OPINIONS

I. SIGNATURES NATURALLY VARY AND THESE VARIANCES ARE DIFFICULT TO DISCERN.

A. Variations versus Differences

27. Determining whether signatures are made by the same or different individuals requires a reviewer to discern whether a feature or combination of features in signatures are “differences” or “variations.” Signatures are the product of a motor program developed in the brain after practice, and then executed with neuro-muscular coordination. Many factors can influence an individual’s motor program and neuro-muscular coordination. These factors cause variations in each person’s signature.³ Variations are deviations of personal, subconscious characteristics normally demonstrated in the habits of each writer. Individuals may have narrow, moderate, or wide ranges of natural variation. A writer’s range of variation can be determined when an adequate amount of specimen signatures is examined. A significant “difference” is a characteristic that is structurally divergent between handwritten items, is outside the range of variation of the writer, and that cannot be reasonably explained.⁴

28. In the field of signature examination, unexplainable “differences” between signatures suggest that different individuals wrote the signatures, whereas “variations” between signatures mean that one individual wrote the signatures. Determining whether signature features are “differences” or “variations” is one of the most difficult determinations in signature examinations, even for experienced FDEs.

³ Mohammed, L. (2019). *Forensic Examination of Signatures*. San Diego: Elsevier.

⁴ SWGDOC Standard for the Examination of Handwritten Items, available at <https://www.swgdoc.org/documents/SWGDOC%20Standard%20for%20Examination%20of%20Handwritten%20Items.pdf>.

29. Some writers may have a very wide range of variation. Figure 1 illustrates four signatures of one writer (redacted) that exhibit wide variation, and if compared in pairs, may easily be mistaken as signatures written by different individuals.

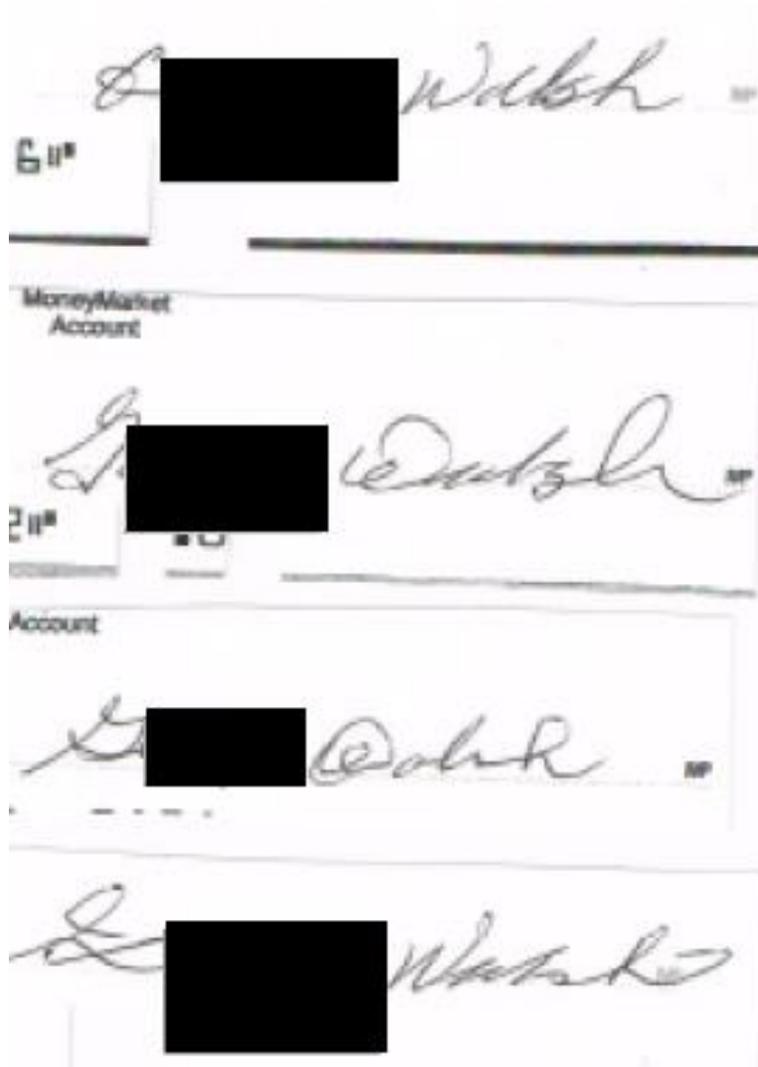


Figure 1 *Four signatures of one individual exhibiting a wide range of variation*

30. To reliably make such a judgment requires, at a minimum:
- Extensive training with different types of signatures: Becoming an FDE requires at least two, and typically three, years of full-time training with an experienced examiner, with at least eighteen months of training in the examination of signatures and handwriting. FDEs learn the science of signature examination, gain experience in casework, and are tested for proficiency.

- Adequate magnification and lighting equipment.
- Excellent eyesight.
- Adequate time: Insufficient time examining signatures is conducive to making errors. For example, one study found that FDEs spent more time looking at the questioned and known signatures than laypersons, and their evaluations were more accurate.⁵

Without these elements, reviewers are likely to mistake legitimate and expected “variations” between one individual’s signatures for “differences” in signatures between two individuals, and conclude incorrectly that someone other than the registered voter signed the ballot return envelope.

B. For some subpopulations, a greater range of variation is natural.

31. Studies have shown that illiterate writers, writers for whom English is a second language, elderly writers, disabled writers, and writers with health conditions tend to have less pen control than most other writers, and therefore would have a greater range of variation in their signatures.⁶

32. Since signatures are developed as a motor program in the brain, the signatures of writers for whom English is a second language are more likely to exhibit wide ranges of variation, as these writers will have to discard their former learned motor program and develop a new one for their new signature style.⁷ For instance, a writer who first learned to write in a non-Latin-based script, such as Chinese, will naturally show more variation when signing a document in English

⁵ Merlino, M., Freeman, T., Dahis, V., Springer, V., et al. (Jan. 2015). *Validity, Reliability, Accuracy, and Bias in Forensic Signature Identification*. Department of Justice Grant 2010-DN-BX-K271, Document 248565, <https://www.ncjrs.gov/pdffiles1/nij/grants/248565.pdf>.

⁶ See, e.g., Hilton, O. (1969). *Consideration of the writer’s health in identifying signatures and detecting forgery*. *Journal of Forensic Sciences*, Vol. 14, No. 2, pp. 157-166; Hilton, O. (1965). *A further look at writing standards*. *Journal of Criminal Law, Criminology, and Police Science*, Vol. 56, No. 3, pp.383; Hilton, O. (1956). *Influence of serious illness on handwriting identification*. *Postgraduate Medicine*, Vol. 19, No. 2.

⁷ Mohammed, *supra* note 1 at pp. 5-1.

than a native writer. Likewise, where the writer's native language is written right to left, such as Urdu, the writer's signature may also be more likely to show variations in letter slanting.

33. Furthermore, young voters (ages 18 to 25) are not likely to have fully developed signatures. According to one study, "the development and progress of one's handwriting passes through four stages in the course of a lifetime: (1) the formative stage, (2) the impressionable or adolescent stage, (3) the mature stage, and (4) the stage of degeneration."⁸ The signatures of young voters will fall between stages 2 and 3. The U.S. Postal Service has reported that "writer[s] achieve[] graphic maturity by the 20th birthday."⁹ Handwriting was developed as a means of communication, whereas signatures are developed as a means of identification.¹⁰ Signatures tend to be more personalized and can therefore be considered as an over-developed form of handwriting. It follows that young writers today will not have developed signatures until later in life. This is exacerbated as young writers will presumably need to sign less often due to the increased use of personal identification numbers ("PINs") and other non-handwritten forms of identification. Their signature development can reasonably be expected to take longer than for previous generations. This will lead to an increased range of variation in a young writer's signature.

⁸ Huber, R.A. & Headrick, A.M. (1999). *Handwriting Identification: Facts and Fundamentals*. Boca Raton, FL: CRC Press.

⁹ Bureau of the Chief Postal Inspector (1966), *20th Century Handwriting Systems and Their Importance to the Document Analyst*.

¹⁰ Plamondon, R., Srihari, S. (2000). *Online and off-line handwriting recognition: a comprehensive survey*. IEEE Transactions on Pattern Analysis and Machine Intelligence Volume: 22, Issue:1, Jan; Srihari S.N., Srinivasan H., Chen S., Beal M.J. (2008). *Machine Learning for Signature Verification*. In: Marinai S., Fujisawa H. (eds) *Machine Learning in Document Analysis and Recognition*. Studies in Computational Intelligence, vol 90. Springer, Berlin, Heidelberg, p. 389.

II. THE CONDITIONS UNDER WHICH SIGNATURE MATCHING OCCURS IN ELECTIONS LEND THEMSELVES TO BALLOTS BEING ERRONEOUSLY REJECTED.

34. Several common aspects of signature matching done by election officials makes the process untrustworthy.

35. Most significantly, election officials are almost exclusively laypersons meaning that they are not required to have any training, certification, or experience in document examination or signature comparison.

36. But even trained FDEs are likely to make incorrect signature determinations under the conditions that most signature matching occurs in the context of elections.

37. These errors are more likely to result in a ballot being rejected because an election official erroneously determines that the signature on the ballot return envelope does not match the signature in a voter's registration files.

A. Lay election officials cannot reliably determine whether signatures are written by different individuals, or by one individual exhibiting natural variation.

38. Individuals untrained or undertrained in signature examination—i.e., laypersons—are highly likely to make mistakes when comparing signatures, particularly by erroneously rejecting signatures as inauthentic or non-matching when they are in fact written by the same individual. These rejections are considered “Type II” errors, and laypersons are more likely than FDEs to make such errors for several reasons. First, lay election officials cannot determine reliably whether signatures are written by different individuals or whether the signatures are written by one person but exhibit natural variations. Second, lay reviewers do not account for the many reasons for naturally varying signatures, causing them to erroneously reject authentic signatures. This is particularly true for writers who have less formal education, learned English as a second language, elderly, disabled, young, or have adverse health conditions. Third, lay elections officials also fail

to account for the different signature styles and features, leading to erroneous rejections. Lastly, election officials are rarely tested for form blindness, a condition that impacts their ability to accurately review signatures.

i. Lay election officials are more likely than FDEs to erroneously determine authentic signatures are inauthentic.

39. There are two types of errors in signature examination. Type I errors occur when a non-genuine signature is deemed to be genuine, and a Type II error occurs when a genuine signature is concluded to be non-genuine. Type II errors are considered to be more egregious than Type I, as with a Type II error an innocent writer can be wrongfully criminally prosecuted for forgery.

40. Compared to FDEs, laypersons have higher so-called Type II error rates. In a 2001 study reviewing the error rates of FDEs and laypersons in comparing six genuine signatures with six non-genuine signatures, laypersons made Type II errors in 26.1% of cases while trained signature FDEs made such errors in 7.05% of cases.¹¹ That means that laypersons are more than 3 ½ times more likely to declare an authentic signature non-genuine—which, in the case of signatures on ballot return envelopes, would mean that election officials would reject more than 3 ½ times the number of ballots than FDEs. It should be noted that for this study, six specimen signatures were used. If only one genuine signature is used for comparison, it is highly likely that the error rate for both experts and laypersons would increase significantly.

41. This study also found that laypersons are much more likely to make Type II errors than Type I errors.¹² A Type II error is considered among FDEs as being more egregious than a

¹¹ Kam M., Gummadidala K., Fielding G., Conn R. (2001). *Signature Authentication by Forensic Document Examiners*. *Journal of Forensic Science*, 46(4):884-888.

¹² *Id.*

Type I error for signature verification and would mean in a mail voting system that a genuine signature is rejected as non-genuine, and the voter's ballot may not be counted.

ii. Lay reviewers erroneously reject authentic signatures because they do not account for the many reasons for naturally varying signatures.

42. As discussed, an individual's signatures may vary for myriad reasons, and to properly determine whether signatures are written by the same individual, one must consider the various reasons why features of the same individual's signatures may visually appear different. To do so, reviewers must possess an adequate number of sample signatures to demonstrate the writer's range of variation. In one of the leading textbooks on handwriting examination, authors Roy Huber & A.M. Headrick identified twenty common reasons why individuals' signatures may appear to show variations:

- Adequacy of standards (or samples)—inadequate standards in terms of quantity and contemporaneousness will not be representative of the writer's range of variation. Variations may therefore be interpreted as differences.
- Accidental occurrences—i.e., these are one-off variations that will not appear in the specimen signatures.¹³ Misinterpretation may lead to a decision of difference versus variation.
- Alternative styles—i.e., some writers have alternate signature styles. This may not be represented in the specimens.
- Ambidexterity.
- Carelessness or negligence.
- Changes in the health condition of writer.
- Changes in the physical condition of writer—e.g., fractures, fatigue, or weakness may alter features of an individual's signature.
- Changes in the mental condition or state of the writer.

¹³ A specimen signature is a signature that is known to have been written by a person. It is not disputed. Typical specimens are Driver's Licenses and Identification Cards.

- Concentration on the act of writing.
- Disguise or deliberate change.
- Drugs or alcohol.
- Influence of medications.
- Intentional change for later denial.
- Nervous tension.
- Natural variations—i.e., inherent variation as a result of differences in neuro-muscular coordination.
- Writing conditions—e.g., the individual’s place or circumstances, such as in a moving vehicle or at a stationary table.
- Writing instrument—e.g., a pen versus a stylus.
- Writing position—e.g., the individual’s stance.
- Writing surface—e.g., paper versus electronic screen.
- Writing under stress.

Examiners must consider each of these reasons in determining whether a feature is “difference” created by different writers or whether the feature is simply a “variation” from the same writer. It is very unlikely that election officials have the knowledge, training, and experience to properly account for these factors. And the signature matching statutes and rules rarely require election officials to consider adequate samples, as would be necessary for even an expert to distinguish a “difference” from a “variation.”

iii. The greater variation exhibited by certain subpopulations compound laypersons’ tendencies to incorrectly determine a signature is nongenuine.

43. As stated previously, certain populations of persons exhibit a greater range of variation within their signatures. These populations include individuals with less pen control such as illiterate writers, writers for whom English is a second language, elderly writers, disabled

writers, and writers with health conditions tend to have less pen control than most other writers, and therefore would have a greater range of variation in their signatures. The increased variation in the signatures of these groups only compounds laypersons' tendencies to err on the side of incorrectly finding authentic signatures to be non-genuine.

44. The signatures of writers for whom English is a second language are more likely to exhibit wide ranges of variation. Qualified, experienced experts in the area of signature verification would know of and account for these factors in evaluating signatures. Election officials, even if put through a short training session, are unlikely to be able to accurately account for these differences, particularly in an expedient time frame, or when only one or a few specimen signatures are available for comparison.

45. The handwriting of adolescents can cause difficulties even for trained FDEs. Comparisons by laypersons of young voters' signatures on the ballot return envelopes will exacerbate the potential for error in rejecting their ballots.¹⁴

iv. Lay election officials also fail to account for the different signature styles and features, leading to erroneous rejections.

46. One of the reasons that accurate signature comparison determinations prove difficult, even for a trained FDE, is that signatures are written in three different styles¹⁵ as illustrated in Figure 2:

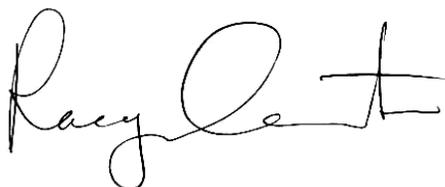
¹⁴ Cusack, C.T & Hargett, J.W. (1989). A Comparison Study of the Handwriting of Adolescents. *Forensic Science International*, 42(3):239-248.

¹⁵ Mohammed, L., Found, B., Rogers, D. (2008). Frequency of signature styles in San Diego County. *Journal of the American Society of Questioned Document Examiners*, Vol. 11, No. 1.

- Text-based: Nearly all the letters can be interpreted.



- Mixed: More than two, but not all, letters can be interpreted.



- Stylized: No letters can be interpreted.



Figure 2 *Examples of three signatures styles*

These signature styles exhibit significantly different characteristics that impact the signature-matching analysis, and by extension, the determination of whether signatures are genuine. For example, kinematic features of signatures, such as size, velocity, changes of acceleration, and pen pressure are important in determining whether a signature is genuine. Yet these kinematic features vary between the same individual's signatures, with the degree of variations often dependent on the signature style. The kinematic features of stylized signatures, for example, vary more significantly than the kinematic features of text-based signatures. And the less legible a signature becomes, the more the election official depends on their pattern recognition ability. Thus, signature styles can have an impact on the determination of genuineness or non-genuineness. Unfamiliarity with the different signature styles may impact a reviewer's ability to determine whether two

signatures come from the same person, and would likely cause a lay person to decide that the compared signatures exhibit “differences” when the changes in features are simply “variations.”

47. To determine whether signatures are made by the same individual, a reviewer should focus on holistic features of signatures, such as alignment, slant, pen lifts, rhythm, the size of writing, the slope or slant of the letters, or other characteristics that are diagnostic of the process used to create signatures. These features are subtle, and a writer is usually unaware of the features, as they are excited by the writer’s subconscious motor program. These subtle features provide significant evidence of genuineness because they occur in natural handwriting. Lay persons, however, often focus instead on more eye-catching features in evaluating signatures. For example, an eye-tracking study on signature examination found that “lay participants focused to a greater extent on individual features such as arches, eyelets, hooks, shoulders, connections, troughs, or other individual features” that catch the eye, and “appear[ed] less likely to use holistic features.”¹⁶ But focusing on these eye-catching features is problematic because these are the types of features that a simulator will try to capture. Properly utilizing the subtle, holistic features of signatures to determine genuineness, however, requires both training and adequate time for review.

B. Even trained FDEs are likely to make mistakes because signature matching for election purposes rarely includes the necessary safeguards.

48. Often the election officials conducting signature matching are restricted to a limited number of comparison signatures and lack proper equipment.

49. Normally, FDEs require multiple specimen signatures for comparison with a questioned signature, and often more if issues such as age or illness are involved. These specimens are required to adequately determine the range of variation of the writer and properly account for

¹⁶ Merlino, *supra* note 13.

the reasons for variation within an individual's signatures discussed above. Indeed, nobody signs the same way twice: no two complex, skillfully written, genuine signatures of one writer have ever been found to be exactly alike, but such a statement should be understood to be true speaking microscopically, and not as the carpenter measures.¹⁷ Inadequate standards, or failure to use adequate specimens fully representing the range of variation in a writer's signature, is a well-known source of error.¹⁸

50. Features observed in the questioned signature(s) may not be observed in the inadequate specimens. This may lead to an erroneous interpretation of a feature as a difference (two writers) not a variation (one writer). Because election officials are not required to consult multiple contemporaneous samples, they cannot distinguish accurately between features, variations, or differences.

51. Furthermore, in many instances, election officials are required to compare a voter's original "wet-ink" signature on the ballot return envelope with the voter's digitized signature in the Qualified Voter File.

52. Comparing a digitized signature with an original "wet-ink" signature has many inherent limitations, some of which are caused by the resolution of the digitized signature, whether the digitized signature is being viewed on a monitor or as a printed item, and the writing instruments used for each signature. If the monitor's resolution is low, or if the digitized signature is a poor copy of the original signature to begin with, this would make it very difficult for a lay examiner to assess the line quality of the signature. Striations made by ballpoint pens may appear

¹⁷ Osborn, A. (1910). *Questioned Documents*. The Lawyers' Publishing Co.: Rochester, NY, p. 281.

¹⁸ Huber, R.A. & Headrick, A.M. (1999). *Handwriting Identification: Facts and Fundamentals*. Boca Raton, FL: CRC Press.

to be gaps in the writing line, and may be interpreted mistakenly as evidence of simulation or forgery.

53. Finally, as discussed above, election officials rarely are provided with proper equipment, such as magnification and lighting equipment and rarely take the time to examine signatures necessary to make an adequate determination. “[T]he microscope is the instrument which makes it possible to see physical evidence directly that otherwise may be invisible. . . .”¹⁹ Without this type of equipment, even a well-trained eye may make errors in a signature authenticity determination. And without adequate time to consider the authenticity of a signature, hasty decisions can lead to ballots being improperly rejected.

* * *

I declare under penalty of perjury that the foregoing is true and correct.

Dated: October 7, 2020 San Bruno, CA.


Linton Mohammed, Ph.D., D-ABFDE

¹⁹ Osborn, A. S. (1929). *Questioned Documents*. 2nd. Ed. Boyd Printing Company, Albany, N.Y., USA.