

## The path to precedent for Maryland probabilistic genotyping

Mid-Atlantic Association of Forensic Scientists

Richmond, Virginia  
May, 2025

Jennifer M. Bracamontes, MS  
William P. Allan, MS  
Mark W Perlin, PhD, MD, PhD



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## TrueAllele® computer solution <sup>2</sup>

- Accurate. 43 validation studies, 8 published
- Objective. Workflow removes human bias
- Accepted. Reported in 47 states, used by 10 labs
- Transparent. Give math, software (4GB DVD)
- Neutral. Can statistically include or exclude

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## TrueAllele in Maryland <sup>3</sup>

Cybergenetics Maryland cases 34

Trial testimony 5

Maryland v. Nelson Clifford  
Maryland v. Omar McGee  
Maryland v. Calvin Odera  
Maryland v. Andy Pantton  
Maryland v. Michael Brown Jr.

Post-conviction hearings 2

Maryland v. William Jamison  
Maryland v. Rodney Brown

Baltimore Police Department

Forensic Science and Evidence Services Division  
TrueAllele laboratory  
(using for over ten years)

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Maryland v. Adan Canela

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3 children slain in apartment

By Stephanie Hanes, Ryan Davis and Richard Irwin

May 20, 2004

The bodies of three young children - one decapitated, two partially beheaded - were found in an apartment in a quiet Northwest Baltimore neighborhood yesterday, and detectives were questioning a man about the murders.

The mothers of the children discovered the bodies hours after the youngsters had returned from elementary school. It was a scene that would later stun even veteran city police officers.

"There's blood all over my apartment," police dispatch reported a woman saying in a 911 call made around 5:25 p.m. "They've killed my family!"

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Maryland v. Nelson Clifford

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11% contributor 1

82% contributor 2

7% contributor 3

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	Victim	Elimination	Nelson Clifford
match statistic	23.1 thousand	32 trillion	182 thousand

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Maryland v. Tyrone Harvin

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83-year-old woman found beaten and sexually assaulted, dies in hospital

14-year-old Tyrone Harvin charged with victim's rape and murder

Evidence: 2 condoms and swabs of broken lamp

Baltimore City TrueAllele® DNA mixture analysis:

At least 2 contributors to the mixtures

Matches to victim and defendant (LR in millions)

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## Defense Challenge

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### Motion in Limine to Exclude Results of TrueAllele Probabilistic Genotyping as Violative of Provisions of the United States Constitution and the Maryland Declaration of Rights and Request for Hearing

*Defendant requests this court to exclude, the results of DNA testing predicated in part, upon the use of TrueAllele probabilistic genotyping*

As grounds for his motion, Defendant asserts **probabilistic genotyping violates the Maryland Declaration of Rights and the United States Constitution** because it shifts the burden of proof *because likelihood ratios prompt juries to convict "without proof beyond a reasonable doubt,"* thereby altering the State's burden of proof.

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## Maryland reliability standard

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### United States: *Daubert v. Merrell-Dow*

1. Has been or can be **tested**
2. **Peer review** and publication
3. Known or potential **rate of error**
4. Existence of **standards** and controls
5. **Generally accepted** (*Frye*)

### Maryland: *Rochkind v. Stevenson*

6. Expert's testimony flows naturally and directly from research he conducted **independent of the litigation** or whether the opinions are developed expressly for purposes of testifying
7. Expert **unjustly extrapolated** from an accepted premise to an unfounded conclusion
8. Expert adequately accounted for **obvious alternative** explanations
9. Expert is being as **careful** as he would be in **his regular profession** outside his paid litigation consulting
10. **Field of expertise** the expert claims is known to reach **reliable** results for the type of opinion the experts would give

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## TrueAllele reliability materials

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Background Readings	Method Reports
Validation Papers	General Acceptance
Validation Studies	Related Systems
Forensic Applications	Admissibility Rulings
DNA Exonerations	Legal Commentary
Regulatory Approval	Scientific Development
Standards Compliance	Other Papers

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## Peer-reviewed validation studies

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Perlin MW, Sinenikov A. An information gap in DNA evidence interpretation. *PLoS ONE*. 2009;4(12):e8327.

Ballantyne J, Hanson EK, Perlin MW. DNA mixture genotyping by probabilistic computer interpretation of binomially-sampled laser captured cell populations: Combining quantitative data for greater identification information. *Science & Justice*. 2013;53(2):103-114.

Perlin MW, Hornyak J, Sugimoto G, Miller K. TrueAllele® genotype identification on DNA mixtures containing up to five unknown contributors. *Journal of Forensic Sciences*. 2015;60(4):857-868.

Greenspoon SA, Schiermeier-Wood L, Jenkins BC. Establishing the limits of TrueAllele® Casework: a validation study. *Journal of Forensic Sciences*. 2015;60(5):1263-1276.

Bauer DW, Butt N, Hornyak JM, Perlin MW. Validating TrueAllele® interpretation of DNA mixtures containing up to ten unknown contributors. *Journal of Forensic Sciences*. 2020; 65(2):380-398.

Perlin MW, Legler MM, Spencer CE, Smith JL, Allan WP, Belrose JL, Duceman BW. Validating TrueAllele® DNA mixture interpretation. *Journal of Forensic Sciences*. 2011;56(6):1430-1447.

Perlin MW, Belrose JL, Duceman BW. New York State TrueAllele® Casework validation study. *Journal of Forensic Sciences*. 2013;58(6):1458-1466.

Perlin MW, Dormer K, Hornyak J, Schiermeier-Wood L, Greenspoon S. TrueAllele® Casework on Virginia DNA mixture evidence: computer and manual interpretation in 72 reported criminal cases. *PLoS ONE*. 2014;9(3):e92837.

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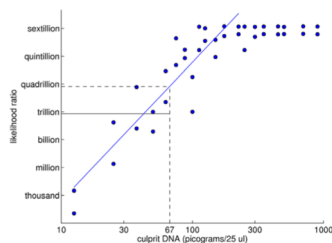
## TrueAllele predictability

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### An Information Gap in DNA Evidence Interpretation

Mark W. Perlin<sup>1\*</sup>, Alexander Sinenikov<sup>2</sup>

 **PLoS one** 2009



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## TrueAllele reliability

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### TrueAllele Casework on Virginia DNA Mixture Evidence: Computer and Manual Interpretation in 72 Reported Criminal Cases

Mark W. Perlin<sup>1\*</sup>, Kiersten Dormer<sup>1</sup>, Jennifer Hornyak<sup>1</sup>, Lisa Schiermeier-Wood<sup>2</sup>, Susan Greenspoon<sup>2</sup>

<sup>1</sup> Cybergenetics, Pittsburgh, Pennsylvania, United States of America, <sup>2</sup> Department of Forensic Science, Richmond, Virginia, United States of America

 **PLoS one** 2014

Validation axes

- sensitive
- specific
- reproducible

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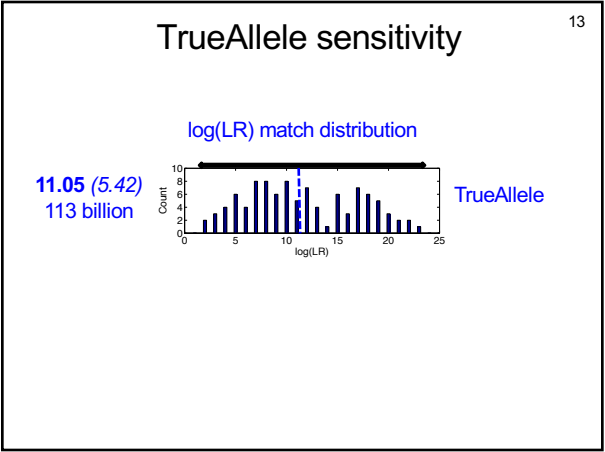
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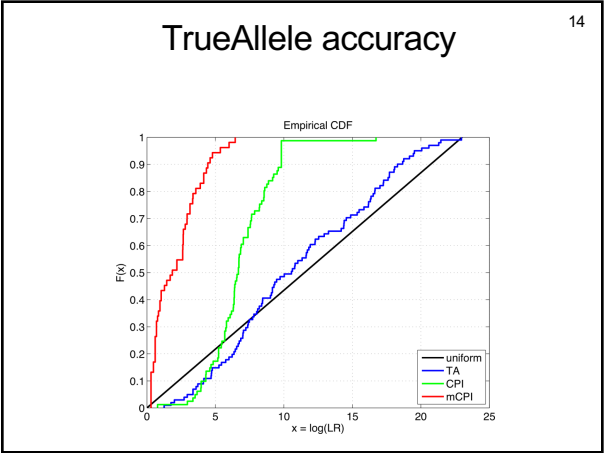
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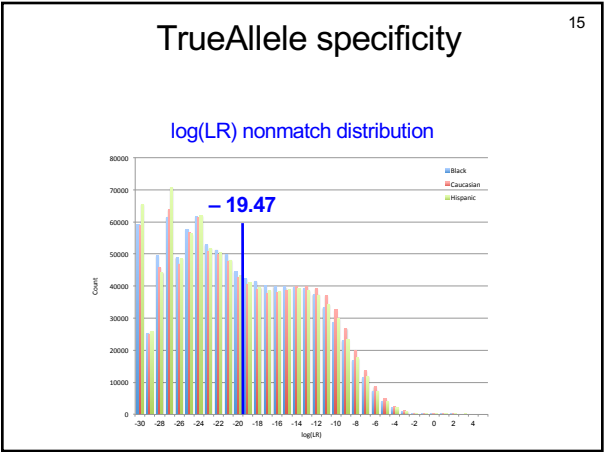
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Higher human error rate

TrueAllele specificity (million samples)  
From noncontributor distribution, for LR > 100:  
Error rate = 1 in 1,000,000 (**0.0001**)%

CPI – analytical threshold  
5 false positives in 81 comparisons  
Error rate = 5 in 81 (**6%**)

mCPI – stochastic threshold  
17 inconclusive results  
1 false positive in 53 comparisons  
Error rate = 1 in 53 (**2%**)

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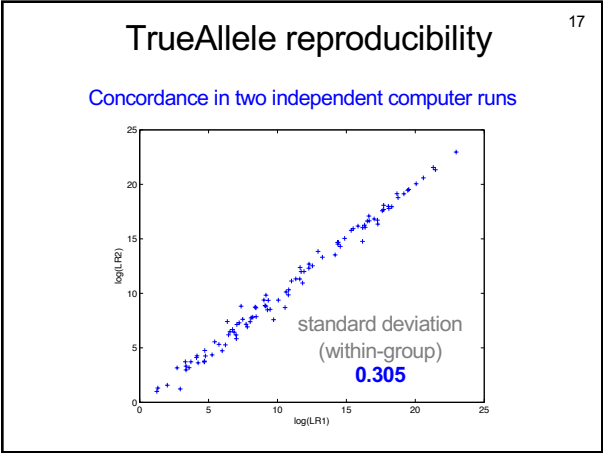
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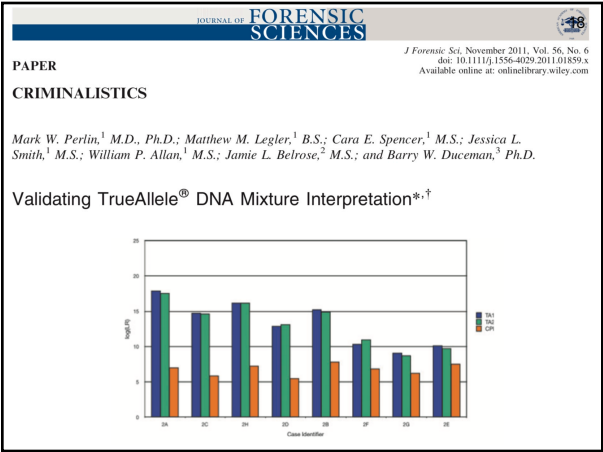
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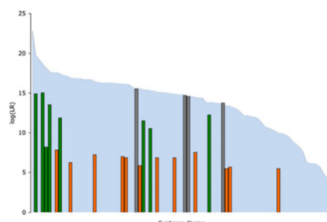
49

PAPER

CRIMINALISTICS

Mark W. Perlin,<sup>1</sup> M.D., Ph.D.; Jamie L. Belrose,<sup>2</sup> M.S.; and Barry W. Duceman,<sup>3</sup> Ph.D.

New York State TrueAllele® Casework Validation Study\*



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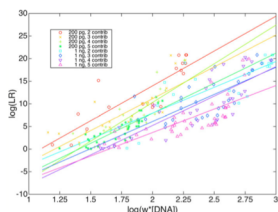
20

PAPER

CRIMINALISTICS

Mark W. Perlin,<sup>1</sup> Ph.D., M.D.; Jennifer M. Hornyak,<sup>1</sup> M.S.; Garrett Sugimoto,<sup>2</sup> M.S.; and Kevin W.P. Miller,<sup>2</sup> Ph.D.

TrueAllele® Genotype Identification on DNA Mixtures Containing up to Five Unknown Contributors\*



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PAPER

CRIMINALISTICS

David W. Bauer,<sup>1</sup> Ph.D.; Nasir Butt,<sup>2</sup> Ph.D.; Jennifer M. Hornyak,<sup>1</sup> M.S.; and Mark W. Perlin,<sup>1</sup> Ph.D., M.D., Ph.D.

Validating TrueAllele® Interpretation of DNA Mixtures Containing up to Ten Unknown Contributors\*

TABLE 4—Independent analysis.

	Operator Site	CCRFSL
Genotypes	78	78
Minimum	-5.16	-9.14
Mean	8.36	8.48
Median	5.98	5.61
Maximum	29.03	29.12
SD	8.37	8.54
$\sigma_0$		0.70

TABLE 7—Peeling sensitivity.

Mixture weight (%)	0	1	2	3	4	5	6
7	K	K	K	K	K	K	K
6	7	K	K	K	K	K	K
5	4	5	K	K	K	K	K
4	4	5	6	K	K	K	K
3	4	3	2	1	6	K	K
2	3	3	4	1	6	8	K
1	1	1	1	1	3	3	4
0	2	2	3	2	3	4	4
0	1	1	1	2	0	2	2
0	0	0	0	0	-1	-1	0

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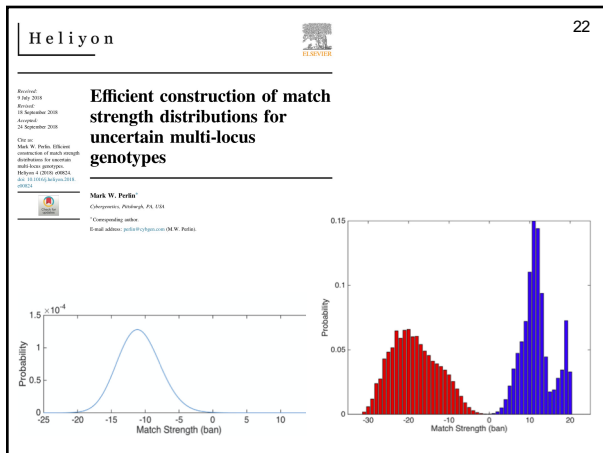
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**47 US admissibility rulings** 23

Commonwealth of Pennsylvania v Kevin Foley (admitted, 2009; appellate precedent, 2012)	State of Georgia v Alexander Battle (admitted, 2019)
People of California v Dupree Langston (admitted, 2013)	United States v Lenard Gibbs (admitted, 2019)
Commonwealth of Virginia v Matthew Brady (admitted, 2013)	State of Georgia v Guy Sewell (admitted, 2019)
State of Ohio v Maurice Shaw (admitted, 2014)	State of Georgia v Adedogba Bah (admitted, 2019)
State of Louisiana v Chastley Chesterfield & Samuel Nicolas (admitted, 2014)	State of Georgia v Nathaniel Day (admitted, 2019)
People of New York v John Wakefield (admitted, 2015; appellate precedent, 2019; high court precedent, 2022)	State of Tennessee v Abdullah Powell (admitted, 2021)
State of South Carolina v Jaguard Alken (admitted, 2015)	State of Georgia v Zarran Garner (admitted, 2021)
Commonwealth of Massachusetts v Heidi Bartlett (admitted, 2016)	United States v Curtis Johnson, Jr. (admitted, 2021)
State of Indiana v Dugniqio Forest (admitted, 2016)	State of Georgia v Rahul Joseph Das (admitted, 2021)
State of Washington v Emanuel Fair (admitted, 2017)	State of Maryland v Tyrone Harvin (admitted, 2021; appellate precedent, 2024; writ of certiorari denied, 2025)
State of Louisiana v Harold Houston (admitted, 2017)	State of Maryland v Gregory Jones (not used, Daubert not applied, 2021)
State of Indiana v Randal Coalter (admitted, 2017)	State of Georgia v Lashumbia Session (admitted, 2021)
State of Nebraska v Charles Simmer (admitted, 2018; appellate precedent, 2019)	State of Georgia v Bryan Byers (admitted, 2022)
State of Indiana v Vaylen Glazebrook (admitted, 2018)	State of Louisiana v Derrnell Lewis, Corey Major, & Gerald Parker (admitted, 2022)
State of Ohio v David Mathis (admitted, 2018)	State of Louisiana v James Tabb (admitted, 2022)
State of Florida v Lajayvian Daniels (admitted, 2018; appellate precedent, 2021)	State of Louisiana v Shawn Briscoe and Lance McIntyre (not used due to timeliness, 2022)
State of Tennessee v Demontez Watkins (admitted, 2018; appellate precedent, 2021)	United States v Hunter Anderson (admitted, 2023)
State of Georgia v Thaddus Nundra (admitted, 2019; appellate precedent, 2023)	State of Louisiana v Corious Dyson (admitted, 2023)
State of Georgia v Monte Baugh & Thaddeus Howell (admitted, 2019)	United States v Ravel Mills (admitted, 2023)
State of Louisiana v Kyle Russ (admitted, 2019)	United States v Diamond Lockett (admitted, 2023)
People of New York v Casey Wilson (admitted, 2019)	State of Georgia v Erin Stephon Arms (admitted, 2023)
	State of Ohio v Michael Carter (admitted, 2024)
	State of Georgia v Jose Ibarra (admitted, 2024)
	State of Hawaii v Eric Thompson (admitted, 2024)
	People of New York v Edward Holley (admitted, 2025)

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**TrueAllele today** 24

Invented math & algorithms	30 years
Developed computer systems	25 years
Support users and workflow	10 laboratories
Routinely used in casework	535 agencies
Validate system reliability	43 studies
Educate the community	175 talks
Train or certify analysts	400 students
Admissibility challenges	45 rulings, 16 states and federal precedent, 2023
Testify about LR results	150 trials
Educate lawyers and public	1,000 people
Make the ideas understandable	1,300 cases, 47 states

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## Court ruling

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The parties' disagreement concerning the reliability of the evidence, as applied in this case, as well as any perceived flaws and weaknesses in TrueAllele, are issues to be **tested through trial**. For this court, the issues presented go to the **weight of the evidence, rather than admissibility** of the evidence. Although this court recognizes there TrueAllele is relatively new and "cutting edge" DNA technology, Defendant failed to demonstrate admission of the evidence would violate his right to due process.

Based on the foregoing, this court finds **admission of the TrueAllele analysis** and the conclusions generated through use of TrueAllele **will not run afoul** of Md. Rule 5-702, Md. Rule 5-403, the United States Constitution, or the Maryland Declaration of Rights.

Harvin was sentenced to life in prison for first-degree murder and rape

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## Appellate opinion

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### Appellant assertions

The TrueAllele parameters

Consistency between results and underlying data

Sufficiency of validation process

The calibration of the electrophoresis machine

### Appellate Court decision

For the reasons articulated above, the circuit court did not abuse its discretion in admitting the TrueAllele evidence under Md. Rule 5-702.

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## Maryland Supreme Court

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January 29, 2025  
NOTICE OF ORDER

*Tyrone Harvin v. State of Maryland*  
Petition No. 355, September Term, 2024

On January 29, 2025, the Court entered an order **denying the petition for writ of certiorari** in this Court.

TrueAllele **appellate precedent** in Maryland (7<sup>th</sup> state)

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## Conclusion

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- Cybergenetics invented TrueAllele technology 25 years ago
- The world's first reliable probabilistic genotyping software
- TrueAllele separates mixture data into contributor genotypes
- These contributor genotypes preserve identification information
- Informative genotypes deliver accurate DNA match results
- Separation turns mixtures into simple single-source-like genotypes
- So TrueAllele results are easy to explain to judges and juries
- Extensive validation established TrueAllele as reliable forensic science
- TrueAllele is regularly admitted as reliable evidence after challenge
- TrueAllele has appellate precedent in seven states: Florida, Georgia, Maryland, Nebraska, New York, Pennsylvania and Tennessee



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