

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

UNITED STATES OF AMERICA :
v. : CRIMINAL NO. 96-00407
BYRON C. MITCHELL :

GOVERNMENT'S POST-*DAUBERT* HEARING MEMORANDUM

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I. Introduction

Trial in this matter was scheduled for Monday, November 2, 1998. On October 27, 1998, the defendant filed two motions *in limine* and then, on October 30, 1998, the government received by letter a notice that the defendant intended to call at trial James A. Starrs, a law professor and a purported "expert in the field of fingerprint analysis [who] will testify to his opinion that there is no scientific basis for a claim of individuality in the matching of fingerprints, and that, as such, the identification made in this case is scientifically invalid." Gov. Exh. 1¹. After a conference call with the Court, which resulted in a continuance of the trial date, the government was advised that the basis of Starrs' "opinion is 1) the absence of any scientific research or studies which would support the claim of individuality in the matching of fingerprints, and 2) the highly subjective nature of fingerprint analysis." Gov. Exh. 2. In his response to the

¹"Gov. Exh." refers to 2 volumes of exhibits which were introduced at the July 7 through July 13, 1999, *Daubert* hearing before this Court. The original exhibits are in the government's possession. The Exhibit List is attached hereto as ATTACHMENT A.

government's Motion for Continuance of the Hearing and Trial Date, the defendant raised the issue of whether or not a government fingerprint expert should be allowed to testify and that "at the core of the government's expert's opinion is the untested hypothesis that it is impossible for two or more people to share as many as nine fingerprint characteristics in common." Defendant's response at 4-5. The government assumed and the *Daubert* hearing confirmed that the term "fingerprint characteristics in common" referred to only the old Galton points.

As directed by the Court, the government filed its Combined Report to the Court and Motions *In Limine* Concerning Fingerprint Evidence on March 29, 1999. In its motion, the government requested that the Court exclude the trial testimony of James E. Starrs, and now, also to exclude the testimony of David A. Stoney and Simon A. Cole. The government requested that the Court take judicial notice of certain facts. Now, the post hearing request is that the Court take judicial notice of the three premises contained in Gov. Exh. A and that the Court permit the testimony of the government's latent fingerprint experts at trial.

On June 24, 1999, the Motion of Defendant Byron Mitchell to Exclude the Government's Fingerprint Identification Evidence was filed. Alternatively, the defendant asked the Court to allow defense experts to testify at trial. In his Memorandum of Law in Support,² the defendant narrowed his question to, **"Is there a scientific basis for a fingerprint examiner to make an identification, of absolute certainty, from a small distorted latent fingerprint fragment, revealing only a small number of basic ridge characteristics such as the nine**

²References to "Defendant Memorandum" are to the memorandum attached to the defendant's Motion to Exclude the Government's Fingerprint Identification Evidence which was filed on June 24, 1999.

characteristics identified by the FBI examiner at Mitchell's first trial?"³ Defendant Memorandum at 1.

By the time of the hearing, the defendant had framed the issue as to whether or not an opinion of individualization could be made from the evaluation of small areas of latent prints.

The *Daubert* hearing⁴ was conducted before this Court on July 7-9, 12 and 13, 1999. Filed contemporaneously with this Memorandum is the Government's Proposed Findings of Fact.

II. The Issues Before the Court

In summary, the Court has before it the following issues:

A. The government's request to admit expert latent fingerprint examiners' testimony under Fed.R.Evid. 702 and the Supreme Court's holdings in *Daubert* and *Kumho* (cited *infra*).

B. The government's request pursuant to Fed.R.Evid. 201(d), that the Court take judicial notice of the premises introduced as Gov. Exh. A, which are:

³The defendant has continuously and erroneously stated that the latent fingerprint expert at the first trial only testified as to nine points of comparison. The trial transcript is clear that the expert used nine charted points for purposes of demonstrating his opinion. The record is equally clear that the expert testified that there were other points that had not been charted. Indeed, only one of Mitchell's two latent thumb prints and one of his known inked prints were charted for the jury.

⁴Government counsel describes the transcripts as drafts. Government counsel has personally compared the transcripts to the audio/video tapes from the Clerk's Office, has reviewed the transcripts with the government's witnesses, and has corrected the rough transcripts. Those corrections will be sent in letter to the court reporter, defense counsel and the Court as contemporaneously as possible with the submission of this Memorandum.

1. Human Friction Ridges Are Unique and Permanent;
2. Human Friction Ridge Skin Arrangements Are Unique and Permanent; and,
3. Individualization, That Is, a Positive Identification, Can Result from Comparisons of Friction Ridge Skin or Impressions Containing a Sufficient Quality (Clarity) and Quantity of Unique Friction Ridge Detail.

C. The government's Motion *In Limine* to exclude the trial testimony of James E. Starrs, David A. Stoney, and Simon A. Cole.

D. The defendant's Motion *In Limine* to exclude the government's fingerprint identification evidence; and

E. In the alternative, to allow the defendant to present the trial testimony of James E. Starrs, David A. Stoney and Simon A. Cole "regarding the limitations of that [fingerprint] evidence." Defendant Memorandum at 53.

III. The Evidence At The *Daubert* Hearing

A. The Government's Case.

1. **Dr. William J. Babler**⁵, a former Post Doctorate Fellow at the University of Virginia, School of Medicine, who holds a Ph.D. in Biological Anthropology from the University of Michigan, was qualified "as an expert in the field of prenatal development of human variation, particularly friction ridges and their configurations." 7 D.T. at 22; Gov. Exh. 8-9 (CV). Dr. Babler described his historical research as following up on research started one hundred years ago, a lot more of which had been done in the last 20 years, concerning the development of

⁵Dr. Babler's credentials are impressive and unchallenged and his full testimony appears at 7 D.T. at 5-76. The designations 7 D.T., 8 D.T., etc, are references to the *Daubert* Hearing Transcripts for July 7, July 8, etc.

human epidermal friction ridges. 7 D.T. at 25. Dr. Babler's laboratory research⁶ was conducted with aborted embryos and fetuses. His hard and soft tissue laboratory research and writing, documenting the development of the hands, the human friction skin, and the friction ridges, took place over a period of 15 years and included access to and use of the Bradley M. Patton Human Embryology Collection at the University of Michigan. That collection consisted of 2,000 well documented human embryos and fetuses. 7 D.T. at 19. Dr. Babler described his research to include preparing and examining very thin sections parallel to the surface area of the palm of the hand. Through serial sectioning of hands he was able to establish how the hands and the friction ridge skin actually developed. Along with his extensive historical research, he sectioned hands of approximately 200 human embryos and fetuses. The mere preparation of a single hand for slicing 5 to 10 micron thick sections with a microtome could take anywhere from several weeks to several months. 7 D.T. at 19-22. Dr. Babler explained how the more recent research, including his own research, confirmed the much earlier research of scientists in the field. 7 D.T. at 25-26.

Through a series of exhibits, Dr. Babler established that: at about the 6th week of gestation, the notching of the fingers appears; at about the 7th week, little pre-bone starts to form cartilage; at about the 8th week the bones start to ossify and form true bone; at about the same time formations called volar pads appear on the palmer surfaces of the hands and feet, with the first pads appearing at about 6 ½ weeks, and staying fairly rounded until around the 9th week; at about the 9th week, and moving into the 10th week, the volar pads start to regress and at the same time the friction ridges start to develop; and friction ridge development continues until

⁶Dr. Babler is one of a very limited number of scientists that have done human tissue research on the origin and development of human friction ridge skin.

approximately the 17th week, when the ridge formation ceases and a template, which forms the basis for the generation of friction ridges and the regeneration of the cells, is permanently formed, and remains unchanged throughout one's life. 7 D.T. at 27-50.

Dr. Babler also explained that at about 14 weeks, sweat glands and sweat ducts begin to form and proliferate from the primary ridges and ultimately appear on the friction ridges. Dr. Babler also established that between about the 17th to 24th weeks, as the friction ridges are maturing, that they are being translated from the template located at the basal layer of the epidermis to the actual surface of the skin. 7 D.T. at 39, 45-46. Dr. Babler stated that at about the 17th week the friction ridges and arrangements become permanent and that they do not change thereafter. 7 D.T. at 49-50. Dr. Babler established that there is genetic basis for the formation of the friction ridges, especially at Level 1 detail (meaning the basic whorl, loop and arch patterns) and that other factors, including ontogenetic or epigenetic factors, which reflect the interaction of the genes and the local developing environment, contribute to the asymmetry of all of the human body including friction ridges. Dr. Babler stated that the asymmetry of the body, including friction ridge variation, results in a significant way from developmental stress. 7 D.T. at 50-52. Dr. Babler established that environmental factors, including chemicals taken into the body, the differential growth and development of the bones in the hands, and the actual dimension of the bones themselves contribute to the variation noted in the friction ridge skin. Dr. Babler established that the dimensions of a ridge, including the separation between ridges or the depth of the ridges and the actual shapes of the ridges, all show considerable amount of

variation between individuals and between individual digits. 7 D.T. at 51-63. Dr. Babler summed it up as follows:

So in summary, basically what I would say is that there are many different factors, many, many different factors that influenced the development of the friction ridge and ultimately the development of its secondary characteristics, the minutiae, the actual shape of the ridge itself. All these are so numerous and so individual that they – that I cannot conclude anything but that each and every friction ridge and their arrangements are individual and specific. There’s – they are unique.

7 D.T. at 63.

Dr. Babler generally defined Level 1 detail as the general pattern of the friction ridges, referred to as whorls, loops and arches; described Level 2 detail to include minutia such as bifurcations or islands or dots formed as the ridges proliferate; and that as the ridges continue to mature, more things happen, like the formation of sweat pores (which he described as one pore being the basic unit of friction ridges), and the changes and variations of the ridges themselves, as getting into Level 3 detail. 7 D.T. at 64-66. Dr. Babler opined that an individual ridge is unique in its formation and shape. 7 D.T. at 73-74.⁷ Based on all of his research, the research of others spanning over 100 years, and his expertise, Dr. Babler, in response to the following questions, opined as follows:

Q. Have you formed an opinion as to whether or not all friction ridges are unique and permanent?

⁷At 7 D.T. 73, line 20, the transcript reads “[the individual ridges] are not (sic) unique.” Government counsel has listened to the Court audio/video tape and believes that the word “not” may actually be heard. However, the use of the word “not” is inconsistent with the rest of Dr. Babler’s testimony and Dr. Babler, after reading the rough draft of the transcript, reported to government counsel that if in fact he used the word “not” it was a misstatement. The sentence should read “They are all unique.”

A. Yes, I have.

Q. What is your opinion?

A. My opinion is that they are all unique and permanent.

Q. Have you formed an opinion as to whether or not human friction ridge arrangements, that is, the arrangement of the ridges themselves, level one, two and three, are unique and permanent?

A. Yes.

Q. What is your opinion?

A. My opinion is that the arrangement of the friction ridges are unique and permanent.

Q. Having been asked a question about four to six minutia . . . does that change your opinion . . . in any way that the friction ridges themselves and their arrangements over the entire friction ridge area are unique and permanent?

A. No, it doesn't.

7 D.T. at 72, 74-75.

Except for some conjecture from of James E. Starrs and Simon A. Cole, on the issues of ridge uniqueness and permanence, a topic that will be more fully discussed below, Dr. Babler's extensive research, expertise and opinions are unchallenged and unchallengeable by the defendant or his experts. Indeed, none of the defendant's experts are "main stream"⁸ scientists in the sense that Dr. Babler and Dr. Budowle mirror that term. Dr. Babler's "main stream" scientific testimony alone meets the government's burden with respect to government's premise one and two.

1. Human Friction Ridges Are Unique and Permanent;

⁸See Defendant Memorandum at 41.

2. Human Friction Ridge Skin Arrangements Are Unique and Permanent.

Gov. Exh. A.

However, as outlined below, other government witnesses, as well as part of the defense case, also confirms those well known and longstanding facts.

2. **David R. Ashbaugh** is a Staff Sargent with the Royal Canadian Mounted Police (RCMP). He has been a police officer for 31 years and has been employed by the RCMP for the past 24 years. Ashbaugh has over 25 years experience in the fingerprint field. Based on his training, experience, independent research, writings, including a recently published text on Ridgeology⁹, teaching and lecturing, Ashbaugh was qualified “as an expert in the development, comparison and identification of friction ridge skin and impressions” and “the creation and development of friction ridge skin and friction ridges.” 7 D.T. at 86 and 158; Gov. Exh. 8-1 (CV).

Ashbaugh, a certified latent fingerprint examiner, is a member of many organizations involved with fingerprints, including being an invited member of the Forensic Science Society of the United Kingdom; has taught and lectured in the fingerprint scientific field for many years; is responsible for planning the training program for the RCMP nationwide; set up a training program in the Northwest Territories of Australia; and will be assisting Scotland Yard in setting up the Yard’s new training program in April of 2000. 7D.T. at 78-87.

⁹Ashbaugh’s book, Quantitative-Qualitative Friction Ridge Analysis-An Introduction to Basic and Advanced Ridgeology, a follow-up to a book on the same topics that was personally published by Ashbaugh in the early 1980’s, has recently been published in the United States. Ashbaugh is the father of Ridgeology and invented the word.

Ashbaugh has conducted independent research over the past 20 years on the creation and development of friction ridge skin as part of what he refers to as the Small Detail Axiom. The “smaller the detail found ...progressively in agreement during comparison, the more individualizing power it has.” His research¹⁰ has been extensive, and included dermatoglyphics, embryology, genetics and other fields studied by and relied upon by Dr. Babler. Mr. Ashbaugh has lectured on Harold Cummins’ research¹¹ to the medical faculty in the Harold Cummins’ Library at Tulane University. 7 D.T. at 83, 87, 89.

Ashbaugh, while demonstrating Gov. Exhs. 3-1 through 3-14, explained the creation and development of friction ridge skin, described Level 1, Level 2, And Level 3 Detail associated with analyzing fingerprints, including small areas of latent prints, and discussed some of the terms used by examiners to describe friction ridges, namely short and long islands or ridges, the shortest being a dot, and bifurcations.¹² 7 D.T. 90-106.

Ashbaugh presented a full and comprehensive explanation of the methodology used by latent fingerprint examiners in forming their opinions.¹³ 7 D.T.106-116. He explained the

¹⁰See Gov. Exhs. 7-1, Selected Reference List, and 7-2, Bibliography from David Ashbaugh’s Book.

¹¹Harold Cummins is an undisputed leading research scientist in the field of friction ridge skin. *See* Gov. Exh. 12.

¹²Ashbaugh explained that some examiners use other descriptive terms when describing what they see. That in no way detracts from the science of fingerprints. 7 D.T. at 137.

¹³Ashbaugh agreed that one way to describe the range of opinions given by examiners is “absolutely him, absolutely not him, and absolutely I don’t know.” 7 D.T. at 154. Although the defendant, through James E. Starrs, suggests that such absolute opinions are inherently non-scientific, David A. Stoney, the defense witness **most closely** resembling a scientist with some knowledge in the relevant fields of fingerprint science and statistics, opined that the examiner’s opinion expressed as an absolute is proper. *See infra*.

methodology, including analysis, comparison, evaluation and verification, ACE-V. Gov. Exh. 3-

15. In applying ACE-V, Ashbaugh discussed what he calls the protocol and the philosophy.

Protocol is described as follows:

Identifications are formed in the human brain and it has to do with shape recognition and shape comparison. And these are the same systems that we use for every day sight. For example, when you walk out into the parking lot to find your vehicle, you are making an identification basically. However, the brain has certain little inherent quirks...that help us see. And some of those little nuances– for example, they will form opinions on very little data. I think we all had this situation where we thought we saw a friend walking down the street, but when we get up to him, gee, the fellow from the back looks like our friend but it isn't our friend, but our brain is saying, there's George, go and talk to him. The brain also has a tendency where it wants to organize things.

For example, when we look at clouds, we tend to like say, that cloud looks like something, and if we look at simple lines that occur, a cartoonist uses, quite often the cartoonist will have very few lines and yet we'll look at that and we'll actually make something out of it.

Now, these various traits, from reading the literature, are very appropriate for how we can see but they are not appropriate for forensic comparison.

So because of that we have a certain protocol. **One of those protocols is that we always examine the unknown fingerprint first. That is so that we don't look at the nice clear fingerprint in the inked impression, and then move over and look at an unclear fingerprint, and then possibly start seeing things that aren't really there.**

7 D.T. at 108-09 (emphasis added).

Ashbaugh discussed the philosophy or mission statement: “[I]dentification is based on the comparison of friction ridge formations in sequence, having sufficient uniqueness [or having a sufficient volume of unique Details] to individualize. 7 D.T. at 110.

The ACE-V process is used in other sciences and as it is applied in fingerprint science, can establish individualization, namely, establish positive identification or “absolutely him”, to the exclusion of anyone else. So what is ACE-V? The examiner must first **analyze** the latent or unknown print and after obtaining all the information available, compare that information with the information gathered during the analysis of the known inked print, or in some cases other unknown latent prints. Ashbaugh described in detail some of the issues an examiner should consider during analysis, namely, distortion, systematic analysis, substrate, matrix, development medium, deposition pressure, anatomical aspects (could the print have been deposited where the print was found), clarity, and red flags. 7 D.T. at 111-114 (emphasis added).

Once we have finished the complete analysis, then we move on to a **comparison** ...the analysis of the known, hopefully, is brief. Many of the things that I talked about would not be present if it was a properly inked impression....Then we move on to comparison, and comparison is **carried out in sequence or systematically**... we would look at **first level detail** is the overall pattern configuration in agreement... start at an area that is common to both the unknown and the known print...and we start systematically comparing all the various friction ridge arrangements and friction ridge shapes, including relative pore position, if it's at all possible.

The comparison is something that is very objective. We're dealing with physical evidence and if I discuss something in the ridge arrangement, I should be able to point to it, so it's a very objective process.

Once the comparison is complete, and we recommend that the whole print be compared, the next thing that we would do is then **evaluate** what we saw during comparison as far as agreement of the various ridge formations. And I break it down into actually **two separate, areas**. The first area is, **do I have agreement?** If you say yes to that, if you form the opinion you have agreement, then you have to ask yourself, **is there sufficient unique detail present to individualize?**

That final decision is a subjective decision. It's based on your knowledge and experience and your ability. And that, if you say yes, I feel there's enough to individualize, then you form an opinion of identification.

The conclusions at the end... would be elimination, which usually would start very early in the identification process, identification, a situation where you have sufficient volume of unique details to individualize [or]... a situation where you have agreement but you're unable to individualize or eliminate.

[W]e move into ... **verification**, which is a form of peer review, and it is part of the scientific process... [T]he person ... goes through the whole identification process again individually.

There are situations ... when we ask for verification, the expert will know that an identification has been made.

However, there are times when the first expert is having difficulty making identification. He is allowed to have consultation with other experts. If that happens, then a third person has to be asked to verify.

7 D.T. at 114-116 (emphasis added).

Ashbaugh next discussed the defendant's use of Def. Exh. 6. The defendant in his memorandum and through cross examination of the government's experts attempted to establish that a small latent print having six or seven Galton characteristics could easily trip up an experienced examiner. Gov. Exhs. 3-16 and 3-17 were images taken from the actual negatives, rather than the photocopy of those two prints as they appeared in the article at 22 Fingerprint World 148 (Oct. 1996). Ashbaugh thoroughly discredited the defendant's position. 7 D.T. at 117-127. He physically examined the fingerprints and noted **dissimilarities** (things that are explainable because of distortion, etc.) and **differences** (things which cause opinions of exclusion).

When I move on to this ridge, there's a dissimilarity here that will— in my opinion, would end up being a difference. Dissimilarity to me is something you can accept [because of distortion or other reasons], but

when it looks like this, I believe that is now moved into the difference category.

I feel that is bordering on disagreement.... I feel this would be a disagreement because even with less pressure... you would still have that shape....In the unknown print, this ridge runs straight through between two short ridges. This ridge makes a major dogleg and that is disagreement. That isn't acceptable....For third level detail, the shape of this ridge is out of agreement. And also we can see relative pore positions here that are fairly clear.... So there's a difference at third level detail

[W]hen I first looked at this, I did not think that these two areas of friction skin were in agreement. I was... disappointed that the authors would actually produce this in a journal and more or less say, you better watch out.

[T]hey are looking at [only Galton] points...but even at level two [detail], we look at the path of the ridge... Not just, it starts here and end there. You have to be sure that you know where it goes in between those two [points]....3-16 and 3-17 ...are not in agreement. There are no parts of it in agreement.¹⁴

7 D.T. at 121-124, 126.

Ashbaugh commented on the Defendant's Memorandum and found omissions or other instances where he believed he was quoted out of context or otherwise thought his statements had been misrepresented. Many of the citations to Ashbaugh's writings failed to identify them as referring to events and the science some 20 to 100 years before the Daubert hearing. 7 D.T. 127-155.

¹⁴Ashbaugh's confidence was not shaken on cross examination. "Q. Sir isn't it a fact that many examiners - - many rank and file examiners would be fooled by these prints? A. No. Q. And might make this identification? A. No. Q. You don't think so? A. No. Maybe the Israelis would.... THE COURT: [W]hy did you say that about the Israelis, sir? THE WITNESS: If they made that statement in this article, that this is something that we should be concerned about, then I feel they are likely in need of some training. 7 D.T. at 195. Of course Ashbaugh had trained the rank and file, including 300 in the United States. 7 D.T. at 184.

Ashbaugh, responding to a question from the Court, testified that to his knowledge, only Italy and England have standards that differ from the ACE-V method of identification. 7 D.T. at 156.

Based on all of his research, his expertise, and the research of others spanning over 100 years, including Dr. Babler's, Ashbaugh, in response to the following questions, opined as follows:

Q. [H]ave you formed an opinion as to whether or not all friction ridges are unique and permanent?

A. Yes. Friction ridges are unique and permanent unless damaged.

Q. [H]ave you formed an opinion ... as to whether or not friction ridge arrangements are unique and permanent?

A. Yes, friction ridge arrangements are unique and permanent, again, unless damaged.

Q. [H]ave you formed an opinion as to whether or not individualization, that is, a positive identification can result from comparisons of friction ridge skin or impressions containing a sufficient ... quality (clarity) and quantity of unique friction ridge detail?

A. Yes, you can make an identification.

THE COURT: Is there any question in your mind as to that, that you can make an identification based on that last premise?

THE WITNESS: No, there's no question. Quantitative- qualitative analysis is the process used in all the other sciences.

7 D.T. at 158-159.

During cross examination, Ashbaugh had to repeatedly remind counsel that the questions were based on events in the distant past, say 20 to 100 years before the hearing. A

careful reading of Ashbaugh's cross-examination, amplified by re-direct, does nothing to advance the defendant's cause. 7 D.T. at 160-226.

3. **Edward R. German** is a Special Agent with the United States Army Criminal Investigation Laboratory located near Atlanta, Georgia. German holds the highest senior technical officer rank in the United States Army, namely, Chief Warrant Officer 5 (CW-5). He is one of about eight CW-5 CID Agents worldwide and is the only one in the Southeast United States and in the United States Army Criminal Investigation Laboratory. He has over 28 years experience in the fingerprint field, most of which has been as a latent fingerprint examiner. He is a member of various organizations, including the Japanese Identification Society, which he founded about 10 years ago when he had a tour of duty in Japan. German, a member of the International Association for Identification which has approximately 4, 800 members worldwide, chairs the Fingerprint Identification Subcommittee . He has published in various peer reviewed journals, has been certified by the United States Army since 1977, and since 1978, has been certified by the International Association for Identification as a latent fingerprint examiner. German is a member of SWGFAST, the Scientific Working Group for Friction-Ridge Analysis Study and Technology, which exists to establish national guidelines for latent fingerprint examiners and fingerprint professionals. Based on his training, experience, independent research, writings, teaching and lecturing, German was qualified "as an expert in the development, comparison and identification of friction ridge skin and impressions." 8 D.T. at 2-13.

German estimated that he had conducted hundreds of thousands, if not millions of latent fingerprint examinations during his career. He has been qualified as an expert in the courts of at least 15 states or commonwealths within the United States; the United States territory of

Guam; Japan; the Republic of Korea; and the Republic of the Philippines. 8 D.T. at 17-19.

Part of German's independent research over the years has concentrated on what is referred to as TWIN studies. German explained an article that was published in 1982 in which the authors described the best matching prints out of 196 pairs of twins. The study involved both identical and fraternal twins. See Gov. Exh. 4-1; 8 D.T. at 20-21. German examined the two prints and he could find only two Galton points or characteristics common between the two impressions. He also entered the two prints in the Automated Fingerprint Identification System (AFIS) and had the system search the prints with 360 degree rotation comparing all the points against each other in both prints. The AFIS could not find more than two Galton points in the same relationship. German testified that the ridge paths and other Level 2 and 3 detail clearly establishes that the prints are not identical with each other and individualized as being from two separate people. 8 D.T. at 21-23.

Through demonstration of Gov. Exhs. 4-2 and 4-3, German established that the right paw prints of a monkey named Netti and its clone, Ditto, (created by nuclear embryo transfer) were different. German only found two Galton characteristics in the corresponding unit relationship. Again German determined that the ridge paths and some Level 3 detail were different. Therefore, they are individualized with two separate monkeys. 8 D.T. at 24-26.

German testified about his own research, involving a total of over 500 sets of twins, and that he determined that in each case, the twins did not have the same fingerprints. During his research, he had input into the AFIS system, ten sets of monozygotic (identical) twins. When utilizing only Level 1 detail, that is, the basic pattern (whorl, loop, arch), AFIS often placed the identical twin in the candidate list, although it had a relatively low matching score. The

identical twin would show up because the class characteristics were similar. German then had the AFIS system process only one-half of the print area of the fingerprints only using Level 2 detail. In those cases, the identical twin never even showed up on the AFIS candidate list. Automated Fingerprint Identification Systems (AFIS) are explained in more detail below. In the AFIS system used by German, the fingerprint images are scanned into the computer and the computer's extraction program identifies the Level 2 Galton Details in an XY grid coordinate. It also has a rotation coordinate. Again, after running those sets of identical twins, AFIS was not able to find the identical twin on the candidate list. Using Level 2 and Level 3 detail, German, while conducting his own examinations, was easily able to eliminate the identical twins as having the same fingerprints. 8 D.T. at 27-31.

German discussed his participation in a conference that was held in Neurim, Israel in 1995. This was an international symposium, the third in an international symposium series and concerned "the science of Fingerprint Identification Regarding Latent Fingerprints." German coauthored the Neurim resolution which states "no scientific basis exists requiring that a pre-determined number of friction ridge features must be present in two impressions in order to establish the identification." 8 D.T. at 32-34.

German, the chair of the Quality Assurance Committee and the Friction Ridge Automation Committee of SWGFAST, described his work as a member of the SWGFAST committee and identified Gov. Exh. 4-4 as SWGFAST guidelines that have been peer reviewed and adopted. He described the guidelines as:

They concern minimum qualification guidelines for considering a person to be trained as a latent print examiner. They also concern the training to competency guidelines, which means the topics or

subjects that need to be covered, the recommended and suggested topics to be covered at training—as a trained latent print examiner and they also concern quality assurance guidelines for latent print examination.

8 D.T. at 34-36.

Those guidelines were the result of the formation of SWGFAST in 1995 and after peer review were adopted in 1997.

German recounted that he sat through and listened to the testimony of Dr. Babler and Ashbaugh. He heard nothing from them with which he disagreed and stated that he shared their opinions as stated. *Id.* at 37.

During cross examination, German established that proficiency testing did not become widely accepted for latent print examiners until the 1970s. He stated that in 1982, he set up proficiency testing for the Illinois State Police which was the first laboratory system accredited by ASCLD/LAB in the United States. ASCLD/LAB, American Society of Criminal Laboratory Directors, Laboratory Accreditation Board, examines laboratories and accredits laboratories which meet strict standards. *Id.* at 38-41.

German, while restating the results of the AFIS search on twins, commented that when the computer was using only Level 2 detail (eliminating the Level 1 information), that the computer found greater similarity between complete strangers than the identical twins. 8 D.T. at 45-46.

German agreed with Ashbaugh's opinion that disagreed with the defendant's position that there is an insufficient amount of studies addressing the probabilities when using a small number of Galton details. 8 D.T. at 46-48.

Also, during cross examination German discussed the advantages of computer systems in enhancing latent prints:

Sometimes you can use computer, for example, to enhance a latent print. The human eye is typically capable of only seeing between 16 and 32 different shades of gray. So if you have a fingerprint that is, for example, on a latent print lift, and the fingerprint ridge detail or a part of it is shade number 255 and the background is shade 254, you are probably not going to be able to detect that with the human eye. However, using the computer, you can tell the computer, show me 255 as orange and show me 254 as red, and instantly you can see the contrast that was present.

8 D.T. at 51.

German disagreed with the defendant's position that the analysis of a latent fingerprint is subjective. *Id.* at 52-53. In response to questions by the Court, German testified that "during the last 140 years of training, research and experience of comparing fingerprints, no one in all the world has ever found two fingerprints from different people or digits to be identical." As German related, he would be in a position to know since he has maintained a web site for the past 4 ½ years on the topic of fingerprints and acknowledged that "it would be a very rich and famous person, who would be sought by all defendants attorneys instantly, if they found two people with identical fingerprints." 8 D.T. at 54-56.

4. **Stephen B. Meagher** is a Supervisory Fingerprints Specialist holding the Unit Chief Position within the FBI. He is one of three Unit Chiefs. He has also been a Project Manager concerned with the research and development of automatic fingerprint technology or AFIS, Automated Fingerprint Identification Systems. He began his career with the FBI in 1972. In 1981, he was involved with trying to develop some of the initial algorithms that were used to

match latent fingerprints against a large depository of known 10- print cards. He saw the implementation of an operational system in 1983 and has remained involved in AFIS technology.

Meagher is also a lead examiner of teams that respond to national disasters, such as plane crashes, in an effort to identify the victims. Meagher said that in many cases, there are only small portions of friction skin available for comparison. Indeed in some cases, in order to prove positive identification, the disaster team processes a victim's residence to obtain latents from items that would logically have been handled by the victims. 8 D.T. at 56-61.

He has been involved in latent fingerprint examinations since 1978, certified by the FBI, a member of the International Association for Identification and a member of SWGFAST, which was described by German. He has had extensive continuing education courses, and has extensive teaching credentials in latent fingerprint examination and the AFIS systems. Meagher estimated that over the last 27 years, he has performed millions of comparisons and has made thousands of identifications and said that Ashbaugh estimated the number of comparisons that Ashbaugh made over his career was in the millions. See Gov. Ex. 8-2 and CV; 8 D.T. 62-65.

Meagher was qualified "as an expert in the development, comparison and identification of friction ridge skin and impressions, and as an expert in the area of AFIS, Automated Fingerprint Identification Systems." 8 D.T. at 65.

During the demonstration of several exhibits, Meagher described the appearance of fingerprints and the Level 1, Level 2, and Level 3 Detail. He explained that exclusions can be made on Level 1 Detail but that individualization cannot take place at that level. *Id.* at 67-71. He summarized this portion of his testimony, by showing that the unique ridge information existing at Levels 1, 2, and 3 can be utilized, and one can expect that information will be transferred as a

latent print when a finger touches an object. 8 D.T. at 72-77.

Referring to Gov. Exh. 5-10, Meagher demonstrated a chart showing the quantitative/qualitative process, in terms of whether the information available is either sufficient or insufficient to render an opinion as to individualization. Basically when an examiner is confronted with latent fingerprints, as the quantity of unique friction ridge detail increases, the relative quality of the friction ridge detail becomes less important and vice versa. 8 D.T. at 78-80. “[I]f a print has a large number of level two information of Galton Details, the quality does not have to be there, present to provide level three information. You can make an identification individualized strictly based on level two information. However, the contrary is that if he has small numbers of level two information, he must then rely on the quality of the image to present additional information which might be present in the level three.” *Id.* at 79. Meagher went on to demonstrate government exhibits that showed the different quality and quantity of friction ridge detail.

In discussing Gov. Exh. 5-14, Meagher testified that the latent print contained three Galton Details and that Gov. Exh. 5-15, an inked fingerprint on paper, had only two visible Galton Details. He said that the large volume of Level 3 information made the identification possible. 8 D.T. at 83-86. It is interesting to note that the prints that he was discussing were recorded ten years apart which also demonstrates the permanence of the friction ridges. Through conversations with Dr. Babler, Meagher was able to determine that over that ten year time period, given that total skin cell replacement on the hand occurs approximately every thirty days, the finger that left the impressions in Gov. Exhs. 5-14 and 5-15 would have regenerated about 120 times. Those exhibits demonstrate the permanency of fingerprints through the exact regeneration

of friction ridges, and compliment the testimony of Dr. Babler and Ashbaugh regarding the permanency of the template formed during prenatal development. *Id.* at 86-87.

Meagher, when commenting on Defense Exhibit 6, stated that he would use the same process that Ashbaugh explained during his testimony and that he, Meagher, in fact did come to the same conclusion, namely, that the two prints in the Israeli article are easily shown to be different fingerprints. *Id.* at 94. Meagher also commented on Defense Exhibit 7, which were two images that appeared in an article by James W. Osterburg. Unlike the defendant's interpretation and use of the ten points as mentioned in his Memorandum, Meagher interpreted the author to mean that although one could locate ten common characteristics, that alone does not constitute sufficient information to say that the two prints were made by the same finger. In fact, Meagher's examination quickly determined that the two fingerprints were made by different individuals. *Id.* at 95-97.

Meagher testified about the clarity or quality vs. quantity prong of the "ACE-V" process. Through several demonstrative exhibits he established that the strict use of only Galton points in making identifications has no scientific bases. He gave a full explanation of how Level 1, Level 2 and Level 3 Detail is used in forming opinions. He agreed with Mr. Ashbaugh that the "ACE-V" process is a scientific process with the ultimate opinion, "definitely him, definitely not him, and definitely I don't know" being a subjective opinion based on the "ACE" process.¹⁵

¹⁵Dr. Bruce Budowle has stated that the evaluation stage of ACE-V is not completely subjective since it has objective components. *See infra.*

Meagher commented on the Defendant Memorandum, on page 34, footnote 12, where the defendant states, “Of course, the identification in the instant case was made by the FBI examiner on just a simplistic counting of points.” Meagher testified that Mitchell’s identification was not made by the FBI examiner using a simplistic counting of points. “When I first read this, I know how the FBI examiners are trained. I know that—how we conduct our comparisons. It is certainly not of a simplistic counting of points.” 8 D.T. at 98. Meagher went on to explain that testimony concerning Galton points, as opposed to the ACE-V identification process, is a simplistic way to explain fingerprint identification to a jury. *Id.* at 99.

Meagher discussed the issue of permanence. He explained that the FBI retains a criminal fingerprint repository as well as a civil fingerprint repository and that the criminal file has approximately 34 million individuals’ fingerprint records. They have been maintained since 1924. He caused an automated search to be conducted of the criminal history records to determine the frequency of repeat offenders. The search showed there were 386,489 individuals that have been arrested over twenty times during the course of their criminal careers. Approximately 1.1 million individual have been arrested at least five times. Meagher explained with respect to all of those arrests, that because the fingerprints are permanent, the FBI was able to identify the new arrests with the prior arrest records, which forms the basis for the automated criminal history record for each individual. 8 D.T. at 99-101.

Meagher testified that Gov. Exh. 6-6, the survey¹⁶ results for Part A supports permanence. Question 6 on survey A asks “Have you ever found two fingerprints from the same

¹⁶A three-part survey was sent to each of the states or commonwealths within the United States as well as to the RCMP and to Scotland Yard. Each part of the survey contained multiple questions, some of which will be discussed herein.

finger of the same person in which the friction ridge arrangements has changed over time, excepting scarring and natural change in size due to growth?” Meagher reported an unanimous “No” answer. *Id.* at 102.

Meagher stated that his reading of the defendant’s memorandum led him to believe that their use of the word “points” was limited to Galton points which are part of Level 2 Detail. The FBI, the IAI, and all of the states do not require a specific number of “points” to make a positive identification, that is, to individualize. Meagher explained that various jurisdictions, including the FBI, and individual examiners have established various numbers of points as quality assurance mechanisms. Meagher went on to testify that the FBI changed from the old Galton only point counting system for identification purposes, to no points required in the late 1940s, and agreed that the IAI and an International Symposium on Fingerprint Detection and Identification Conference concluded there was no requirement for a Galton point system for identification in 1973 and 1995, respectively. Meagher testified that the FBI agrees with those positions and that ACE-V is the methodology used for fingerprint identification within the FBI. 8 D.T. at 103-106.

Meagher discussed Gov. Exh. 6-1, Law Enforcement Fingerprint Operations Survey A, Survey 1, FBI Laboratory, Gov. Exh. 6-3, Law Enforcement Fingerprint Operations Attachment B, AFIS Survey, FBI Laboratory and Gov. Exh. 6-5, Law Enforcement Fingerprint Operations Attachment C, Survey 2, FBI. Survey A was designed to obtain information from the jurisdictions on the general acceptance of fingerprints as a means to individualize. Unanimously, all the jurisdictions responded that they use fingerprints as a means to individualize and all believed in the two basic principles, namely, fingerprints are unique and permanent. Survey C was designed to draw out from the jurisdictions the history of the use of fingerprints. All jurisdictions

unanimously answered “no” to the question of whether they had ever found two individuals to have the same fingerprints. The total repository of 10-print cards for all of the jurisdictions from Survey A totaled over 69 million. Meagher noted that some of the fingerprint operations started as early as 1904.

Survey A, in particular, clearly establishes the world wide general acceptance of the fingerprint science as a means to individualize. 8 D.T. at 109-113.

Survey B was designed to demonstrate uniqueness. Using AFIS technology showed no other individual but Byron Mitchell would be identified as having the same fingerprints as those submitted with the survey. The second part of Survey B, was designed to demonstrate uniqueness, in that an AFIS search of Mitchell’s two latent prints against the entire 69 million AFIS 10-print repository would only identify Mitchell and the specific fingers, one and six. The third part of Survey B requested the jurisdictions to conduct a manual comparison of the two latent prints against the submitted 10-print card to demonstrate that if an identification was made it could only be made with the specific fingers, namely one and six of the 10-print card.

The results of Survey B were consistent with what Meagher already knew. The identifications made were only made with fingers one and six of the 10-print card submitted with the survey. The survey was directed to uniqueness of latent fingerprints and the AFIS searches, without any filters, increases the possibility of finding a person having the same fingerprint. *Id.* at 113-116.

The defendant in his memorandum and through some of his experts criticized the FBI for sending blowups of the latent prints and the inked prints to jurisdictions that had not made one or both of the latent fingerprint identifications. Meagher and government counsel had no misgivings about sending the blowups with Galton points identified to those jurisdictions. What was being conducted was a survey, not a scientific experiment or a proficiency test. The fingerprints at issue had already gone through the ACE-V process, had been individualized and verified. Meagher explained that it was nothing more than what is done in-house when someone fails to make an identification that they should have been made. 8 D.T. at 119-125.

Of the approximately 69.4 million 10-print cards that were searched with Mitchell's 10-print card, the only hit on existing records was from Pennsylvania, an expected event since Byron Mitchell's fingerprints were known to exist in Pennsylvania's data base. Only Pennsylvania identified Byron Mitchell's 10-print card. When the latent prints were run through the various AFIS systems, there were a few hits.¹⁷ It was discovered that for all of the jurisdictions that had a hit when they searched the latent prints against their AFIS databases, they had input Byron Mitchell's 10-print card prior to conducting the latent print searches. Although it was an unintended result, it nonetheless showed that those jurisdictions' AFIS systems were working well.

Meagher did not prepare scientific experiments but surveys to glean from the jurisdictions the general acceptance of fingerprints, demonstrate uniqueness and permanence of friction ridge skin, and to continue, in part, a survey that had been work in progress for over a

¹⁷Pennsylvania's latent print AFIS search capacity was being upgraded during the survey and therefore, they could not perform the latent print searches against their AFIS system.

year. 8 D.T. at 125-129. Meager had participated in sending surveys in the past, and had no expectation that everyone receiving a survey would do exactly as they had been asked. Indeed some jurisdictions had not responded to some parts of the survey at the time of the hearing. *Id.* at 129.

Uniqueness is also demonstrated to an extent by Gov. Exh. 6-7, the classification distribution of the 34 million 10-print cards in the FBI's criminal master file. Classification is extracting Level 1 information by the computer from all ten fingers on a 10-print card and reducing that extraction process to a master classification for all ten digits. The largest group having the same classification consisted of 831 individuals and at the bottom of the distribution, there were 34,533,673 individuals that all had unique classifications. 8 D.T. at 130-131.

Meagher testified about defense exhibit 21 which was a listing of contacts with nine states that initially had not made a positive identification of either one or both of the latent prints. Meagher established that defense exhibit 21 was inaccurate. Gov. Exh. 6-10 reflects the information that Meagher obtained during his conversations with those jurisdictions. *Id.* at 132-134. Meagher testified about the comments made by those jurisdictions. It was clear that none of the jurisdictions required a point standard for making positive identifications. Likewise, it was very clear that some jurisdictions, and indeed some individual examiners, have a point standard for quality assurance purposes or "comfort" purposes. Meagher also learned why there had not been identifications. The comments included: concerns about the lack of original evidence; examiners not taking the Survey issue seriously; "screwing up"; and not being experienced enough to make the call. *Id.* at 135-151.

The defendant, at page 22 of his Memorandum, makes the claim that the failure of some examiners to make a positive identification in the first instance, is “devastating to the government’s claim of scientific reliability.” That is nonsense.

Q. Now, Sir, when you sent out the surveys, did you have an expectation that you would have, as counsel in their motions stated, have an expectation that each and every jurisdiction would come back with a positive ID on each latent?

A. I did not have that expectation. I was hoping that that would be the case but I did not have an expectation that that would happen, no.

Id. at 151.

Meagher also explained that it is his understanding from conversations with legal counsel within the FBI, the U.S. Attorney’s Office, as well as others within the fingerprint community, that practitioner error is not part of the error rate discussed in the *Daubert* case.

A. My understanding as explained to me was that *Daubert* error rate was an issue of the science, not of the practitioner. So, the methodology and the basis from which opinions were made, were of the process of the error rate, not how well the examiner was able to perform the process.

Q. And in your authorship of these surveys and in the design of these...were you at all concerned that with respect to the latent examinations, someone may come back and not make an ID?

A. No, I was not concerned.

8 D.T. at 152-154.

Error rate can either be related to the methodology or to a practitioner. Based on the ACE-V process, which is shared and used in other scientific endeavors, and the fact that

friction ridges and arrangements are unique, Meagher, stated the error rate of the ACE-V process is zero. *Id.* at 155-156. As stated below, “main stream” scientist, Dr. Budowle, holds the exact same opinion. Meagher readily admitted that practitioner error exists and agreed that there was a correlation between a second opinion in the medical profession and another examiner picking up the original evidence and forming his or her own examination and forming an opinion as to individualization. *Id.* at 156-157.

Meagher began to discuss the 50K x 50K study. Gov. Exh. 6-8. Meagher described the thought process that lead to the development of the 50K x 50K study. He knew that the FBI had a sophisticated AFIS system which he had worked on and been involved in for the past 18 years. He viewed that system as a statistical model and explored the possibility of using that model to generate statistical probabilities that would support the known fact that human friction ridges and arrangements are unique. He consulted with Dr. Bruce Budowle, who, among other things, is a statistician with the FBI. Dr. Budowle agreed that the task was to take the data that already existed, and using probabilities with that data, see if a measure of uniqueness could be determined. They wanted to and did use criteria which would slant or bias the test to produce the greatest possibility of getting a match of fingerprints of two different individuals or two digits of one individual. Neither believed that *Daubert* required a statistical analysis concerning uniqueness. 8 D.T. at 157-159.

Meagher and Dr. Budowle talked with the contractor that works on the IAFIS/FBI program. Because of limited computer power, it was decided that 50,000 fingerprints would be reasonable and also statistically significant. “We certainly didn’t have the [computer] horse power or the means to run a 34 million times 10 fingers, 340 million test”. 8 D.T. at 157-160.

The first 50,000 left slope loops of white males picked by the computer, without any other filtering, were used. Lockheed Martin Information Systems, through Donald Ziesig, was the contractor working on the algorithms for the new IAFIS/FBI system. After some discussions, it was determined that two tests would be run. Test 1 would run and compare each entire fingerprint with itself and with every other print in the 50,000 print data base. Test 2 using pseudo latents, would run and compare against every other print in the 50,000 print data base. The average size latent was determined to be 21.7 percent of an average size rolled print (approximately 1 square inch). That was determined using 300 latent prints from a previous study conducted by the FBI. *Id.* at 162-163.

With respect to each of the tests, two and one-half billion file print comparisons were made. Test 1, using the fully recorded fingerprint, established the probability of one in ten to the ninety-seventh power, two individuals or digits will have the same fingerprint, which far exceeds the population of the world. 8 D.T at 164-165. See, Ziesig and Budowle, *infra*.

Meagher discussed some consolidations that appeared in the test. The system had identified a couple instances where two different fingerprints were getting scores that approached what you would expect to have with the test definition identical. In each instance there were two 10-print cards of the same person in the FBI database. Meagher concluded that those consolidations demonstrated the robustness of the algorithms. *Id.* at 165.

Test 2, using the pseudo latents, established the probability of one in ten to the twenty-seventh power, for a small number of minutia, and approaching one in ten to the ninety-seventh power, for larger numbers of minutia, defined by the test as eighteen or greater, that two

individuals or digits will have the same fingerprint, which also far exceeds the world population. *Id.* at 167.

Meagher demonstrated Gov. Exh. 6-9, a 10-print card which was part of the database. The computer identified two different fingers as being essentially numerically equivalent. It turned out that the plain inked impressions which appear at the bottom of the 10-print card were deposited in such a way that there were two overlapping fingerprints of different fingers. Even with two overlapping prints, the computer was able to independently identify both prints, which shows the power of the algorithms used in the AFIS program. 8 D.T. 169-170.

The defendant's Memorandum, at page 26, stated that the government had attempted to utilize an AFIS as it had never before been utilized. Meagher said the defendant was simply wrong. The algorithms and programs were used in exactly the same way as they are used in everyday operations. Meagher also testified that similar tests had been performed during the development of the algorithms and during the testing of the System. *Id.* at 172-173. See, Ziesig, *infra*.

Meagher identified and discussed an article by Andre A. Moenssen¹⁸ titled, Is Fingerprint Identification a Science. Moenssen had posted the article on the Internet after the Supreme Court decision in *Kumho*.

Q. What's the premise he's talking about there?

A. The premise of - - the underlying premise upon which fingerprint identification are based, have been empirically validated, the previous sentence before that.

¹⁸Moenssen is a law professor and wrote the fingerprint chapter in Scientific Evidence in Civil and Criminal cases. James E. Starrs is listed as a co-author.

- Q. Okay, go on.
- A. [Quoting Moenssen] “That these premises are threefold. One, the friction ridge Detail and the epidermis on the palm side of the hands remains unchanged during the lifetime of an individual, except for accidental or intentional scarification or alteration;
- “Two. Friction ridge pattern areas exhibit so much variety of detail that no two patterns are ever found to be exactly the same on the digits (or palms or soles of the feet) of one individual, or on the digits (or palms or soles of feet) of other individuals;
- “Three. While these friction ridge patterns exhibit an infinite variety of detail, they nevertheless fall within certain broad classes or categories that permit police to store and retrieve millions of prints according to classifications formulae.”
- Q. Okay. Now, Government Exhibit A, the premises. You’ll agree with me, won’t you, that his one and two are pretty close in meaning, anyway, to human friction ridges are unique and permanent, and human friction ridge skin arrangements are unique and permanent?
- A. Yes.
- A. “Premise 1 has clearly stood the test of time and experience. It has been established in over 100 years of accumulated experience that friction ridge patterns remain unchanged naturally in their ridge detail during the lifetime of an individual. The ridge patterns begin to form during prenatal life and are fully formed by the seventh month of fetal life....”
- A. “Premises No. 2: That all fingerprints are unique and never duplicated in the universe, is a premise that is harder to prove empirically, despite the fact that all fingerprints examiners fervently believe in it. However, in all of the human experience with fingerprints worldwide, no two fingerprints from different digits have been found to match exactly.”

- A. “There is, however, respectable empirically established evidence of the uniqueness of fingerprints patterns. Studies done by many examiners have shown that the fingerprints of identical twins are different, as the prints of triplets, quadruplets and quintuplets. In that sense, fingerprints identification has been found to be even more discriminating than the vaunted DNA . . . fingerprinting method which cannot distinguish, by today’s technology, between the DNA of identical twins.”
- A. “Clearly, if exact pattern duplication were to exist in the world, at least a single instance of this would have been discovered by now.”
- A. With the data that is available today, however, it would be rather ludicrous to argue that the premises underlying fingerprint identification have not been scientifically validated in the face of the accumulated experience of the millions of fingerprints that have been scrutinized by experts.

THE COURT: Did you say ludicrous?

THE WITNESS: I’m sorry, your Honor?

THE COURT: Did you say ludicrous?

THE WITNESS: Yes, that “it would be rather ludicrous to argue that the premises underlying ...”

THE COURT: Very well.

- A. “While experience has dictated such research is not necessary, the purists (or skeptics) could be satisfied by a rather simple research program that asks our AFIS system to search, say, a partial individual print of a know person and compare the print against the entire database.”
- Q. Sir, is the formation of the development of the AFIS system that last sentence, is that what happened?
- A. Yes.

Q. In the 50/50 study, is that what happened?¹⁹

A. Yes.

Q. Should there be any skeptics left?

A. Not in my opinion.

8 D.T. at 178-185; Gov. Exh. 6-11.

Based on all of his research, his expertise, his training, his teaching and lecturing, and the research and testimony of Dr. Babler and Ashbaugh, Stephen B. Meagher, opined his agreement with the premises contained in Gov. Exh. A. See p.3-4, *supra*; 8 D.T. at 185-186.

On cross examination, Meagher was asked questions relating to the defendant's assertion that the 50K x 50K study was research that was conducted solely for purposes of litigation. The 50K x 50K study used the existing database and the existing AFIS system in the same way that they have been used for the past 2 ½ years. 8 D.T. at 195. The cross examination of Meagher was otherwise uneventful when viewed in light of the redirect. 8 D.T. at 195-228; 9 D.T. at 2-31.

5. **Donald Ziesig** is currently employed as an algorithmist at Lockheed Martin Information Systems in Orlando, Florida. Ziesig literally started out his engineering career as a rocket scientist with Bell Aerospace in Niagara Falls, New York. Later, he worked on radar jamming as part of Vietnam era research; an infrared guided missile system, parts of which, as modified, are still being used by the Air Force today; on two aspects of the F-15 Tactical Electronic Warfare System, concerned with pattern recognition to identify enemy or friendly radar

¹⁹The same type of comparisons were also done by the states in Survey B. Instead of only a 50,000 print database, over 69 million 10-print cards, or over 690 million fingerprints, were in those databases.

and to establish jamming programs to defeat the radar; at Ford Motor Company, on the software reliability of the electronic engine control systems used in automobiles; electronic warfare systems with the Air Force; and pattern and target recognition types of algorithms for the Air Force. The systems he worked on can discriminate between a Russian T-72 tank and a U.S. M-1 tank. In the mid 1980s he continued his work on image processing algorithms for ballistic missile defense. Ziesig was the technical director of the Smart Weapons Program which was intended to produce technology beyond that used in the Gulf War. In 1992, he switched to his present area, namely fingerprints. He was asked to apply the technology that had been developed in pattern recognition to fingerprints. Ziesig created a feature extractor, the Finn-Ziesig Feature Extractor, which is currently being used by the FBI Remote Fingerprint Entry Station.

Martin Marietta decided to corroborate with Sagem/Morpho from France and incorporate their work with Martin's in the IAFIS/FBI program (Integrated Automated Fingerprint Identification System). Ziesig helped translate the French algorithms into English for integration into the AFIS/FBI system. That system has been operational for over 2 ½ years in West Virginia. Among other things, Ziesig is currently working on technology replacement for fingerprint systems. Ziesig was qualified "as an expert in Automated Fingerprint Identification Systems and an expert in pattern recognition." 9 D.T. at 32-39. Ziesig was named the technologist of the year for Lockheed Martin Information Systems for the year 1999 (one person out of approximately 20,000 individuals).

Ziesig described the Automated Fingerprint Identification System (AFIS) and in general terms talked about the fact that the computer extracts ridge and individual minutia information and assigns classifications which are part of the filtering system used in searching the

AFIS system. Ziesig explained that there was a 10-print side of the house and also a latent print side of the house. Ziesig explained that the French company supplied one matcher program while Martin Marietta Laboratories produced the other matcher program. A Calspan program mathematically fuses the results of the two matcher programs. In essence, the matchers take the minutia that has been extracted and compares that minutia to approximately 100 million prints which have been filtered by the classification program. 9 D.T. at 44-46.

Ziesig explained the matchers each search the 100 million print files in sequence, but in such a way that neither program knows what the other program is doing. Each of those programs utilizes different portions of minutia patterns and use different mathematics. Therefore, they generate different raw numbers, although most of the time they agree directly on the search results. Ziesig also described that the searches that are performed are rotationally invariant and also translationally invariant which basically means that the programs will search a minutia pattern in many, many different positions, while searching for matches. After the two matcher programs compute raw scores, they are mathematically fused by the Calspan fusion program that uses Extreme Value Statistics, the type of statistics used, among other things, to predict failures in nuclear power plants, and how bad the 100 year flood will be. The end result is a final raw score for a given search comparison of a given file print. A file print represents one digit. 9 D.T. at 44-50.

Ziesig gave a detailed explanation of the 50K x 50K fingerprint comparison test. They used the latent side of the AFIS house to perform the two tests. Mr. Ziesig stated **why he used an identical print and compared it to itself.**

Part of what you said of the earlier question was that I used the identical print and the answer is yes, **I used the identical print as the number one, the configuration control or software error check. We wouldn't get a score higher than that.** Number two, there was no scientific basis for modifying that or modifying the pseudo latent in any way that would withstand any kind of examination, so I did not . . . basically I'm extracting a set of minutia from a block. When I extract that out, that is a identical set to the set that is in the search or the file print. I have no scientific basis that I would like to state that I would say, let's move this a little bit here, let's rotate that one a little bit that way, let's change it. I have no justification for changing it, so I will not change it. I did not change it.

9 D.T. at 51-55 (emphasis added).

Ziesig confirmed that the operations the AFIS were asked to perform during the 50K x 50 K tests were the same operations that the system is required to do every day. It uses the same test software to prove that the system works and the same algorithms and decision-making processes for the matchers. Indeed, similar tests were performed during the creation and testing of the algorithms, the software and the system. *Id.* at 55-56. Ziesig confirmed that in the past, the same types of raw scores were generated by the matchers and the fusion program and that they are generated now on a daily basis. The raw data produced in the past, and day to day, is not exposed to a statistical formula to determine probabilities. 9 D.T. at 57-59. Ziesig discussed how the tests were conducted and confirmed the consolidations that Meagher had discussed earlier. 9 D.T. at 62-64.

Ziesig, referring to Gov. Exh. 6-9, confirmed Meagher's comments about the power of the computer and the programs, which identified two overlapping fingerprints in one area of a 10-print card. He described it as a very difficult situation and yet the computer was able

to identify each print and score it separately. *Id.* at 65-66. Ziesig explained that the way the algorithms interact is extremely proprietary. 9 D.T. at 67.

Ziesig confirmed that the statistical results of the tests, range from one in ten to the ninety-seventh power for the full print search, to one in ten to the twenty-seventh power for small numbers of minutia in the pseudo latent print tests. Ziesig noted that with some pseudo latents, the extractor only identified four minutia within the 21.7 percent center of the pattern but that such a search would still have generated some 50 billion minutia to minutia computer comparisons for those four minutia sets. 9 D.T. at 74. Ziesig testified that for all practical purposes the ranges of probabilities of two individuals or the same person having the same two fingerprints equates to zero. He noted that if the AFIS system was able to extract Level 3 Detail that he expected the calculated probability to be even lower than determined in the tests. 9 D.T. at 78-80.

Cross-examination of Ziesig concentrated on the consolidations that were discovered during the Test 1 and Test 2. The reason that the print was run against itself as explained by Ziesig and by Dr. Bruce Budowle was to establish a standard to determine whether or not the programs were operating correctly. Ziesig knew that if he obtained a score higher than the “identical match” score, he would have a software problem. The significance of the tests was not the comparisons of prints made with each other, but those prints with the other 49,999 prints in the database. Although each of the tests ran 2.5 billion file comparisons, as Ziesig pointed out, with rotational and translational invariance, the minutia by minutia comparisons are in the range of 50 billion. Ziesig stated that the defense questioning concerning the 50 x 50K tests did not shake his confidence as to the reliability or significance of the statistical probabilities generated. 9 D.T. at 101-102. Mr. Ziesig on redirect opined that assuming that no two people or any person can

have the same fingerprint, that the tests he ran would be moot since the tests and their probability ranges did nothing more than support the fact that friction ridges and friction ridge arrangements are unique and permanent. 9 D.T. at 103.

6. **Dr. Bruce Budowle**, a post doctoral fellow at the National Cancer Institute, holds a doctorate in genetics. Dr. Budowle has been employed by the FBI for approximately 16 years and is a senior scientist with the Laboratory Division. Dr. Budowle said most of his scientific background and research was genetics. At the FBI he worked on developing genetic marker typing systems for blood, semen, and saliva, has done population studies, and has been involved with DNA for a substantial period of time. As part of his duties as the Chair of SWGDAM, the Scientific Working Group on DNA Analysis and Methods, he has been involved in quality assurance and setting up systems that produce high quality results. Dr. Budowle was responsible for finalizing the standards as they are now used in DNA typing. Dr. Budowle, a “main stream” scientist, was qualified “as an expert in the field of genetics, genetics population, statistics, quality assurance standards, and validation of scientific methods.” 9 D.T. at 108-110.

Like Dr. Babler, Dr. Budowle testified that genetics plays a part in the formation of friction ridge skin, but that environmental factors also contribute:

When you start looking at Level two, then onwards to Level three, where everything starts to break down on some consistencies, it has to be due to some other factor than genetics, because the variation cannot be due to the genetic difference between twins, so we can get an idea there is a tremendous amount of environment effect, such that there is not a controlled mechanism.

I think where people have been talking about random effects which are these non-controlled or environment effects, so you can get an idea by looking at this that the degree of variation at Levels two and three is substantially controlled by these environmental factors,

non-programmed factors.

9 D.T. at 111-113.

Dr. Budowle was asked about the validity of ACE-V, the methodology used by latent fingerprint examiners and about the use of the word empirical in the defendant's memorandum.

Q. As a scientist, does the word empirical include observations?

A. That's what empirical means. . . . Empirical is going out, rolling up your sleeves and actually observing what's done. . . .

Q. What is your opinion as to whether or not the studies and the testimony that you heard in this hearing, comport to empirical studies?

A. Well, empirical studies is when you roll up your sleeves, you do observational analysis. The idea of taking prints, comparing them to other prints to seeing how often things are similar or dissimilar, is empirical studies. The 100 years of fingerprint employment has been empirical studies. The fact you are looking for individuals that match, no two unrelated individuals or related individuals have the same print is an empirical study that's maybe not collected and counted up to say there are 10 million of these, but we know there had to be a lot over the 100 years. **The 50,000 and by 50,000 a study is an empirical study.** The question asked: If you take a print and compare it not just to itself but to all others, which isn't just 50,000, it is actually 2 and a half billion comparisons, because you are increasing the chance of making matches the more you compare against things. So if I compare one against 50,000, as might be done in a latent print search in the AFIS System, that's a certain amount of information. But then if I take the second one, compare it to all the others, the third against all the others, I increase my odds of finding things that will match. If they do truly match, it is an empirical study, I can ask the question, taking all of this data, what do

they tell me? Again, if I have something that with a large amount of searching is consistent with all the other observations, I can take it altogether, use the empirical data to support or refute particular assumptions or hypotheses.

9 D.T. at 114-116 (emphasis added).

Dr. Budowle explained his involvement in the 50,000 x 50,000 study.

A. Well, I would say when the Daubert issue arose, the FBI, I was tapped on the shoulder as having some statistics, genetics background to see if I can assist in interpretation, understanding of how statistics works, especially in all the models proposed over the decades in fingerprint analysis, models such as given certain amount of minutia or level one, level two detail and level three detail. How can you say how common or rare a particular print or subset of a print may be? So I was involved. So the first question, I wanted to know what data exists, what are available to us as a scientist might ask, what can we do with this kind of information? So one of the questions that I asked was: Has anyone ever done the kind of study given that we have all the data sitting there, all the algorithms exist, all the information is already there, has anyone just counted it up? When you do all of these empirical studies over the 100 years it has been scattered around, but not counted up.

The second question, the power of the computers today, has anyone ever done where you take all 340 million prints, search them against themselves, and see what happens? And that had not been done. Although it was all there to do in one neat study. **As you heard under the previous testimony, it took four days to run 50,000. So you know we couldn't do the 340 million in a short time frame, probably not even in a long time frame.** So the question was: Can I take a certain amount of information, compare them, and then see what happens?

9 D.T. 116-117 (emphasis added).

Dr. Budowle summed up the discussions with Lockheed Martin as follows:

We sat down, Meagher and I, and discussed this some,

formulated some plan, then we went to Lockheed Martin, can you do this? Of course the first thing, we can't do as many as you want. We can't do as many populations as you want. We have to settle it down to something reasonable. We came down to the 50,000 Caucasian left sloping loops because they would give us the most likely chance of getting matches out of all the population groups we would look it, and we went on and did the study.

Id. at 117-118.

Dr. Budowle described the statistical modeling of fingerprints with an analogy to describing movies. The more detail that you try to model, the more difficult it is to come up with the model that describes the events. *Id.* at 118-119.

If I go to level three where there is so much variation, the reason I think it is a very difficult thing to quantify, if we assume – I think that's a fair assumption – that all fingerprints are unique, we have to accept there's tremendous variation, if there is tremendous variation, then we have to accept it is hard to get a base line value that says this is the same in every individual to quantify, so we have to start saying, let's look at some of the data. Let's ask the question what that tells us, if that some data at that level two or level one is exceedingly rare, then is it a real leap of faith to say if you add in any more data, you are so exceedingly rare it really doesn't matter. When you look at some of these models, they look at portions of the information, they look at a skeleton, a frame of the house, but not the whole house. Then they quantify it and they come up with some very consistent observations.

To start with, though, let me take one step back, they will all make assumptions. The assumptions may be valid or invalid or close enough, that it really doesn't matter. For practical purposes, it is close enough. They go through and calculate it and one thing they all come to with a limited amount of information, it is exceedingly rare you will find this particular arrangement of information. They don't include all the information, but every model has come to that conclusion. Now, if you add any more information, especially if you think, if you agree with that level one is less than informative term level two, the more informative level three is extremely more informative, you can take that the general view, use the holistic approach and say, there is some objective

basis to do the final interpretation. So I may object to the subjective terminology, the last part is all subjective. It is based on some models, based on some observations that allow you to take the next jump on all the information, but modeling that, would be a very difficult almost impossible job.

Id. at 120-121.

Dr. Budowle agreed that there is no error rate for the methodology used by latent fingerprint examiners.

- A. Well, this transcends all forensic, it transcends all kinds of disciplines in that, but in the forensic area particularly, this has been an issue discussed repeatedly in lots of disciplines, whether it is DNA chemistry and latent fingerprints. We have to understand that error rate is a difficult thing to calculate. I mean people are trying to do this, it shouldn't be done, it can't be done. I'll give you an example as an analogy. When people spell words, they make mistakes. Some make consistent mistakes like separate, some people I'll say that I do this, I spell it S-E-P-E-R-A-T-E. That's a mistake. It is not a mistake of consequence, but it is a mistake. It should be A-R-A-T-E at the end. That would be an error, but now with the computer and Spell Check, if I set up a protocol, there is always Spell Check, I can't make that error anymore. You can see, although I made an error one time in my life, if I have something in place that demonstrates the error has been corrected, it is no longer a valid thing to add as a cumulative event to calculate what a error rate is. An error rate is a wispy thing like smoke, it changes over time because the real issue is, did you make a mistake, did you make a mistake in this case? If you made a mistake in the past, certainly that's valid information that someone can cross-examine or define or describe whatever that was, but to say there's an error rate that's definable would be a misrepresentation. So we have to be careful not to go down the wrong path without understanding what it is we are trying to quantify. Now, error rate deals with people, you should have a method that is defined and stays within its limits, so it doesn't have error at all. So the method is one thing, people making mistakes is another issue.

9 D.T. at 121-123.

Dr. Budowle testified that he was involved in the review of the anomalies that formed the basis of questions to Ziesig. Concerning the different numerical values when two different prints of the same finger are run through the system, Dr. Budowle stated that the results did not affect the rarity or probability of an event.

- A. That was one of the first observations I made when I got the results, getting one will result one way or the other, trying to understand what is happening in the system and what it means. You can't confuse what these systems are doing. Under the identical print where the mate, the same print matched against itself, it tells us something about how rare the event, you can't confuse when you look at either print rolled at different times or two different prints or whatever, it has to deal also with encompassing some of the quality of the algorithm systems. These are two different things. Those values don't necessarily mean anything about identity or the rareness of profiles. The match to itself tells us about the particular characteristics and their arrangement, how rare it might be.

The other one is to talk about matching criteria for algorithms given the information that it has on candidates, not on rarity of profiles. When you do this, we have to accept that it is not as good as that is, as our eyes are or brain are in pattern recognition, and that you wouldn't ever say, I am going to look at the first candidate. I'll have a Z score, that's the end of the picture. You want to look at it. What's the second and the third and the fourth candidate, because that's important to understanding, to understand the power of the system and limitations of the system.

In every case where we had that situation, where forward was one value, reverse was another value, the second – the next best score on there, we will call it the second best, was that particular pattern. That's how you would want to work with it. Nothing to do with how rare or common it is, it has to do with assignments, and two different algorithms coming together, looking at something one way versus the other, fitting first this one on top of that see versus this one on top of that, and these little kinds of distortions and all, is more of an issue of the power of the system to identify things, but not the rarity of it. But if I were setting it up, as it was set up, I would look at the second and the third and the fourth candidates, because I would expect those to be the candidates for matches, understanding my system. It doesn't say that there is something wrong with the system, it is a limit that we work with in the system.

Second point I may add it to, remember, everything is biased toward making a match. When you have 50,000 prints, you throw out the 49,500 that are really different, you only take the 500 that are closest – although they are not close, but they are closest – you are raising that value closer to making a match toward the candidate, which in actuality if you took all the data as it was, it would be way down here. So we have to understand we are working within the limits of the system, understanding it, not try to mix apples with oranges in trying to infer probabilities or errors in systems.

Id. at 124-126.

Dr. Budowle examined and agreed with the probabilities that were generated in the 50K x 50K studies.

- A. I like the empiricists' approach, the observational approach, but that's something that gives me some solidness out of all of these things. The 50,000 by 50,000 comparisons is what gives me confidence that supports this tenet of uniqueness with a limited amount of information, because I took one print, I compared it against all others, I didn't get a match except itself. I took another print, compared it to all the

others, we had a wide range of amount information. Bearing in mind we only took a portion of the total information that prints provide, we only took the points themselves, the Galton points, not any level three detail, looking at any of these ridges how they bend, the pores or any other information that would be there.

Four points, all of those different kinds of comparisons in geometry around all the other prints that had a lot more points didn't get any hits; five points didn't get any hits; six points didn't get any hits. That's a study that's in support. I like the empiricist's part of it, how much I looked at it. I didn't get any hits except with those that are matches or the second best candidate that was the other match.

9 D.T. at 127-128.

Dr. Budowle also reminded us of the proper use of statistics:

Q. Sir, for the science of fingerprint or fingerprints, is it any less reliable because latent fingerprint examiners do not record their results in terms of probability?

A. I don't believe so.

Q. Why?

A. Because I think you have to look at the whole package and what it means. By looking at all the models that have been proposed to date, all the data that has been collected, all the studies that have been done, it is an exceedingly rare event. When you only take a portion of the information, even only a small region of the print, if you were to add in all the other information that's around, it would make a very, very, very exceedingly rare event. And it comes – a point no matter what the numbers are. It doesn't change the overall outcome. You can make numbers until the cows come home, the reality is, it will be still an identity for all practical purposes. There comes a point, where no matter what the numbers are, we should be able to say, in our opinion, this is an individual that is the source of this particular pattern or profile. And I don't think you gain necessarily by throwing

in numbers after a certain point.

Q. And, with respect to statistics to begin with, are they supposed to give you the answer?

A. No. I think one of the things that often, I think, troubles statisticians is that they automatically forget the basic rules. Statistics are tools not rules. I actually went into the first year, the first year of college statistics book by an author called Snediker and Cochran called Statistical Methods, and pulled out something that I used all along to better understand how statistics work, and it is on page 28 of their 670K issue of the book, which just states: A test of significance is sometimes thought to be an automatic rule for making a decision either to accept or reject a known hypothesis. In other words, as a rule, this attitude should be avoided. An investigator rarely rests his decision wholly on a test of significance. To the evidence of the test he adds his knowledge accumulated from his own past work and from the work of others, the size of the sample for which the test is significant is calculated is also important, the small sample, and it goes on and on and on, but the main point is, it is meant to be a guide to help us understand things but it is not meant to be a rule.

I think the same thing applies here. We use statistics to lay some foundations to understand if things are common or rare, or the arrangements are common or rare. We see with every kind of analysis that is done, no matter what the assumptions are, these are rare events. If we used all the information, they would be such rare events, that we can use these tools to help us make the final decision on all of our information.

Q. Do you have an opinion as to whether or not a statistical model is required for the science of fingerprinting?

A. I don't think it is required to make the interpretation. I think it is part of the knowledge base that has been used to get to that point. If we look back at the earliest papers from Galton onward, they all applied models to try to categorize and, understand their work, to justify their interpretation of

uniqueness, and that's part of the basis, but there comes a point you had so much data, so much comparisons and redundancy of the results, you always get the same kind of conclusion that you don't have to apply it all the time, otherwise we are not gaining from our knowledge and experience over 100 years.

Id. at 129-132.

Dr. Budowle also noted that it was important to differentiate between proficiency testing and error rate. In essence, proficiency testing is something that is done to be self-critical or take corrective action or to determine if there are weaknesses. But he stressed that proficiency testing does not define an error rate. *Id.* at 133.

Dr. Budowle said it is just as important not to confuse the 50K x 50K study and what the data meant.

- A. All right. I said there are two things going on in data being generated you have to think about. The first one is the information we can gain by looking at the mate match, the one that is the print that matches itself. That tells if it is a good quality situation or quality situation, and all the minutia and their relationship and what kind of value that gives, so it tells us something about the identity value, the statistical value of the test. There's another process going on that now says, when I have a distorted print from the original, where the original may be distorted the other may be better or vice versa, but they are not exactly the same, I have to now correct for those, for ranking matches for candidates for the AFIS system. That now is not asking how rare the particular profile is, it is saying I'm ranking it. If a pattern is distorted, one still has to go in at the end and identify Galton points, level one detail, level three detail. If you were to use statistical models one would still have to count all of those points, regardless of their distortions in that they would still have the general relationship to each other and that would tell us something about the rarity, regardless of the fact that it matched this one algorithm, it may be a z score of 2 instead of 25 or 30 or 21. The value

obtained of the 10 to the 10th to the 97th is a value that defines the individuality of the print.

In reality, if you had a distorted print that had the same amount of information but was a little warped, it would be still in the 10 to the 97th range. In fact, if you add all the information, level one detail and level three, 10 to the 97th is a conservation estimate. You have not calculated all the other variations that exist, it could be many, many, many more zeros at the end of that. If you take the fact that we averaged only the 500 top candidates, the closest ones the 10 to the 97th is way down the line.

So the idea there are two different things going on, we shouldn't confuse the meaning of those two.

The last point to remember is there was a question asked whether the profile number one matched profile number three, for example. At a very high z score, and then profile three to one had a lower z score, why wouldn't they be exactly the same? Well, there's two ways to think about is that explain that, because it is just a computer system and algorithms. If you remember that Ziesig said there are millions and billions of comparisons of this minutia to do that, well, what happens is, first it starts down, it says here is a starting point, I'm going to go down the path. I'll make these comparisons.

The other way, they may start at a completely different point and, go down a different path. The paths are not exactly the same. You can think of it as if you were comparing you and I, we start with you, we say black hair, brown eyes, that's a certain path of a certain value. We go down the line, make the comparisons. Compared to me, we will say we are different very quickly. You will have a different weighted value because of the more commonality of those two features.

You start with me with red hair and brown eyes. You start at a different value in that pathway because of the more rare red hair scenario, so it is not unexpected that you get different values. That's why you have to look at rankings.

Id. at 133-136.

Dr. Budowle opined that the 50K x 50K study helps to understand what is happening when examiners are dealing with small areas of friction ridges, like latent prints.

- A. I think it adds more support to the same issue, because although these are what was called a pseudo latent or a partial print, they are still telling us about detail information. Even if we were working with a small amount of information, we are not getting hits except to their mates or to people rolled at another time. So, in other words, from the same person. That's pretty strong evidence to support everything else that has come for the last 100 years beforehand. When you get down to the four points, it is only four or five people, each one of them were compared to, as I said, 50,000 people. There's a lot of information there. Not 50,000 people in one place but lots of different places, lots of configurations, to see if we can get any matches, increasing the chances of that. That's strong evidence that very small amounts of information, small friction ridge skin contains a lot of variations and a lot of information, and we have to remember in that study, we don't do anything about level three, which is far more variation than level two.

So my conclusion from that is it supports that very small area of ridge detail provides such tremendous variation it is a reasonable interpretation that an individual is unique if it has sufficient quality and clarity.

Id. at 136-137 (emphasis added).

Dr. Budowle also discussed the non-judicial use of the fingerprint science. He related a conversation he had with Don Ziesig. Ziesig has another assignment to come up with a

biometric scan for security entry and identification of individuals that will work on only six percent of the surface area of an average fingerprint. Both Dr. Budowle and Ziesig have confidence that using six percent area for such purposes will not be difficult to accomplish and according to Dr. Budowle, that is possible because there is so much information contained in a small area of friction ridge skin. Dr. Budowle also gave other examples of non-judicial use of fingerprints, such as smart cards, identity computer locks, paternity testing laboratory identification, drivers' licenses and other identity cards in the United States and outside of the United States, and the identification of victims of disasters. 9 D.T. at 138-140.

Dr. Budowle, based on all his expertise, opined that the methodology, ACE-V, used by latent fingerprint examiners is valid, that human friction ridges are unique and permanent, that human friction ridge skin arrangements are unique and permanent, and that positive identification can result from comparison of friction ridge skin or impressions containing a sufficient quality (clarity), and quantity of unique friction ridge detail. *Id.* at 140-141.

Dr. Budowle in discussing his work in DNA stated that like fingerprints he prefers to opine that an individual is the source of the DNA material rather than the likelihood or a statistical basis for that opinion. 9 D.T. at 152. In response to the question of whether or not fingerprint science has created various bins similar to DNA science, Dr. Budowle in essence said it would be impossible. "DNA doesn't even come into the complications of Level 2 information [in fingerprints]." As to fingerprints being a science, Dr. Budowle stated that there is both an empirical basis and various models that he discussed, for fingerprints as science. *Id.* at 160-161. Dr. Budowle went on to describe another non-judicial use of fingerprints, namely, the military's use for identification which is still used today. *Id.* at 161-162.

Summing up error rate in the fingerprint field:

- A. I don't think error rates is the right approach. I think errors are the right approach in reviewing errors and in improving upon them, discussing them and fixing them is an absolutely important thing to do. **But using them to calculate an error rate is meaningless and misrepresents the state of the art.**

Id. at 163 (emphasis added).

A reading of the remainder of the cross examination of Dr. Budowle is unremarkable and does not advance the defendant's cause. 9 D.T. at 141-172.

B. The Defense Case.

1. The defendant called his investigator, **Marilyn Peterson**²⁰, who is employed by the Defenders Association of Philadelphia. The essence of Ms. Peterson's testimony was her contacts with various jurisdictions concerning the surveys that were sent to the states by the FBI. If the Court will recall, Meagher had testified extensively on the defendant's charts and his own follow-up conversations with examiners in those jurisdictions. Although the government has no reason to dispute the integrity and truthfulness of Ms. Peterson, it respectfully suggested that the testimony is of little value. It is apparent from Ms. Peterson's testimony on the cross examination that some confusion existed as to whether or not a certain number of points were "required" for positive identifications. The record as a whole establishes that other than England and Italy, it appears the entire rest of the world has abandoned the method of identification which only relied on counting Galton points. The Court will recall the testimony that the FBI abandoned that system approximately 50 years ago.

²⁰This whole text of the testimony appears at 12 D.T. at 2-35.

2. The defendant called **Doctor David A. Stoney** who has very limited experience in the area of latent fingerprint examination. Dr. Stoney who holds a Ph.D. in Forensic Sciences was initially offered “as an expert in forensic science and particularly with respect to the issue of fingerprint individuality”. 12 D.T. at 46. In voir dire on his qualifications, Dr. Stoney stated that with respect to fingerprints, he had perhaps 36 hours of undergraduate study and some undefined number of hours at the graduate level. He also stated that with respect to his latent fingerprint comparisons, he would put the figures at hundreds but not above the level of a thousand, and that his experience in that area was more akin to the verification process described in ACE-V. 12 D.T. at 61-63.

While the government was trying to determine from Dr. Stoney the meaning of “an expert in fingerprint individualization,” the defendant modified the proffer of expertise to “we are offering him as an expert with respect to scientific status or lack thereof with respect to latent fingerprint identification.” 12 D.T. at 83. Shortly thereafter, the defendant modified Stoney’s expertise to having expertise “with respect to whether a fingerprint examiners’ conclusion that a latent fingerprint came from a particular individual is a scientific determination”. 12 D.T. at 85.

Dr. Stoney stated that in his career he has testified and has made “absolute identifications” and also has made absolute “not him” exclusions. 12 D.T. at 85-86.

The essence of Dr. Stoney’s testimony was that the determination as to the sufficiency of the volume of information necessary to make an absolute identification is not a scientific determination, but is based on subjective standards. 12 D.T. at 87.

Like the other defense witnesses, Dr. Stoney believes “something” cannot be a scientific process unless the hypothesis can be tested and the test is capable of showing the hypothesis to be false. 12 D.T. at 87. Dr. Stoney seems to accept the ACE-V process as valid. But opined the evaluation process for positive identification or individualization is not a scientific determination but subjective and that differs from other sciences because no probabilities are associated with the conclusion. 12 D.T. at 98. Dr. Stoney agrees with the government’s experts, in particular Dr. Budowle, that there is a scientific foundation that gives an examiner the basis for the absolute opinion. 12 D.T. at 101.

Dr. Stoney emphasized that for “something” to be scientific “it has to be capable of proving that I’m wrong.” As Dr. Cole in his testimony acknowledged, testing the soundness of a latent fingerprint examiner’s opinion is as easy as hiring another qualified latent fingerprint expert to examine the evidence and thereby test the validity of the first expert’s opinion. A litigant or defendant can do this. Dr. Stoney also discussed error rate and was critical of Dr. Budowle’s conclusions about error rate. The government notes that Dr. Budowle’s discussion about error rate was not limited to the fingerprint science. However, as applied to fingerprint science, the government suggests that Dr. Budowle’s position and opinions are clear and logical statements concerning error rates. Dr. Stoney believes “that something with a zero error rate cannot be a science, in the following sense: that if we start out saying fundamentally something can’t be shown to be wrong, then it means that we can’t test it. If we can’t test it, it is not - - there’s no way to show that it is wrong”. 12 D.T. at 103.

The government suggest that Dr. Stoney has given the answer. So, what is the “something” that the government is referring to? The defendant has all but conceded that friction

ridges and friction ridge arrangements are unique and permanent. So, applying an error rate or attempting to apply an error rate to those premises is foolhardy. It appears that Dr. Stoney believes in the ACE-V methodology, but, states that if you don't use an error rate it is not science. 12 D.T. at 103. However, it is abundantly clear that latent fingerprint examiners only have before them one print at a time. The government in no way suggests that practitioner error is not a concern, but it has been established that practitioner error is something that can be corrected through remedial action, such as additional training or supervision. And as stated earlier, the expert opinion of individualization is subject to review, not only in verification process of ACE-V but, also by other latent fingerprint experts asked to perform their own examination to test the accuracy of the first expert opinion.

The defendant, through his examination of Dr. Stoney on AFIS, set up a strawman. Questions as to whether or not the 50K x 50K study or AFIS supports the expert's conclusion as to there being sufficient information to individualize are irrelevant. See example 12 D.T. at 107-110. The record is clear that AFIS and the 50K x 50K study were used in support of the fact that friction ridges and friction ridge arrangement are unique.

Dr. Budowle said distinctions have to be made as to what AFIS is doing in the 50K x 50K study to demonstrate how rare an event is versus what the system is showing about identification. Dr. Stoney criticizes the 50K x 50K study for using the definition of "identity" as either the full print compared to itself or the pseudo latent compared to its full mate.

However, as Dr. Budowle testified, numerical values obtained by those comparisons are used as quality control on the system itself. If a score was reached that exceeded that "identity" score, it would be an event that was unexpected and would require investigation.

The government suggests that Dr. Stoney is just off the mark when he bases his criticism upon “the identical” definition used for purposes of the 50K x 50K study. 12 D.T. at 114-115.

Dr. Stoney also criticized the 50K x 50K study saying “so to agree that a person would read that and think that it did or read into this, this is the probabilities of a comparison coming out wrong or this is a random probability of encountering a particular minutia configuration, that would – it does not present that to us. However, the 50K x 50K study had nothing to do with whether of not a comparison would be right or wrong. 12 D.T. at 119. The remainder of Dr. Stoney’s direct examination needs not further comment from the government.

On cross examination²¹ Dr. Stoney stated that he did not agree with Professor Starrs’ statement that in order for fingerprint science to be valid, there must be a probability associated with an identification. Additionally, Dr. Stoney does not believe any additional statistical modeling with respect to fingerprints is needed. 12 D.T. at 236. Dr. Stoney also agreed that human friction ridges are unique and permanent even in small areas of friction ridges. 12 D.T. at 237-238. Dr. Stoney also testified: that he does not see a problem with fingerprints and fingerprint comparison; he believes that there is a foundation in science for the expertise of the examiner who renders an opinion; he agrees that if friction ridges and arrangements are not unique in a small area, there would be no basis from which a latent fingerprint examiner could offer an opinion as to individualization. 12 D.T. at 239-240. Dr. Stoney also agreed that at some point, the quantity and quality of the information in a latent print becomes so great that an opinion of individualization is valid. 12 D.T. at 244.

²¹The government agreed to accommodate Professor Starrs by allowing him to testify before the government had the opportunity to cross examine Dr. Stoney.

Dr. Stoney restated his main and overriding point that the determination of what is sufficient is a subjective judgment. However, the government suggests that if Dr. Stoney is correct in concluding that valid science is something that is capable of being proved false, then the ACE-V process and, in particular the opinion of the sufficiency of the information present, which completes the opinion of individualization, can easily be tested by the review of the evidence by other experts.

3. **James E. Starrs**, a professor at George Washington University Law School and a full professor in the Department of Forensic Science at the university level, was identified to the government on October 30, 1998 as “an expert in the field of fingerprint analysis” Gov. Exh. 1, whose basis for his opinion is “the absence of any scientific research or studies which would support the claim of individuality in the matching of fingerprints, and the highly subjective nature of fingerprint analysis” Gov. Exh. 2. By the time of the hearing, Professor Starrs was offered “as an expert in forensic science qualified to provide an opinion as to whether latent fingerprint evidence meets the criteria of science.” 12 D.T. at 136. Professor Starrs stated that if he had known that he had been offered as an expert in the field of fingerprint analysis to testify to his opinion that there is no scientific basis for a claim of individuality in matching of fingerprints, he would have corrected it. 12 D.T. at 137. Professor Starrs acknowledged that he was not a certified latent print examiner, was not a latent print examiner, and had no formal training as a latent fingerprint examiner. 12 D.T. at 138-141. Professor Starrs summed up his opinion as follows:

- A. It is my opinion that the present process as I know it of fingerprint comparison and analysis, is not predicated on a sound and adequate scientific basis for purposes of making

an individualization to one person from a fragmentary print to the exclusion of all other persons in the world.

12 D.T. at 151.

In his testimony he refers to himself as a purist and states, that in science we cannot have absolute certainty. 12 D.T. at 152. However, the government submits that absolute certainty is not the bench mark to determine the admissibility of scientific or other evidence under Rule 702 or what is a scientific fact in a court of law.

Commenting on error rate, Professor Starrs states “the infallibility of fingerprinting, fingerprinting is only as fallible or infallible as the people who conduct it and one can’t say fingerprinting is infallible unless we are constantly on our guard to watch over those doing it, making sure the persons are doing it in a proper scientific way.” 12 D.T. at 161. The government suggests that Professor Starrs’ concern can be met by the ability of a defendant or any other person challenging a latent fingerprint expert’s opinion, to consult other fingerprint experts. As Dr. Budowle said, when someone has made a mistake in the past and has taken corrective action, that fact sheds very little light on error rate or how that person is performing today. A fair reading of Professor Starrs testimony fails to disclose any portion of fingerprint comparison and practice with which he has no criticism. Indeed, having launched his basic premise in the area of individuality in small areas of latent prints, he takes out his shotgun and riddles the entire relevant community , that is, the community of latent fingerprint examiners, of which he is not a member, with his verbal bullets. However, the government suggests that this Court must take Professor Starrs’ testimony with much caution. As will be talked about more

fully below, Professor Starrs' refused to accept facts for the purpose of a hypothetical question, which among other things, seriously undermines his stature as a "expert."

Professor Starrs, walking the Rule 702 line, comments "I'm simply saying skill that comes from experience is not science." 12 D.T. at 167. When asked about the ACE-V process, he objected to it being termed science, but readily accepted that it might be a proper protocol. 12 D.T. at 170. Professor Starrs, when asked to accept the hypothetical that the friction ridges are unique, refused to do so. 12 D.T. at 176. Professor Starrs appeared to make the reluctant concession that a full square inch of friction ridge is unique.

- Q. Okay, fine. My question is very specific. Given that area, [21.7% of a one square inch of friction skin] do you concede that the friction ridges themselves, the human friction ridges in that area are unique?
- A. It may well be, if scientifically established. I haven't seen the scientific proof of it. I have seen scientific indications that we are on the way to proving the entire one square inch you mentioned may be unique. I have seen strong indications of that, but I haven't seen any indication of 25% or one quarter of it is unique, where there is a scientific basis for that.

12 D.T. at 179.

Government counsel again asked Professor Starrs to make certain assumptions about the uniqueness of ridges and again he refused. In particular, the government asked him to assume that friction ridges are unique. Professor Starrs would not accept that assumption without scientific proof. 12 D.T. at 180-181.

However, Professor Starrs did concede that his opinion would change if it was a fact that friction ridges in small latent areas are unique.

Certainly, if it has been scientifically established by experiment with proper database that friction ridges on latent prints are individual as to particular person as to all others, that would change my testimony, but that has not been established.

12 D.T. at 185-185.

Professor Starrs even quibbled about the terms Level 1, 2, and 3 Detail. He suggested he did not want to use those terms since Level 1 sounded like it was the best. 12 D.T. at 189. The government never suggested such a thing, and for Professor Starrs to refuse to accept a particular label or definition does not speak well of him as a expert witness.

Professor Starrs suggested that one test fingerprint experts could do would be to send the exact same latent prints to qualified and competent examiners to see if the amount of detail is sufficient for purposes of making a comparison. 12 D.T. at 186-188. However, as this Court heard at the first trial, and I am sure in other contexts, one of the first things a latent examiner does is to analyze the latent to see if it is a “latent of value.” As the court is aware and as I am sure Professor Starrs is aware, there are many, many instances where latent prints are determined by experts not to have sufficient detail in order to make a comparison with any other print. The government respectfully suggested Professor Starrs’ opinion of what is proper testing is blinded by his belief that in order for the fingerprint science to be “science” the field “must be able to make a probability finding with respect to the issue of individualization.” 12 D.T. at 225.

Professor Starrs was taken through a discussion of the Third Circuit case on which the defendant relies for authority to call Professor Starrs’ at trial. He acknowledged he was in a similar position to law professor Denbeaux whom he had criticized and stated that under his standards, the Third Circuit should have excluded. 12 D.T. at 196-205.

Professor Starrs stated that he considered Andre Moenssens a colleague and a forensic scientist involved in fingerprint identification. 12 D.T. at 208. Professor Moenssens, in July of this year, stated:

By the way, while James Starrs is a co-author on a book with me and a long-time colleague, I do not subscribe to his somewhat hysterical positions on various forensic issues. I consider him to be an excellent researcher, a compelling and interesting writer, but I do not consider him to be a scientist, forensic or otherwise.

12 D.T. at 208-210. Gov. Exh. 6-12.

Professor Starrs grudgingly granted that running latent fingerprints against the database containing 34 million records has “some value.” 12 D.T. at 213. Professor Starrs summed up his own bias as follows: “I hate to say, I’m a scientific purist. If it is good and scientific, it should be used; and if it is not, it should not be used.” An opinion he holds regardless of whether or not “it” is a legal scientific fact.” 12 D.T. at 222.

4. **Simon A. Cole**, a Ph.D. in science and technologies, with a specialty of the interaction between law and science and technology was offered “as an expert in the field of science and technology studies with particular expertise regarding the fingerprint profession.” Dr. Cole described an article that he wrote concerning why fingerprint identification was so widely accepted.

He focused on: what he called an occupational norm of unanimity; how the fingerprint community handled cases of misidentification or error so deftly; that fingerprint identification was never subjected to judicial scrutiny; and the lack of organized opposition to fingerprint science. 13 D.T. at 9 and 15.

To make his first point on “occupational norm of unanimity,” Dr. Cole reached back to literature from 1913. Dr. Cole suggested that the FBI survey sent to the state proved his point. He suggested that the survey results, where some jurisdictions did not make a positive identification, established disagreement between two experts. 13 D.T. at 11. Dr. Cole is simply incorrect. There was no disagreement between experts. Some experts had made an identification and for a variety of reasons others had not. None had made a misidentification or an erroneous exclusion. Dr. Cole’s point seemed to be that for the sake of fingerprint science, experts in the fingerprint community would not disagree. That position belies reality. As the court pointed out, if Cole had contacted defense attorneys, or Defender Association as part of his research, something Cole admitted he did not do, that would have shown his findings to be incorrect. 13 D.T. at 12.

Dr. Cole’s second point is closely related to the first from the government’s view. He states that cases of errors have been successfully managed. The government is at a loss to understand exactly what he means. However, if errors are made by latent print experts those errors can be corrected either by improving training, peer review or consulting another expert.

Dr. Cole’s third point about lack of judicial review, although interesting, it is invalid. It certainly is true that the courts over time have accepted fingerprint evidence as a form of positive identification. However, that is how the law developed. By the time *Frye* was decided in 1923, fingerprints had already gained general acceptance. The government does not understand how the prior court decisions can or should cast a shadow over fingerprint science.

Dr. Cole’s fourth area, lack of organized opposition, seem to be a subclass of his first point. He points out that a group of counter-experts did not develop. The government

believes that Dr. Cole is just misinformed. The Court, as well as most lawyers involved in criminal law, are well aware of the availability and use of defense experts to attack fingerprint evidence. 13 D.T. at 10-16. Of course to be successful, there has to be some error to attack.

Dr. Cole next described what he believed were two methodologies coexisting in the same profession. He referred to the one as the old Galton point counting method and the other as the new ridgeology, using Ashbaugh's term and ACE-V. 13 D.T. at 16-18. Dr. Cole gave a laundry list of reasons why "latent fingerprint identification" does not fit within the definition of science. He also stated: that there had been no studies to attempt to falsify its premises; that case work is not experiments; that latent fingerprint examiners may have a bias in continuing the validity of fingerprint identification; that there is no way of finding out if you are wrong, that is, you would not know of an erroneous identification and an innocent person could be convicted; and there was a lack of cold searches of latents against the entire database. On cross-examination, Dr. Cole admitted that his reference to "new," as he referred to the ACE-V methodology, dated back at least 20 years. 13 D.T. at 27-28. He admitted that as to the term Third Level Detail, he had never had the benefit of that term or Ashbaugh's writings until after his interviews and research had been concluded. He stated it is not unusual for a scientific field to be segmented and moving along with evolutionary change. 13 D.T. at 27-28. Dr. Cole acknowledged that in the 1970's the IAI had grandfathered in many of the "old guard," a reference to those that use strictly point counting for identification. He admitted that the IAI certification process began in the 70's. 13 D.T. at 29.

Dr. Cole also discussed the falsification issue mentioned by Starrs and Stoney, saying that the premise that had to be able to proven false was "that latent fingerprint examiners

can reliably match a partial latent print to a single unique individual among all individuals who ever existed in the world.” Dr. Cole candidly admitted that if the individual ridges and ridge arrangements are unique, no one could prove that false or that they were not unique. 13 D.T. at 30.

Dr. Cole admitted that there are non-judicial uses for latent fingerprints, when somebody might be fired for perhaps stealing top secret information, 13 D.T. at 31, and Dr. Cole was present when Professor Starrs talked about a student being dismissed because of stealing an exam where the student was identified by the use of the examination of latent prints. Of course, Dr. Cole heard Meagher and Budowle testify about non-judicial use. 13 D.T. at 31-32. As the court will recall, Meagher testified to processing the residences of victims of disasters in order to obtain latent fingerprints for the purpose of making positive identifications.

With respect to error, Dr. Cole said his comment was meant as a historical note and when asked about defense attorneys ability to hire other experts, again noted that his comment was made as a historical note. 13 D.T. at 33-34. Dr. Cole conceded that defense attorneys, at least since the end of World War II, have been sophisticated enough to think about the issue of hiring their own experts in cases involving fingerprints. 13 D.T. at 35.

With respect to Dr. Cole’s suggestion that cold searches of latents through a database would be an appropriate experiment, he apparently was not aware that Byron Mitchell’s latents were cold searched against over 69 million 10-print cards or over 690 million fingerprints. 13 D.T. at 36. He admitted that for the jurisdictions that had not followed the rules, and had input Byron Mitchell’s 10-print card into their AFIS system and then ran Byron Mitchell’s latent prints through the system without any filters, they were cold searches. 13 D.T. at 38.

When questioned about his testimony that the ACE-V methodology was subjective, Dr. Cole stated that it was the last part of E, the evaluation step, that was subjective. When asked if other parts of ACE-V were objective, Dr. Cole gave the answer “I don’t know.” 13 D.T. at 39. Unlike Professor Starrs’ answer, Dr. Cole lined up on Dr. Stoney’s side and admitted that probabilities are not always required in determining scientific validity. 13 D.T. at 40.

As to Dr. Cole’s position that he could not find fingerprint experts disagreeing, he admitted he was not aware of the fact that two of the government’s experts had testified regarding a bum identification made by other fingerprint experts. 13 D.T. at 44. Dr. Cole did comment:

- A. I always have been aware through my research that good latent fingerprint examiners will, if they think – if there’s a bad identification, they will try to expose it because they understand that that’s their duty.

As to Dr. Cole’s comment that there had never been two sides dueling against each other over the “point method” vs. the “ridgeology method,” Dr. Cole did not seem to understand the importance of the fact that it is only through the adversary process, and the defense either calling another qualified expert latent print examiner or asking questions, that Cole’s complaint about the missing dueling methodologies in reported cases, would show up. 13 D.T. at 49-50. Dr. Cole ended his testimony in part by stating that none of the fingerprint field or the positive identifications from fingerprints have ever been tested.

THE COURT: Let me ask you a question, one or two before you go.

It's my understanding from your research that you've done, the only question in your mind as to whether or not fingerprinting is scientific or not, is that the question –

THE WITNESS: The only question.

THE COURT: In general.

THE WITNESS: Of all questions?

THE COURT: Obviously, you believe that a positive identification can be made from a fingerprint.

THE WITNESS: I don't know.

THE COURT: So you don't have any idea one way or another, after all of this research that you've done?

THE WITNESS: I would say that the question hasn't been tested.

THE COURT: Pardon?

THE WITNESS: I would say the question hasn't been tested –

THE COURT: According to what standards? That's what I'm trying to find out.

THE WITNESS: It hasn't been tested in any way, either scientific or otherwise. The assertion is based on collective experience.

THE COURT: But you said any way.

THE WITNESS: Correct.

THE COURT: Scientific is according to your definition, but that means any other form of testing fingerprint identification has never been tested. And that's your testimony, sir?

THE WITNESS: Well, I wouldn't say – yeah. I wouldn't say it's been tested. I would say collective experience has accumulated. But I wouldn't say tested.

THE COURT: Very well. I understand. And at one point in time in your testimony you indicated that there were these groups of sections of latent print experts. There's the elitist group and the not so elitist group. Would you consider the FBI the elitist group?

THE WITNESS: I would do it more by individual than by jurisdiction. I wouldn't have known through my research. I mean, I heard the FBI's experts here. I couldn't speak to all the FBI examiners.

THE COURT: So you wouldn't have known from your research whether or not the technology and the experience that exists in the Federal Bureau of Investigation is enough for your to determine one way or another whether they are elitist or not?

THE WITNESS: No, it seemed to me to be much more by the individual, but whether the individual is motivated to go to these meetings and so on. I mean, yeah – for example, Professor Starrs testified about Mr. –

THE COURT: I'm not talking about Professor Starrs' testimony. I'm talking about from your research. That's why you came here to testify.

THE WITNESS: Yeah, right, I would base it on the individual. There may well have been an old guard at the FBI that did it another way.

13 D.T. 50-52.

C. The Government's Rebuttal Case.

1. Pat Wertheim has been working in the fingerprint field since 1976 and was certified by the IAI in 1981. He was qualified as an “expert in the area of the development, comparison, and identification of friction ridge skin and friction ridge impressions.” Wertheim considers himself part of the “elite” that Dr. Cole had described, and stated that he has been

training people in latent fingerprint science since around 1981. He has taught a 40-hour class as many as 50 times and in 20 different states. In each class that he has taught, there have been examiners from 5 to 7 different states. He believes that he has had in his training classes representatives from all of the states within the United States. Additionally, he has taught in Trinidad and Tobago and recently came back from teaching a course with David Grieve in Durham, England. He noted that a latent fingerprint examiner from the Bahamas had attended that class. 13 D.T. 53-57. Wertheim stated that in his experience he had determined from all the participants that they were all using the ACE-V methodology, but that they did not necessarily understand the terminology.

Q. When you get into these states or into the classroom situations, do you determine from the participants how they are doing their job?

A. Yes, sir.

Q. And whether it be labeled ACE-V or not, tell us, if you can think of any exceptions, tell us what method – what they are doing and how that compares to ACE-V?

A. My experience working with these examiners in class, if they don't already understand the terminology ACE-V, nonetheless they are following that methodology in the examinations that they performed. It's a very common experience that someone will come into the class reluctant to embrace the philosophy and the methodology of ridgeology. But once they've been exposed to it through both the lectures and the practical exercise, they'll sit back and say, "this is what I've been doing all along." I mean, that's the only exception, of the students who haven't read or studied the ridgeology techniques before taking the class.

13 D.T. at 57-58.

Following up on what Dr. Cole was asked about a recent misidentification, which

showed that experts are prepared to testify against the opinions of other experts, Wertheim testified as follows:

A. I was contacted last January by a father in England who represented that his daughter was going to trial as a defendant on a single fingerprint identification. He asked me if I would come review the case. I was going to be in Liverpool, I had lectures, and I agreed to go to Glasgow to look at the case. On reviewing the fingerprint when I arrived in Glasgow, I determined very quickly that it was an erroneous determination. It was not made by the young woman who they were representing. I examined the fingerprint on the original surface. It had not been lifted. I photographed it myself, took my own fingerprints from the young woman. Without discussing my conclusion, I gave copies of the latent print and the ink print to Mr. Grieve.

Q. He's in the courtroom.

Would you stand up, sir?

And tell us about Mr. Grieve. What position does he hold?

A. Mr. Grieve is editor of the Journal of Forensic identification and in charge of the training for Illinois State Police, I believe.

So I gave copies of the print to Mr. Grieve without informing him whatsoever of my opinions, gave him the two prints and said, would you compare these and talk to an attorney. And he said he'd be glad to do that. Subsequently, the attorney advised us not to even discuss the case at all between ourselves. So when we went back to Glasgow to testify, we had basically only the assumption that we reached the same conclusion because we were both there. But the prosecution produced their case, presented their examiners. Grieve and I testified to the erroneous identification.

Q. Do you know the outcome of that case?

- A. The young lady was found not guilty by a unanimous verdict of the jury.

13 D.T. at 58-60.

Wertheim also testified that he believed every one of the quotations or inferences attributed to him in the defendant's memorandum was inaccurate. He was quoted out of context or with incomplete sentences used, etc. Wertheim said: "I don't believe I was quoted accurately in any one of those instances." 13 D.T. at 60. Wertheim rejected the notion that there were many examiners still solely relying on points for identification in the United States. 13 D.T. at 67. He also rejected the notion that two examiners looking at the same particular distorted print could identify the print with two different people. He explained what he meant by reaching different conclusions, is that one examiner may be able to make the identification, while another examiner may not be able to find sufficient detail to reach that same conclusion. 13 D.T. at 70. Through questioning by defense counsel and the government, it was apparent that Wertheim was correct in his criticism of the defense memorandum. 13 D.T. at 71.

2. Dr. Bruce Budowle was recalled to the stand. Commenting on Dr. Stoney's testimony, Dr. Budowle stated that he agreed with Dr. Stoney that absolute identifications can be made and that probability or statistic models are not necessary to make those identifications. "In other words, somewhere one can draw a line in the sand and say, there's enough information here and this is unique to anybody else in the world." 13 D.T. at 79.

As to Dr. Stoney's criticism of the 50K x 50K study, Dr. Budowle pointed out that he believed that Dr. Stoney was mixing and mismatching apples and oranges again.

- A. I think Dr. Stoney has mixed again and mismatched the apples and oranges, and not confusing what the studies are and what the practices are.

First is, the reason why one wants to put the print in there and search it against itself is a quality control measure because that print that's identical should match itself and should give the highest score possible. If we got a score what was higher than that, then there's something wrong with the system.

So you have to build quality control in any kind of analysis and any kind of experiment. We would – it would be foolhardy not to do that. Otherwise, we would have no way of knowing how the system performs.

The second point is that we recognize that whenever one wants to build a model for identifying detail on anything, whether it's fingerprints or DNA or anything else, we only build models. Then we want to test those models. You remember Dr. Stoney's testimony, he said he even produced a model, but he didn't know if it was good or bad because he hadn't been able to test it. We use the power of computers to test models. It's not any different in DNA than it is with fingerprints. I can do a thousand analyses statistically with DNA typing using the computer. I'm doing exactly the same thing in the fingerprint analysis. We're able to look at thousands, if not millions of prints in a relatively short time to search through to ask certain questions, whether or not there are any candidates that might match this. Having candidates is not a bad thing. In fact, having candidates increases our chances of finding potential matches. If you think of the system where, let's say we take the top ten candidates that had any semblance at all by the model that AFIS uses, means we would look at all ten of those candidates,

increasing our odds of finding potential matches to improve our chances than we ever had by doing it manually. So I think there's a misunderstanding of the process if we don't understand what that is.

The 50,000 studied has a real empirical value. Empirical value is that you look at 50,000 prints with a minimal amount of data and a lot of data, sometimes. So I think that in and of itself is valued.

If one wants to say that test by itself proves uniqueness, no one would say that. No one would say any one test or any kind of thing has been done in one hundred years proves uniqueness. It's the culmination of all of the experiences that say that, that one can have confidence in the next step to say that this is unique or not.

I think if one tries to classify any one study as being the proof of everything, that would be a misrepresentation.

13 D.T. at 80-82.

Dr. Budowle also commented on defense exhibit 55, an article Dr. Stoney used as part of his testimony that AFIS can't be used to search profiles to make matches, to give us some idea of the chance of having similar identical profiles in the database.

A. Yes, it's basically saying the AFIS System can't be used to search profiles to make matches to give us some idea of the chance of having similar identical profiles in a database.

Q. And can you give your comments about this – by the way, you've read this article, have you not?

A. Yes.

Q. Who is this article directed to, what was the audience?

- A. You have to look at the conclusion on page, I believe that's 151, which says: The intention of this article is simply to help procurement officials better understand the nature of the fingerprint matching problem and avoid some of the more common mistakes.

In other words, people are spending money building AFIS Systems, going to vendors. They are saying this is better than that and they need to understand that when they are buying basically the pig-in-a-poke kind of thing, that they don't just buy something they don't know what it is. That they ask certain questions about its efficiency before searching and creating candidates. I agree those are important things to consider.

- Q. And what is your comment with respect to the article itself?

- A. But it also says that if one want to work with latents, just to read, as it says on 148, . . . talking about searches and prints. They typically contain 50 to 100 minutia, where a general latent might show as few as four or five clearly.

Well, that's exactly what we did in our study. By reducing the area, we are looking at sometimes four or five Galton points in making our searches.

So I think in the spirit of this, there are a lot of things here that when we're testing the accuracy, we could use it in the same way as long as we understand its limitations. We look through candidates on the ability to do what manually may only do a few hundred prints over a length of time, where millions could be analyzed to ask questions, to give an even greater foundation to what we know has been observed for over 100 years.

- Q. Does your reading of this article in any way detract from the 50K study itself?

- A. I don't believe so.

13 D.T. at 83-85.

As to Dr. Stoney's statement that the analyze and comparison portions of ACE-V were not scientific, Dr. Budowle stated he did not agree and explained:

- A. Well, I have to draw from my own experiences in the fields that I've dealt with as comparisons. I'll give you the two fields that I've done a predominant amount of work in, DNA and let's say the medical genetics field as such. In DNA typing, we generate a profile, a group of genetic markers that makes some sort of constellation of observations.

We look at that entire profile to give some general idea of whether or not it's a good quality, what some of the information may be. And we look and say that's the evidence profile. Then we look at another profile, the reference and then we make comparisons between those.

I heard, much to my pleasure, that DNA typing is a science. So, if that's a science and that's part of its process, I think that that's part of the scientific process also, as what latent fingerprints are doing. They look at a profile – they look at the latent print or a rolled print or whatever kind of print, and they say, this is of a certain quality that I may proceed. Then they go in and they break it down into components and identify those components, and then they go to another one and break down the components and then they compare them. I think that that's the same in those fields.

It's also comparable to medicine. As you know, practicing the art of medicine is also used with the practice of medicine, but no one would argue that medicine is not based on science. There's a lot of scientific basis. In my own work in the area of say melanoma, skin cancer, a doctor would look at some abnormal growth and then he would go to some textbook and say, I observe something like this. This may be that. Then I have to look at all the

information combined and then I make a determination.

From there, there are different levels in the process. There are people – let's take breast cancer as a good example. You take two people who have breast cancer. The doctor says, this woman is stage two breast cancer. This woman is stage two breast cancer. Therefore, I will give them exactly the same treatment. Sometimes one responds and sometimes one doesn't.

You have to understand and then go back. Although it's all based in science, there's still this point where one has to make an interpretation based on all the information available to make that final opinion statement.

So when someone says this isn't a science and it's not that, I think we have to look at the whole process. We do this everyday in what everybody agrees is the scientific field.

13 D.T. at 85-87.

IV. The Defendant's Memorandum

On June 24, 1999, defendant filed his Motion to Exclude the Government's Fingerprint Identification Evidence. The evidence elicited from the government's experts at the hearing shows there are many instances where the government experts took exception to the defendant's memorandum. Indeed, much of the defendant's motion is factually incorrect either because the defendant has been misinformed or is relying on events and the state of the science as it existed 20 or more years ago. The government at the hearing made it known that the two fundamental premises as stated by the defendant, on page 1 of the memorandum, were

categorically rejected by the government. The government incorporates by reference its prior comments in response to the defendant's memorandum.

To the extent that the case law cited in the defendant's memorandum has any modern day validity to the facts of this case, they are discussed within the LAW section, herein. Likewise, specific references to the defendant's experts are discussed within the section titled "The Defendant's Case" above. However, the contradictory positions taken by the defendant's witnesses on the issue of probabilities or statistics is noteworthy.

The defendant in his memorandum advances David A. Stoney's position for the proposition that theoretical or statistical models and tested probability models are required for fingerprint science. That is overshadowed by Dr. Stoney's admission during cross examination that probabilities are not required and that he was not a proponent of additional probability modeling. Def. Memo. at 13-14; 12 D.T. at 236. Defense witness Simon A. Cole rejected the suggestion that all science requires probability models and statistical validation. 13 D.T. at 40. It is beyond dispute that statistical modeling, of all fingerprint detail, either fully rolled or latent, is virtually impossible considering the volume and uniqueness of all the data present in such prints. This is especially true given the present day computer power, the cost to develop such a model, or at least to try, and the cost of computer time required to perform the statistical analysis.

James E. Starrs, on the other hand, was adamant that statistical modeling or probability was required for a valid science including fingerprints. 12 D.T. at 225. As more fully discussed, above James E. Starrs' testimony, should be viewed with some skepticism.

It is also abundantly clear, that the defendant's arguments, flowing from what he generally describes as seven and ten ridge characteristics in common, is flawed beyond all doubt.

If anything is clear, it is clear that the “ridge characteristics in common” or “points of comparison,” or “points in common,” are terms limited to Galton points. Although such points play a role in modern day fingerprint comparison, they are inadequate in and of themselves to form opinions as to individualization. Fifty years ago, the FBI, like most of the modern world, abandoned such point methodology.

In summary, defendant’s memorandum is so infested with errors, omissions, and misrepresentations, that it cannot reasonably be relied upon.

V. THE LAW APPLIED TO THE FACTS IN THIS CASE

A. The Law.

From 1923 until 1993, scientific evidence and the experts offered by parties to testify about the scientific evidence were controlled by *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923), which established the “general acceptance” standard used by the majority of the federal and state courts in the United States. Fingerprint evidence had been accepted by many courts even before *Frye* was decided.

In 1993, the Supreme Court in *Daubert*²² held that the Federal Rules of Evidence, which became effective in 1975, superseded the general acceptance test of *Frye*. 509 U.S. at 587-88. Rule 702 provides:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

²²*Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

Although the *Daubert* holding was limited to scientific evidence, *Kumho*²³ settled any doubt that *Daubert* is applicable to technical or other specialized knowledge. In *Kumho*, the district court²⁴ excluded the expert and was reversed on appeal.²⁵ The Supreme Court in *Kumho* found the circuit court had erred, reversed, and upheld the exclusion of the expert witness.

The *Daubert* Court found that

a rigid ‘general acceptance’ requirement would be at odds with the ‘liberal thrust’ of the Federal Rules ... [that did] not mean ... that the Rules themselves placed no limit on the admissibility of purportedly scientific, [technical or other specialized knowledge] evidence [nor] is the trial judge disabled from screening such evidence. To the contrary, under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.

Id. at 509 U.S. at 588-89 (footnotes omitted).

The subject of an expert’s testimony must be ‘scientific, [technical, or other specialized] knowledge’. The adjective ‘scientific’ implies a grounding in the methods and procedures of science. [The adjective ‘technical’ implies being derived from a technique or from a speciality or from science. The word ‘specialized’ implies a grounding in training or employment in a special study or activity.] Similarly, the word ‘knowledge’ connotes more than just subjective belief or unsupported speculation. The term ‘applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds’. **Of course, it would be unreasonable to conclude that the subject of scientific testimony must be ‘known’ to a certainty; arguably, there are no certainties in science.**

Id. at 589-90 (citation and footnote omitted; emphasis added).

²³*Kumho Tire Company, Ltd. v. Patrick Carmichael*, 119 S. Ct. 1167 (1999).

²⁴923 F. Supp. 1514 (S.D.Ala. 1996).

²⁵131 F.3d 1433 (11th Cir. 1997).

Daubert also held that “[R]ule 702 ... requires that the evidence or testimony ‘assist the trier of fact to understand the evidence or to determine a fact in issue’. This condition goes primarily to relevance.” *Id.* at 591.

Faced with the proffer of expert scientific, [technical, or other specialized] testimony, then, the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific, [technical, or other specialized] knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically, [technically, or otherwise] valid and whether that reasoning or methodology probably can be applied to the facts in issue.

Id. at 592-593 (footnote omitted).

Rule 702 applies to more than “novel” or “unconventional evidence”: Of course, well-established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have obtained the **status of scientific law, such as the law of thermodynamics, properly are subject to judicial notice under Federal Rule of Evidence 201.**

Id. at 592 fn.11 (emphasis added).

The Court listed several, but by no means exclusive, criteria that courts could use in fulfilling their gatekeeper responsibilities: 1) Can the theory or technique be tested and what are the results; 2) Has the theory or technique been subjected to peer review and publication, noting that publication is but one element of peer review; 3) What is the known or potential error rate of the theory or technique, and 4) general acceptance. *Id.* at 593-94.²⁶

²⁶The Third Circuit noted additional factors including the existence and maintenance of standards controlling the technique’s operation, the relationship of the technique to methods which have been established to be reliable, the expert witness’s qualifications, and the non-judicial uses to which the method has been put. *In re Paoli Railroad Yard PCB Litigation*, 35 F.3d 717,

Finally, ‘general acceptance’ can yet have a bearing on the inquiry. A ‘reliability assessment does not require, although it does permit, explicit identification of a relevant scientific, [technical or other specialized] community and an express determination of a particular degree of acceptance within that community’. Widespread acceptance can be an important factor in ruling particular evidence admissible, and ‘a known technique which has been able to attract only minimal support within the community,’ may properly be viewed with skepticism.

The inquiry envisioned by Rule 702 is ... a flexible one. Its overarching subject is the scientific, [technical or other] validity and thus the evidentiary relevance and reliability--of the principles that underlie a proposed submission. **The focus, of course must be solely on principles and methodology not on the conclusions that they generate.**

Id. at 594-95 (emphasis added).

Rule 403 permits the exclusion of relevant evidence ‘if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury ...’ Judge Weinstein has explained: ‘Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it. Because of this risk, the judge in weighing possible prejudice against probative force under Rule 403 of the present Rules exercises more control over experts than over lay witnesses. Weinstein, 138 F.R.D., at 632.

Id. at 595.

In reaching its decision, the Court in *Daubert* noted:
[I]t is true that open debate is an essential part of both legal and scientific analyses. **Yet, there are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly.** The scientific project is advanced by broad and wide-ranging consideration of a multitude of hypotheses, for those that are incorrect will eventually be shown to be so, and that in itself is an advance. **Conjectures that are probably wrong are of little**

742 n.8 (3d Cir. 1994); *Heller v. Shaw Industries, Inc.*, 167 F.3d 146, 152 (3d Cir. 1999).

use, however, in the project of reaching a quick, final, and binding legal judgment--often of great consequence--about a particular set of events in the past. We recognize that, in practice, a gatekeeping role for the judge, no matter how flexible, inevitably on occasion will prevent the jury from learning of authentic insights and innovations. That, nevertheless, is the balance that is struck by Rules of Evidence designed not for the exhaustive search for cosmic understanding but for the particularized resolution of legal disputes.

509 U.S. at 596-97.

Kumho not only held that Rule 702 and Daubert's factors applied to all "expert" witnesses, it expanded on the notions of reliability and the district court's gatekeeping responsibility.

We conclude that Daubert's general holding-- setting forth the trial judge's general 'gatekeeping' obligation--applies not only to testimony based on 'scientific' knowledge, but also to testimony based on 'technical' and 'other specialized' knowledge. We also conclude that a trial court may consider one or more of the more specific factors that Daubert mentioned when doing so will help determine that testimony's reliability. But, as the Court stated in Daubert, the test of reliability is 'flexible,' and Daubert's list of specific factors neither necessarily nor exclusively applies to all experts or in every case. Rather, **the law grants a district court the same broad latitude when it decides how to determine reliability as it enjoys in respect to its ultimate reliability determination.** See *General Electric Co. v. Joiner*, 522 U. S. 136, 143 (1997) (courts of appeals are to apply 'abuse of discretion' standard when reviewing district court's reliability determination). Applying these standards, we determine that the District Court's decision in this case--not to admit certain expert testimony--was within its discretion and therefore lawful.

Kumho Tire Company, Ltd. v. Carmichael, 119 S.Ct. at 1171 (emphasis added).

In *Kumho*, the district court initially strictly applied the *Daubert* factors, but upon reconsideration, noted that the *Daubert* factors must be applied flexibly. Even so, the district court excluded the proffered expert testimony on causation. *Id.* at 1173.

In *Daubert*, this Court held that Federal Rule of Evidence 702 imposes a special obligation upon a trial judge to 'ensure that any and all scientific testimony ... is not only **relevant, but reliable.**' 509 U. S., at 589. The initial question before us is whether this basic gatekeeping obligation applies only to 'scientific' testimony or to all expert testimony. We, like the parties, believe that it applies to all expert testimony.

Neither is the evidentiary rationale that underlay the Court's basic *Daubert* 'gatekeeping' determination limited to 'scientific' knowledge. *Daubert* pointed out that Federal Rules 702 and 703 grant expert witnesses testimonial latitude unavailable to other witnesses on the 'assumption that the expert's opinion will have a reliable basis in the knowledge and experience of his discipline.' *Id.*, at 592 (pointing out that experts may testify to opinions, including those that are not based on firsthand knowledge or observation). The Rules grant that latitude to all experts, not just to 'scientific' ones.

Experts of all kinds tie observations to conclusions through the use of what Judge Learned Hand called 'general truths derived from ... specialized experience.' Hand, Historical and Practical Considerations Regarding Expert Testimony, 15 Harv. L. Rev. 40, 54 (1901). And whether the specific expert testimony focuses upon specialized observations, the specialized translation of those observations into theory, a specialized theory itself, or the application of such a theory in a particular case, the expert's testimony often will rest 'upon an experience confessedly foreign in kind to [the jury's] own.' *Ibid.* The trial judge's effort to assure that the specialized testimony is reliable and relevant can help the jury evaluate that foreign experience, whether the testimony reflects scientific, technical, or other specialized knowledge.

Kumho, 119 at 1174 (emphasis added).

We conclude that Daubert's general principles apply to the expert matters described in Rule 702. The Rule, in respect to all such matters, 'establishes a standard of evidentiary reliability.' 509 U. S., at 590. It 'requires a valid ... connection to the pertinent inquiry as a precondition to admissibility.' Id., at 592. And where such testimony's factual basis, data, principles, methods, or their application are called sufficiently into question, see Part III, *infra*, **the trial judge must determine whether the testimony has 'a reliable basis in the knowledge and experience of [the relevant] discipline.'** 509 U. S., at 592.

Daubert makes clear that the factors it mentions do not constitute a 'definitive checklist or test.' Id., at 593. And Daubert adds that the gatekeeping inquiry must be 'tied to the facts' of a particular 'case.' Id., at 591 (quoting *United States v. Downing*, 753 F. 2d 1224, 1242 (CA3 1985)). We agree with the Solicitor General that '[t]he factors identified in Daubert may or may not be pertinent in assessing reliability, depending on the nature of the issue, the expert's particular expertise, and the subject of his testimony.' ... The conclusion, in our view, is that we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in Daubert, nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue.

119 S.Ct. at 1175.

In certain cases, it will be appropriate for the trial judge to ask, for example, how often an engineering expert's experience-based methodology has produced erroneous results, or whether such a method is generally accepted in the relevant engineering community. Likewise, it will at times be useful to ask even of a witness whose expertise is based purely on experience, say, a perfume tester able to distinguish among 140 odors at a sniff, whether his preparation is of a kind that others in the field would recognize as acceptable.

We must therefore disagree ... that a trial judge may ask questions of the sort Daubert mentioned only where an expert 'relies on the application of scientific principles,' but not where an expert relies 'on skill- or experience-based observation.' We do not believe that Rule 702 creates a schematism that segregates expertise

by type while mapping certain kinds of questions to certain kinds of experts. Life and the legal cases that it generates are too complex to warrant so definitive a match.

To say this is not to deny the importance of Daubert's gatekeeping requirement. The objective of that requirement is to ensure the reliability and relevancy of expert testimony. It is to make certain that an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field. Nor do we deny that, as stated in Daubert, the particular questions that it mentioned will often be appropriate for use in determining the reliability of challenged expert testimony. Rather, we conclude that the trial judge must have considerable leeway in deciding in a particular case how to go about determining whether particular expert testimony is reliable. That is to say, a trial court should consider the specific factors identified in Daubert where they are reasonable measures of the reliability of expert testimony.

The trial court must have the same kind of latitude in deciding how to test an expert's reliability, and to decide whether or when special briefing or other proceedings are needed to investigate reliability, as it enjoys when it decides whether that expert's relevant testimony is reliable. **Our opinion in Joiner makes clear that a court of appeals is to apply an abuse-of-discretion standard when it 'review[s] a trial court's decision to admit or exclude expert testimony.' ... That standard applies as much to the trial court's decisions about how to determine reliability as to its ultimate conclusion. ... Thus, whether Daubert's specific factors are, or are not, reasonable measures of reliability in a particular case is a matter that the law grants the trial judge broad latitude to determine.** See *Joiner*, supra, at 143. And the Eleventh Circuit erred insofar as it held to the contrary.

119 S.Ct. at 1176 (emphasis added; citations omitted).

In sum, Rule 702 grants the district judge the discretionary authority, reviewable for its abuse, to determine reliability in light of the particular facts and circumstances of the particular case.

119 S.Ct. at 1179.

The importance of the district court's gatekeeping responsibilities was emphasized by Justice Scalia in his concurring opinion specifically addressed to that issue:

I join the opinion of the Court, which makes clear that the discretion it endorses--trial-court discretion in choosing the manner of testing expert reliability--is not discretion to abandon the gatekeeping function. I think it worth adding that it is not discretion to perform the function inadequately. Rather, it is discretion to choose among reasonable means of excluding expertise that is false and science that is junky.

Id.

B. The Defendant's Issue.

The defendant frames the issue for the Court as determining whether or not an opinion of individualization can be made from the evaluation of small areas of latent prints. The *Daubert* hearing established that friction ridges and their arrangements are unique even in small friction ridge areas. Remembering that the whole is equal to the sum of its parts, the larger and clearer the latent print becomes, the more volume of unique detail is present. Therefore, the defendant's statement of the question, is there a scientific basis for making the opinion of individualization in a small latent print area is a red herring. Having proved that the friction skin is unique down to the individual ridge detail, uniqueness seen in progressively larger areas of a latent print just makes the latent print more unique, while the opinion of individualization, formed through the ACE-V process, remains the same. That is, the opinion of individualization does not become "more" of an opinion of individualization. In other words not an opinion laced with probabilities.

C. *Daubert* Factors.

What factors can this Court rely on in concluding that the fingerprint science meets the test of *Daubert* and *Kumho*? The FBI's survey to the state jurisdictions established beyond any doubt the universal or general acceptance of fingerprint science by the relevant community of qualified latent fingerprint examiners. A proposition the government suggests is well known to the Court and for that matter the rest of the modern world.

The ACE-V process and the experts' conclusions have been tested empirically over a period of 100 years and in any particular case they can be tested by examination of the evidence by another expert.

The fingerprint field and its theories and techniques have been published and peer reviewed during a period of over 100 years.

The government witnesses' expert qualifications are beyond dispute.

The non-judicial use of fingerprints, including latent prints, e.g., processing mass disaster victims' homes for latent prints to establish positive identification, among others, was established at the hearing.

Dr. Budowle testified that methodology error rate in the science of fingerprints is not a relevant inquiry. Moreover, practitioner error can be detected and corrected by another qualified examiner, either in the verification process or through consultation with other experts during litigation.

D. The Defendant's Authority

The defendant has argued that *United States v. Velasques*, 64 F.3d 844 (3d Cir. 1995), mandates that his experts be allowed to testify at trial. He is simply wrong. In *Velasques*,

the district court did not find as a fact or take judicial notice of the uniqueness of handwriting. Nor can handwriting analysis be summarily equated with the science of fingerprints. In *Velasques*, Mark P. Denbeaux, a professor of law and a “critic” of handwriting analysis, was offered to assist the jury in “understanding the limitations of the government’s handwriting testimony.” Denbeaux’s qualifications have been the subject of much criticism. See Moenssens, Handwriting Evidence in the Post-Daubert World, 66 UMKC L.Rev. 251, 255 n.11 (Winter 1997) (the *Velasquez* court based its decision to permit the testimony of Denbeaux, in part, on the “mistaken belief, from [Denbeaux’s] testimony, that he was a social scientist and statistician, [an error which Denbeaux failed to bring to the court’s attention].” Mitchell’s expert, James E. Starrs, said “Denbeaux was a lawyer who was out moonlighting as a document examiner with an honesty chip on his shoulder. His qualifications for this task as an expert were just a shade above that of a well-read person. His major qualification was said to be his eight years of self-study. Of course, his co-authored article also stood him in good stead as an expert. 34 Duq. L. Rev. 813, 830-31 (Summer 1996).

Velasques was decided prior to *Kumho*. However, in a post-*Kumho* decision the Eleventh Circuit, in *United States v. Paul*, 175 F.3d 903 (11th Cir. 1999), rejected the defendant’s arguments that handwriting analysis does not qualify as evidence under *Daubert*. The court held that the government expert’s handwriting testimony would assist the trier of fact and rejected the defendant’s Rule 403 attack, finding the testimony more probative than prejudicial. The court also noted that cross-examination of the expert prevented any confusion for the jury. *Id.* at 911.

In striking contrast to the Third Circuit's pre-*Kumho* decision in *Velasques*, the court in *Paul* excluded Professor Denbeaux's defense testimony. It found Denbeaux unqualified as an expert because, among other things, he would not have assisted the jury. 175 F.3d at 912. In this case, the defendant's proffered trial testimony is offered to assist the jury in understanding the limitations of fingerprint evidence, the same refrain heard in *Paul* and *Velasques*.

What was at issue in *Velasques* was the defense's opportunity to criticize the standards employed in handwriting analysis. The government conceded in *Velasques* "that evidence that handwriting analysis is not scientifically credible 'goes to [the] weight' that such handwriting evidence should receive." *Id.* at 848.

Here, the government vehemently opposes the notion that the defendant's proposed testimony should be admitted and to weigh whether the fingerprint science is qualified under *Daubert* or to determine what weight the evidence should be accorded. While defendant offers through his purported experts an attack on the fingerprint field as a science, such testimony must be ruled inadmissible since it is well-established that fingerprints are unique to an individual and permanent and that positive identification can be made. The reason advanced by the defendant for allowing his experts to testify at trial is to **avoid jury confusion** about whether or not fingerprint evidence is scientific evidence under *Daubert*. The government has requested the Court take judicial notice of the premises cited in Gov. Exh. A. For the Court to allow the defendant's experts to testify to a contrary view would only mislead the jury. Therefore, a Rule 403 balancing should be struck in favor of excluding the defendant's witnesses. It was established at the *Daubert* hearing that Stoney, Starrs, and Cole are not members of the relevant community. Starrs and Cole are wholly unqualified to offer an opinion about the analysis, comparison, and

evaluation of latent prints. Although Stoney was marginally more qualified than Starrs and Cole, he is not an expert in the development, comparison and identification of friction ridge skin and impressions.

The jury instruction on expert witness is:

The rules of evidence ordinarily do not permit witnesses to testify as to their own opinions or their own conclusions about issues in the case. An exception to this rule exists as to those witnesses who are described as "expert witnesses". An "expert witness" is someone who, by education or by experience, may have become knowledgeable in some technical, scientific, or very specialized area. If such knowledge or experience may be of assistance to you in understanding some of the evidence or in determining a fact, an "expert witness" in that area may state an opinion as to relevant and material matter in which he or she claims to be an expert.

You should consider each expert opinion received in evidence in this case and give it such weight as you may think it deserves. You should consider the testimony of expert witnesses just as you consider other evidence in this case. If you should decide that the opinion of an expert witness is not based upon sufficient education or experience, or if you should conclude that the reasons given in support of the opinion are not sound, or if you should conclude that the opinion is outweighed by other evidence you may disregard the opinion in part or in its entirety.

The evidence at the *Daubert* hearing established that the ACE-V methodology had a subjective element in the evaluation stage when the expert is forming the ultimate opinion of individuality. However, ACE-V is a recognized methodology in other scientific disciplines and the government submits that the fingerprint field is scientifically well grounded in multiple disciplines of science, research and testing covering over 100 years.

Reading the jury instruction on expert witnesses in the context of the science of fingerprints, there is no doubt that the evidence offered by the government's experts will assist the

jury in understanding the evidence. It is equally clear that the defense experts' testimony will only contribute to jury confusion. Cross examination of the government's experts should serve to adequately enlighten the jury. Cross examination along with the jury instruction will more than adequately prevent any prejudice to the defendant.

E. Judicial Notice.

Velasques cannot and does not stand for the proposition that Starrs or someone in his stead can attack every theory of science, including those "so firmly established as ... scientific law ... properly ... subject to judicial notice." *Daubert*, 509 U.S. at 592 n.11. The government has requested the Court to take judicial notice of the premises in Gov. Exh. A. The *Daubert* hearing has supplied the Court with the necessary information to make the proper findings under Rule 201(d) (the "court **shall** take judicial notice)" (emphasis added).

F. Prior Court Decisions On Fingerprints.

No Court decision could be found which has rejected the science of fingerprints and the fact that fingerprints are unique and permanent.²⁷ The reported cases on fingerprints generally fall into: 1) those where fingerprint evidence is admissible, 2) those where defense challenges to fingerprint evidence were summarily rejected by the courts and 3) those where the

²⁷The government is unaware of any **reported** case where the issues were tested under Rule 702 or *Daubert*.

courts have taken judicial notice of the fact that no two individuals have the same fingerprints. Judicial notice was taken by the courts in many cases.²⁸

Respectfully submitted:

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United States Attorney

/s/ Paul A. Sarmousakis
PAUL A. SARMOUSAKIS
Assistant United States Attorney

²⁸*See, e.g.: People v. Jennings* [96 N.E. 1077 n.1 (Ill. 1911)]; *Lamble v. State*, 96 N.J.L. 231, 114 Atl. 346 (1921); *State v. Rogers*, 233 N.C. 390, 64 S.E.2d 572 (1951); *State v. Bolen*, 142 Wash. 653, 254 P. 445 (1927); *Piquett v. United States*, 81 F.2d 75 (7th Cir. 1936), *cert. denied* 298 U.S. 664 (1936) (taken from *Andre A. Moenssens, James E. Starrs, et al., Scientific Evidence in Civil and Criminal Cases*, §8.09, at 519, n.5 (4th ed. 1995), herein referred to as “Moenssens’ Scientific Evidence.” The government understands that Andre A. Moenssens is the primary author of Chapter 8, titled Fingerprint Identification.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the Government's Post-*Daubert* Hearing Memorandum has been served upon the following counsel on the date set forth below:

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DATE: September 13, 1999

Revised as of July 15, 1999

GOVERNMENT'S EXHIBIT LIST

**UNITED STATES v. BYRON C. MITCHELL
CRIMINAL NO. 96-00407**

<u>Admitted</u>	<u>Exhibit No.</u>	<u>Description</u>
7/6	A.	The Government's Premises.
7/13	1.	Letter from Defense Counsel Dated October 30, 1998.
7/13	2.	Letter from Defense Counsel Dated November 6, 1998.
7/7	3-1.	Volar Pads on Fetal Volar Areas. <i>Topographic History of Volar Pads</i> , Cummins (1929).
7/7	3-2.	Volar Pad/Pattern Relationship. <i>The Genesis of Dermatoglyphics</i> , Mulvihill & Smith (1969).
7/7	3-3.	Two Layers of Friction Skin. <i>FingerPrints Palms and Soles</i> , Cummins & Midlo (1943).
7/7	3.4.	Color Diagram of the Organization of the Skin. Gray's Anatomy (37th ed).
7/7	3-5.	Ledges on Bottom of Epidermis. <i>Morphogenesis of Volar Skin In the Human Fetus</i> , Alfred Hale (1952).
7/7	3-6.	Slide of Epidermal Skin. <i>Atlas of Normal Skin</i> , Montana, Klighman, Carlisle (1992).
7/7	3-7.	Drawing of Epidermal Skin. <i>Quantitative-Qualitative Friction Ridge Analysis</i> , Ashbaugh (1996).
7/7	3-8.	Cell Structure of Epidermis. <i>Morphogenesis of Volar Skin in the Human Fetus</i> Hale (1952).
7/7	3-9.	Epidermal Cells Labeled. <i>Atlas of Normal Human Skin</i> , Montagna, Kligman, Carlisle (1992).

- 7/7 3-10. Drawing of Ridge Units. Ashbaugh.
- 7/7 3-11. Dissociated Ridges. Genetic Program Failure. Ashbaugh.
- 7/7 3-12. Palm Print Showing Islands, Bifurcations and Open Fields. Barclay (1986).
- 7/7 3-13. Cyanoacrylate and Inked Prints Showing Ridge Shapes and Ridges Flowing in Concert.
- 7/7 3-14. Print on Telephone Wire Showing Ridge Shape and Relative Pore Position. Barclay (1986).
- 7/7 3-15. The Ridgeology Formula. Ashbaugh
- 7/7 3-16. Cropped Latent Print and Cropped Inked Print from Y. Mark & D. Attias, What is the Minimum Standard of Characteristics for Fingerprint Identification, 22 Fingerprint World, 148 (Oct. 1996).
- 7/7 3-17. Cropped portion of Government Exhibit 3-16.
- 7/7 4-1. Best “Matching” Prints of 196 Pair of Twins. Fingerprint Comparison I: Similarity of Finger Print, Osterberg.
- 7/7 4-2. Fingerprints and Palm Print of the Right Hand of Cloned Monkey “Netti”. Cloned Primates and the Possibility of Identical Fingerprints, Brandon.
- 7/7 4-3. Fingerprints and Palm Print of the Right Hand of Cloned Monkey “Ditto”. Cloned Primates and the Possibility of Identical Fingerprints, Brandon.
- 7/7 4-4. Swgfast Guidelines.
- 7/8 5-1. Level 1 Detail, Photograph of Whorl Pattern Finger (Reverse Color and Position).
- 7/8 5-2. Level 1 Detail, Photograph of Whorl Pattern Perspiration Fingerprint on Glass (Reverse Color).
- 7/8 5-3. Level 1 Detail, Photograph of Whorl Pattern Inked Fingerprint.

7/8	5-4.	Level 2 Detail, Photograph of Finger Showing Ending Ridges, Bifurcations, etc. (Reverse Color and Position).
7/8	5-5.	Level 2 Detail, Photograph of Perspiration Fingerprints on Glass Showing Ending Ridges, Bifurcations, etc. (Reverse Color).
7/8	5-6.	Level 2 Detail, Photograph of Inked Fingerprint Showing Ending Ridges, Bifurcations, etc.
7/8	5-7.	Level 3 Detail, Photograph of Finger Showing Ridge Edge Shapes, Pores, etc. (Reverse color and position).
7/8	5-8.	Level 3 Detail, Photograph of Perspiration Fingerprint on Glass Showing Ridge Edge Shapes, Pores, etc. (Reverse Color).
7/8	5-9.	Level 3 Detail, Photograph of Inked Fingerprint Showing Ridge Shapes, Pores, etc.
7/8	5-10.	Chart --- Quality vs. Quantity Process for Friction Ridge Comparisons.
7/8	5-11.	Photograph of Fingerprint Card of S. Meagher, Recorded in 1972.
7/8	5-12.	Photograph of Fingerprint Card of S. Meagher, Recorded in 1999.
7/8	5-13.	Photograph of Miscellaneous Inked Fingerprint Recordings of the Left Index Finger of S. Meagher, Recorded in 1999.
7/8	5-14.	Photograph of 1982 Perspiration Fingerprint on Glass, Permanency of Level 3 Detail.
7/8	5-15.	Photograph of 1992 Inked Fingerprint on Paper, Corresponding Area of Exhibit 5-14, Permanency of Level 3 Detail.
7/8	5-16.	Photograph of an Identification Using Level 2 and 3 Detail.
7/8	5-17.	Photograph of Charted Enlargement of the Inked Fingerprint in Exhibit 5-16.
7/8	5-18.	Photograph of Charted Enlargement of the Latent Fingerprint in Exhibit 5-16.
7/8	6-1.	Survey Form Entitled <i>Law Enforcement Fingerprint Operations, Attachment A, Survey I</i> . FBI Laboratory.

- 7/8 6-2. Survey Results Titled *Law Enforcement Fingerprint Operations, Attachment A, Survey 1, Summary Report, March 1999.*
- 7/8 6-3. Survey Form Titled *Law Enforcement Fingerprint Operations, Attachment B, AFIS Survey.* FBI Laboratory.
- 7/8 6-4. Survey Results Titled *Law Enforcement Fingerprint Operations, Attachment B, AFIS Survey, Summary Report, March, 1999, Revised 6/25/99.*
- 7/8 6-5. Survey Form Titled *Law Enforcement Fingerprint Operations, Attachment C, Survey 2.* FBI Laboratory.
- 7/8 6-6. Survey Results Titled *Law Enforcement Fingerprint Operations, Attachment C, Survey 2, Summary Report, March, 1999.*
- 7/8 6-7. FBI Criminal Master Fingerprint File Classification Distribution from the Integrated Automated Fingerprint Identification System.
- 7/8 6-8. 50K vs. 50K Fingerprint Comparison Test.
- 7/8 6-9. 10 Print Card of 4T3.
- 7/8 6-10. Chart of contacts with selected states.
- 7/8 6-11. *“Is Fingerprint Identification A Science”* by Andre A. Moenssens, Internet printout.
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