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United States District Court,
N.D. California.
UNITED STATES of America, Plaintiff,
v.
Edgar DIAZ, Rickey Rollins, Don Johnson, Robert Calloway, Dornell Ellis, Emile Fort, Christopher Byes, Paris Ragland, Ronnie Calloway, Allen Calloway, Terrell Jackson and Redacted Defendant No. One, Defendants.
No. CR 05-0167 WHA.

Dec. 6, 2006.

Robert F. Waggener, Law Office of Robert Waggener, San Francisco, CA, Susan Marie Raffanti, Law Office of Susan Raffanti, Oakland, CA, George Claude Boisseau, George C. Boisseau, Santa Rosa, CA, for Defendants.

ORDER DENYING IN PART AND GRANTING IN PART MOTIONS TO EXCLUDE DRUG IDENTIFICATION EXPERT TESTIMONY

WILLIAM ALSUP, District Judge.

INTRODUCTION

***1** In this criminal street-gang prosecution, defendants invoke *Daubert* to exclude the government's narcotics-identification expert witnesses (Docket Nos. 637 & 634). A six-day *Daubert* evidentiary hearing was conducted on the science of narcotics identification.

Defendants' arguments fall into two categories. *First*, they claim that the science was flawed under *Daubert* and thus inadmissible under Federal Rule of Evidence 702. *Second*, they allege defects in the foundational laboratory reports.

This order addresses the first of those concerns-the science at issue and its admissibility under Rule 702. The essence of this long order is this: The laws of chemistry are immutable. It is true that nowadays instrumentation is favored over chemical tests among scientists in the field and that the San Francisco Police Department Crime Lab is still relying on the state of the art as of the 1970s. But the science was good then. It is still good, the scientific principles being fixed. Despite the

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many hundreds of thousands of drug convictions in the criminal justice system in America, there has not been a single documented false-positive identification of marijuana or cocaine when the methods used by the SFPD Crime Lab are applied by trained, competent analysts. On the other hand, the SFPD Crime Lab's practice of testing only one of numerous bags of suspected narcotics is sufficient only as to the bag tested. At trial, the analysts will not be allowed to render scientific opinions as to the chemical composition of untested bags.

A separate order will address the second set of issues related to the destruction of narcotics evidence, maintenance of records, and purported lack of documentation by the SFPD Crime Lab.

STATEMENT

Four experts testified at the hearing. SFPD Crime Lab manager James Mudge testified as an expert for the government. Mudge had been at that position since January 2006. He had about ten years of experience in the field of narcotics identification. James Norris testified as an expert for the defense. Norris had been in the criminalistics field since 1970. From 1987 to 1995, he was Senior Criminalist at the SFPD Crime Lab, and from 1995 to 2004 he was the Director of the SFPD Forensic Services Division. Dr. Frederic William Whitehurst, an attorney and former FBI agent, also testified for the defense. His testimony covered the subject of color tests and sufficiency of laboratory protocols. SFPD criminalist Deborah Madden testified as a rebuttal witness for the government. She had been employed by the SFPD Crime Lab for 26 years.

Two types of controlled substances are at issue in this case: cocaine and marijuana. Cocaine was and remains the narcotic most frequently analyzed by the SFPD Crime Lab. Marijuana was the second most common. During the relevant period (June 1998 through May 2005), the SFPD Crime Lab initially operated under the April 1995 version of the SFPD Crime Lab Standard Operating Procedures ("SOP") (PX 9).[FN1] That version was replaced by the September 2004 version (DX 7 Tab 14). Although there were two versions of the SOP, the cocaine and marijuana testing procedures did not change during the relevant period. A description of those procedures follows.

FN1. Throughout this order, "PX" refers to the government's exhibits and "DX" refers to defense exhibits.

1. SFPD CRIME LAB PROCEDURE FOR IDENTIFICATION OF COCAINE.

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***2** At the time of the tests involved in this case, the SFPD Crime Lab employed the cobalt thiocyanate color test, the platinic (or platinum) chloride microcrystalline test, and the gold chloride microcrystalline test.

For the cobalt thiocyanate color test, a small sample of the suspected cocaine was scraped off and put in a spot well with dilute acid. A solution of cobalt thiocyanate was applied, followed by acidified stannous chloride. If the solution turned blue, that was considered a positive result for cocaine. The cobalt thiocyanate test was only considered a "screening" or "presumptive" test. Other substances were known to produce blue when mixed with cobalt thiocyanate.

The platinic chloride and gold chloride tests were and remain two tests used by the SFPD Crime Lab to confirm the presence of cocaine. These are referred to in the art as "microcrystalline" tests, for reasons that will become evident. In the platinic chloride test, a sample of suspected cocaine was mixed with dilute acid on a microscope slide. Platinic chloride was applied to the sample. The technician then looked at the mixture under a high-powered light microscope to see if the characteristic crystals formed. The characteristic crystal formation associated with a positive platinic chloride test was generally described by forensic scientists as "eagle-wings," "comb-like" structures, or "feathers." These are called "microcrystals." No other substance was known to create this result when platinic chloride was applied.

The procedure for the gold chloride test was similar except that gold chloride was applied to the sample rather than platinic chloride. When gold chloride was applied to cocaine, X-shaped, needle-like crystals formed. No other substance was known to produce such microcrystals when gold chloride was applied.

Positive results in all three tests-the cobalt thiocyanate test, gold chloride microcrystalline test, and platinic chloride microcrystalline test-were considered sufficient to confirm that a substance was cocaine. A failure as to any of the three ruled out cocaine. These tests were used at the time in question for confirming cocaine.

2. SFPD CRIME LAB PROCEDURE FOR IDENTIFICATION OF MARIJUANA.

For the suspected marijuana evidence in this case, the SFPD Crime Lab used three tests: macroscopic examination, microscopic examination, and the Duquenois-Levine color test.

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The macroscopic examination was simply a general inspection of the sample without any equipment. During macroscopic examination, a technician would simply look at the sample with the naked eye and smell the sample to determine whether it appeared to be similar to marijuana.

The microscopic examination required use of a stereomicroscope. The analyst would place a small sample on a microscope slide and look for the presence of botanical features unique to marijuana. *First,* the analyst would look for "cystolithic hairs." The forensic community described these hairs as looking like "bear claws." Cystolithic hairs typically had calcium carbonate at their base, which appeared as a distinct white feature. *Second,* a technician would look for "clothing hairs." Clothing hairs were much finer than the cystolithic hairs. Together, cystolithic hairs and clothing hairs were botanical features unique to marijuana. Marijuana samples varied in color and plant-matter shape, but all genuine marijuana had cystolithic and clothing hairs.

***3** The Duquenois-Levine color test was a microchemical test used for the identification of marijuana. The Duquenois-Levine test confirmed the presence of tetrahydrocannabinol ("THC"), the psychoactive chemical in marijuana. In the Duquenois-Levine test, a small sample of suspected marijuana was placed in a spot well or test tube. Hydrochloric acid and the "Duquenois reagent" were added to the plant matter. If a purple or violet color was achieved, the next step was to apply a drop of chloroform. Because the chloroform was a heavier liquid than the purple aqueous result, a "chloroform layer" would develop at the bottom. If purple was then extracted to the chloroform layer, that was considered a positive test for THC.[FN2]

FN2. Depending on a technician's preference, the technician could perform the Duquenois-Levine test as described above or a "modified" Duquenois-Levine test. In the modification, petroleum ether was applied to the plant matter to extract the potential cannabinoids. The Duquenois-Levine test described above was then applied to the extract, rather than the plant matter directly. Both methods were and are accepted practices, and both produced the same results. One treatise stated: "The 'rapid Duquenois' test (it would have been better termed 'rapid Duquenois-Levine test') omits the petroleum ether extraction stage, that is, the reagent is added directly to the suspect material in a test tube and the chloroform is added after the color transitions have been noted" (PX 30 at 818).

A positive Duquenois-Levine color test, in

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combination with positive microscopic and macroscopic examinations, was considered essential to identify marijuana. According to Mudge, these tests were all employed at the time in question.[FN3]

> FN3. Mudge testified that other tests were available to test for the presence of marijuana. These tests were thin-layer chromatography (another chemical test) and the instrument analysis described below. Typically, those alternative tests were only employed if the botanical features were not visible, which could happen if the sample was only burnt ash or residue. In those cases, the Duquenois-Levine test was used as a screening test, and instrument analysis or thin-layer chromatography were used to identify the unique chemicals in marijuana.

3. INSTRUMENT ANALYSIS.

The foregoing are the tests at issue. But modern science has marched on. Modern techniques use "instrumentation." The SFPD Crime Lab rarely uses these new methods for the drugs at issue, cost and speed being the reasons. This order explains the modern techniques so that the issues as framed by the defense can be understood.

The two main types of instrumentation are Gas Chromatography Mass Spectrometry ("GCMS"), which can be used to identify cocaine and marijuana, and Fourier Transform Infrared Spectroscopy ("FTIR"), which can be used to identify cocaine. Many forensic laboratories use instrumentation to identify cocaine and marijuana. Instrumentation is often preferred by crime laboratories because the equipment produces printouts that enable other technicians to look at the relevant data and come to independent conclusions about the sample. The SFPD Crime Lab possesses the expensive equipment required to perform instrument analyses, but does not require its technicians to use GCMS or FTIR to identify marijuana and cocaine. As stated, none of the samples in this case was subjected to instrument analysis.

The SFPD analysts typically use GCMS to identify suspected cocaine only if there are adulterants interfering with formation of the crystals in a microcrystalline test. The GCMS equipment can identify cocaine even if it is mixed with adulterants. Additionally, SFPD analysts can use GCMS to identify marijuana. If, for example, the sample has been ground up and it is difficult to identify the hairs that are unique to marijuana, the suspected sample is subjected to the Duquenois-Levine color test. If the Duquenois-Levine test is positive, the analyst will then run the sample through the GCMS

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equipment to render a conclusive opinion.

ANALYSIS

1. *DAUBERT* AND RULE 702.

"Rule 702 assigns to the district court the role of gatekeeper and charges the court with assuring that expert testimony rests on a reliable foundation and is relevant to the task at hand." *United States v. Hermanek*, 289 F.3d 1076, 1093 (9th Cir.2002) (internal quotations omitted).Rule 702 provides:

***4** 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, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 593-94 (1993), the Supreme Court created a flexible, factor-based approach to analyzing the reliability of expert testimony. These factors can include: (1) whether a method can or has been tested; (2) the known or potential rate of error; (3) whether the methods have been subjected to peer review; (4) whether there are standards controlling the technique's operation; and (5) the general acceptance of the method within the relevant community. *See Daubert*, 509 U.S. at 593-94;*see also United States v. Prime*, 431 F.3d 1147, 1152 (9th Cir.2005). The Supreme Court has further explained that a district court has "considerable leeway in deciding in a particular case how to go about determining whether particular expert testimony is reliable." *Kumho Tire v. Carmichael*, 526 U.S. 137, 152 (1999). Although the circumstances of the particular case will determine the "applicability of the factors mentioned in *Daubert*," this order finds analysis of the *Daubert* factors useful here. *Id.* at 150.

2. ANALYSIS OF *DAUBERT* FACTORS FOR IDENTIFICATION OF COCAINE.

A. Whether the Theory or Technique Can Be or Has Been Tested.

According to the SOPs in effect during the period in question, cocaine could be conclusively identified after positive results from all of the cobalt thiocyanate, gold chloride,

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and platinic chloride tests. Mudge testified that the cobalt thiocyanate test was used as a presumptive test to narrow the possibilities that a suspected sample could be. The cobalt thiocyanate test alone was insufficient to conclusively prove that a substance was cocaine. Finding the proper crystal shapes after applying the gold chloride and platinic chloride microcrystalline tests, however, allowed an analyst to conclusively identify a particular sample as cocaine.

The techniques used by the SFPD Crime Lab continue to be used and "tested" by SFPD analysts daily. Moreover, as discussed in greater detail below, the government presented literature demonstrating that the identification of cocaine using the cobalt thiocyanate color test along with the microcrystalline tests has been practiced for decades. Since at least 1933, scientists have used the gold chloride, platinic chloride, and cobalt thiocyanate tests to conclusively identify cocaine.

B. Whether the Technique Has Been Subject To Peer Review and Publication.

***5** The government's peer-reviewed literature supports the SFPD Crime Lab's procedure for identifying cocaine. One article published in the July and August 1933 issues of the *American Journal of Pharmacology* described tests for identifying cocaine and novocaine. The article concluded that "[f]or pure cocaine, platinum chloride ... [was one of] the most convenient reagents" (PX 17 at 380). The article also discussed using the gold chloride microcrystalline test as a confirmatory test for cocaine. Mudge explained that this was significant because novocaine, like cocaine, could produce blue when subjected to the cobalt thiocyanate test. Microcrystalline tests, however, could distinguish between cocaine and novocaine (*ibid.*).

The government also submitted a treatise that Mudge described as the "bible" of narcotics analysis, *Isolation and Identification of Drugs*, by E.G.C. Clarke. This treatise explained that a microcrystalline test's "real value [was] as a means of final identification to confirm a provisional diagnosis made from chromatographic or spectrophotometric evidence, its extreme simplicity, the rapidity with which it [could] be performed, and its high degree of specificity, [rendered] it ideal for this purpose."The microcrystalline test, however, was "unsuitable as a primary method of identification of an unknown compound."This comports with the SFPD's procedure, however, which used the cobalt thiocyanate color test as the primary or preliminary method of screening an "unknown compound." Microcrystalline tests were used for the final identification of suspected narcotics (PX 19 at 135).

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In another study, "The Cocaine Diastereoisomers," published in the January 1981 issue of the *Journal of Forensic Sciences,* researchers analyzed four isomers of cocaine: cocaine, pseudococaine, allococaine, and pseudoallococaine. Despite the chemical similarities of the four compounds, the microcrystalline tests were able to distinguish cocaine from the others. For example, the researchers found that after applying microcrystalline tests to the four compounds, "[c]ocaine [was] the only one of the four diastereoisomers to give a crystalline precipitate with the gold reagent."The article concluded that "[t]he advantages of the microcrystalline technique are speed, selectivity, and sensitivity" (PX 20 at 15, 26).

Finally, in "Further Studies on Spot Tests and Microcrystal Tests for Identification of Cocaine," published in the May 2003 issue of the *Journal of Forensic Sciences,* researchers attempted to determine the specificity of color tests and microcrystalline tests on a variety of chemicals, controlled substances, and non-controlled substances. The article concluded that even where nine other compounds produced a presumptive test result similar to cocaine, the microcrystalline test allowed for differentiation between all the other compounds and cocaine. The article noted: "The addition of microcrystal tests ... allowed the differentiation of cocaine from the nine other compounds. Using gold chloride, three of the compounds did not produce distinct crystals and the remaining six chemicals produced distinctly different crystalline structures. None of the compounds except cocaine produced distinct crystals with platinic chloride" (PX 23 at 4).

***6** This order finds that the SFPD Crime Lab's method of confirming the presence of cocaine during the relevant period has been subjected to peer review within the forensic science community. For the identification of cocaine, the forensic community accepts the use of the cobalt thiocyanate test as a screening test, and the gold chloride and platinic chloride tests as confirmatory tests. The significant amount of peer-reviewed literature establishes that microcrystalline tests are sensitive, efficient, and simple tests for the confirmation of cocaine.[FN4]

FN4. The government submitted further excerpts from peer-reviewed literature that described the results an analyst should expect when performing a particular test on cocaine. All of the literature corresponds with Madden and Mudge's description of results expected when the tests were performed properly. For example, in *Methods of Analysis for Alkaloids, Opiates, Marihuana, Barbiturates and Miscellaneous Drugs,* published by the Internal Revenue Service in 1960, the crystalline precipitates of the platinic chloride test

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> for cocaine were described as "[f]eathery, pale yellow crystals." The description of the crystals formed by the gold chloride test for cocaine was "long rods with many short arms running out at nearly right angles from the main axis."Both microcrystalline tests were described as sensitive tests for cocaine. Moreover, the cobalt thiocyanate test was also described in the article as producing a blue color when applied to cocaine (PX 18 at 39). Other literature reiterated that the crystal structure of a successful gold chloride test was a crystal that looked like "serrated needles," and that the crystal structure of a successful platinic chloride test was "delicate, feathery crystals, later becoming heavier in structure" (PX 21 at 267; PX 22 at 706).

C. Known or Potential Rate of Error.

This order also holds that the potential rate of error when using cobalt thiocyanate and microcrystalline tests for the confirmation of cocaine is acceptable under *Daubert.*It is not disputed that when cocaine is subjected to a gold chloride test, it produces crystals that look needle-like when viewed under a microscope. It is also true that under the platinic chloride test, cocaine produces feathery crystals. At the hearing, no expert could identify other substances that, when subjected to the gold chloride or platinic chloride tests, produced similar results. This order finds that when performed by a competent analyst with the proper materials, the chemical reactions of the gold chloride and platinic chloride tests will produce the same crystals every time, and that no other known substance produces exactly the same results. Furthermore, the experts could not identify a single instance of a false-positive identification of cocaine when the correct tests were used by a qualified analyst. Thus, as to the chemistry itself, this order finds that the error rate of the procedures used by the SFPD Crime Lab to identify cocaine is close to zero.

The inquiry, however, does not end with the chemistry. Determination of a potential error rate requires consideration of the skill of the analyst and the potential for other variables to affect the outcome of the test. Put differently, if only an Einstein could be expected to perform the test properly, then it would be unreliable in the hands of ordinary mortals. Mudge acknowledged that there were no known error rates for the testing of cocaine with microcrystalline tests. There was, however, some evidence presented that strongly suggests that the error rate for the testing of cocaine with microcrystalline tests is exceedingly low.

First, Norris testified that while he was Senior Criminalist at the SFPD Crime Lab, he ran

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several "blind" proficiency tests within the SFPD Crime Lab. In those blind tests, the subject of the test did not know that he or she was being tested. When Norris implemented these tests, he would generate a narcotics envelope that was identical to an envelope that would be delivered to the SFPD Crime Lab in a real case. He would, for example, create a fake suspect name and case number. Norris testified that he ran about ten of these tests through the laboratory while it was under his supervision. In some of the tests, Norris submitted marijuana and cocaine as the "unknown" substance. Norris testified that there was not a single erroneous result during any of the blind proficiency tests. Although there was not enough data generated from the tests to calculate an error rate, Norris thought that the results were "heartening."

***7** *Second*, the SFPD Crime Lab had (and still has) a policy that when a particular sample was going to be used as a basis for a criminal prosecution, the original analyst who tested the sample should have been available for retesting, if necessary. If the original analyst was not available-which typically happened if he or she was sick or on vacation-the sample was retested by a different analyst. Norris testified that while the SFPD Crime Lab was under his supervision, there were occasionally "rare" instances when the retest was different from the original test. He could not, however, identify specifically when that had occurred or what types of drugs had been the subject of those retests. The evidence presented by Mudge was far more specific and persuasive. Mudge offered documentation of ninety cocaine retests and twenty marijuana retests run in 2005 and 2006. In each case, the conclusion of the original analyst was confirmed. Mudge could not identify any instances relating to marijuana or cocaine where the original conclusion was not confirmed by the second analyst (PX 31).

Third, there was evidence presented regarding a Collaborative Testing Services cocaine salt sample proficiency test.[FN5] CTS is an independent body that provides proficiency tests for forensic laboratories throughout the country. In the 2001 cocaine-salt test, 491 laboratories participated. There was not a single erroneous result reported by CTS-all 491 laboratories correctly identified the unknown substance as cocaine. Of those laboratories, 124 used microcrystalline tests followed by instrumentation. Seven, including the SFPD Crime Lab, used microcrystalline tests and color tests alone, without instrumentation. Mudge produced documentation that two SFPD Crime Lab analysts participated in that test, and both identified the substance as cocaine.[FN6]

FN5. The precise chemical difference between cocaine salt and cocaine base was not clear from the testimony. The samples at issue in this case are all allegedly cocaine base.

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FN6. According to Mudge, CTS does not calculate error rates because it allows each lab to follow its own protocol when participating in the proficiency test. Because procedures vary between laboratories, calculation of error rates based on CTS proficiency tests would not account for all the differences in various laboratories' procedures.

Fourth, before 2001, the SFPD Crime Lab had a policy of "retesting" ten percent of all confirmed cocaine samples. Ten percent of the samples that had been confirmed as cocaine with microcrystalline tests were run through the GCMS instrument. Madden, who was employed by the SFPD Crime Lab at the time those retests were performed, testified that she was not aware of a single instance when the instrument analysis did not corroborate the prior identification of the substance as cocaine.

The evidence establishes that, when performed by a competent analyst, the procedure followed by the SFPD Crime Lab had a low error rate. The potential for error satisfies the standard set forth in *Daubert.See Prime,* 431 F.3d at 1153 (noting that the method "need not be flawless in order to be admissible"). This order recognizes that errors could arise when an analyst was not competent to recognize the crystals, or performed the tests improperly. This alone, however, was not a basis for exclusion under *Daubert.*The Ninth Circuit has stated that "[a]s long as the process is generally reliable, any potential error can be brought to the attention of the jury through cross-examination and the testimony of other experts."

D. The Existence and Maintenance of Standards Controlling the Technique's Operation.

***8** This order finds that the next factor under *Daubert* is also satisfied-there were standards controlling the SFPD Crime Lab's method for identifying cocaine. In 2006, the Scientific Working Group for the Analysis of Seized Drugs ("SWGDRUG"), a deliberative body of scientists, published recommendations for the analysis of narcotics. SWGDRUG's recommendations stated that most narcotics, including cocaine, could be identified by using "three different validated methods." Microcrystalline tests were considered "Category B" validated techniques, and color tests were considered "Category C" validated techniques. According to the recommendations, it was acceptable for an analyst to use two "uncorrelated" Category B techniques and one Category C technique. The SWGDRUG recommendation defined "uncorrelated techniques" as "those that yield uncorrelated

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measurements ... often achieved by using techniques that have a different fundamental mechanism for characterization."Mudge explained that the gold chloride and platinic chloride microcrystalline tests were both *uncorrelated* techniques because neither test predicted the other (PX 15 at 14-15, 41). Thus, the tests used by the SFPD Crime Lab to identify cocaine-two uncorrelated Category-B microcrystalline tests and one Category-C cobalt thiocyanate color test-satisfied the SWGDRUG minimum requirements for cocaine identification.

Additionally, the government submitted a "Standard Guide for Microcrystal Testing in the Forensic Analysis of Cocaine," published by *ASTM International,* a body of researchers that produces standard guides for testing. The ASTM guide provided detailed instructions for the platinic chloride and gold chloride tests for identifying cocaine. It recommended using a light microscope "capable of varying magnifications including 100x."The ASTM standard guide also recommended that analysts use the following reagents and materials for microcrystalline tests: ten-percent solution of acetic acid, authenticated cocaine standard, five-percent solution of gold chloride in reagent grade water, ten-percent solution of hydrochloric acid, and five-percent solution of platinum chloride in reagent grade water. Finally, the standard guide stated: "The reagents utilized for these microcrystal tests are to be tested for reliability using an authenticated cocaine standard. Only when it is determined that the reagents are producing the expected response, may the reagents be used in this procedure" (PX 24 at 1-2).

The 1995 version of the SFPD Crime Lab SOP stated that "[c]obalt thiocyanate ... produces a blue precipitate with cocaine salt (as well as other nitrogenous base salts). Additional [sic] of hydrochloric acid will cause this precipitate to form in the presence of cocaine base (as well as other nitrogenous bases). If cocaine is present, the blue precipitate should remain upon the addition of the acidified stannous chloride."Additionally, the SOP stated that "[g]old chloride ... and platinum chloride ... microcrystalline reagents are used on the material or an ether extract of the material dissolved in 10% HCl" (PX 9 at 22). The SOP also described how to create the reagents. Gold chloride reagent was created by adding "1 g. gold chloride to 20 ml water."To create a platinum chloride reagent, the SOP required the analyst to "[d]issolve 1g. platinic chloride (Chloroplatinic acid) in 20 ml water. i.e. 5% solution."A cobalt thiocyanate solution was created by adding "2 grams of cobalt thiocyanate to 100 ml of water ."Acidified stannous chloride was created by adding "5 g. of stannous chloride to 10 ml of hydrochloric acid, then dilut[ing] to 100 ml with water"(*ibid.* at App. 3).[FN7]

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FN7. The 2004 SOP did not differ materially from the 1995 version in describing the microcrystalline tests used to identify cocaine or the reagent recipes. For example, while the 1995 version instructed the technician to create cobalt thiocyanate reagent by adding "2 grams of cobalt thiocyanate to 100 ml of water," the 1995 version simply said "2% w/v cobalt thiocyanate in water."It is not a stretch to conclude that two grams of cobalt thiocyanate in 100 milliliters of water is equivalent to a two-percent cobalt thiocyanate solution. The 2004 version also instructed the analyst to examine the crystals in a microcrystalline test "under polarized light at 100x" (DX 7 Tab 14 at 17).

***9** Defendants complain that the SFPD Crime Lab SOPs did not *precisely* align with the protocols recommended by the peer-reviewed literature. For example, during the period in question, the SFPD Crime Lab did not require its analysts to compare the crystals generated from suspected samples of cocaine with "control" samples and crystals. Instead, the SOP allowed the analysts to rely on photographs for reference to a standard. In addition, for both cocaine and marijuana identification, the chemical reagents were not tested against known samples before *each* use, which is recommended by the literature. Instead, *new* reagents were tested prior to use and *all* reagents were tested each month (PX 15; PX 24). Moreover, Madden testified that the reagents were extremely stable chemicals, and there was no risk of the reagents becoming stale. This order finds that the differences highlighted by the defense are not significant.

The defense seizes on a sentence from the article discussed above, "Further Studies on Spot Tests and Microcrystal Tests for Identification of Cocaine."That sentence reads: "Reaching an accurate conclusion using microcrystal tests will depend on the level of experience of the analyst, the proper use of standards and controls, the presence of adulterant and/or diluent in the seized samples, the reaction pH, the temperature and humidity, and the concentration of the reagent and of the chemical" (PX 23 at 4). The defense contends that the SFPD procedures were deficient because the SFPD Crime Lab SOP did not specify procedures in instances where adulterants were present. Nor did the SOP control for the temperature or humidity.

On the issue of adulterants, Madden and Mudge testified that although the procedure was not written in the SOP, the analysts did follow procedures when they believed adulterants could be present. Typically, adulterants added with cocaine could inhibit or warp the development of the expected crystals. If an analyst saw that the crystals had not formed properly, he or she would have two options. *First,* with the

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assistance of a microscope, a skilled analyst could separate the suspected cocaine from the adulterant, and perform the microcrystalline tests on the suspected cocaine. The proper crystals would usually be observed once the cocaine was separated from the adulterant. *Second,* the analyst could simply take the sample and perform an instrument analysis on it. The instruments were able to distinguish between the adulterant and cocaine, and the analyst could render an opinion based on the instrument's printout.

Madden also testified that in her thirty years of experience, she had not known of any situation where the temperature or humidity of a normal work environment affected the formation of the crystals. She testified that the SFPD Crime Lab was maintained at a constant temperature and humidity, and did not reach any extremes. According to Madden, in her experience, the crystals created by positive gold chloride and platinic chloride microcrystal tests always looked the same.[FN8]The defense has overemphasized the importance of one sentence from the literature. Although temperature and humidity are likely to affect crystals in extreme circumstances, this order finds that it is reasonable to conclude that at a normal room climate, the crystals formed are predictably consistent.

FN8. At the hearing, the defense showed Madden a photograph of a gold chloride-cocaine crystal included in one of the peer-reviewed articles (PX 23 Fig. 1). The picture looked different from the X-shaped crystals both Madden and Mudge had described. This order notes that the photograph from the exhibit was magnified at 200x, when the SOP required analysts to view crystals at 100x magnification. The other conditions under which the photograph in the article were taken were unknown. This order finds that Madden credibly testified that the X-shaped crystals she expected to see in a successful gold chloride test should look the same every time.

***10** In sum, the procedures used by the SFPD Crime Lab for the identification of cocaine are subject to many standards promulgated both by the SFPD Crime Lab itself and the forensic community in general. This order finds that to the extent the SFPD procedures fell short of the procedures recommended by the literature, the deficiencies were not sufficient to undermine their reliability for *Daubert* purposes. This criticism can be the subject of cross-examination before the jury.

E. General Acceptance.

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The validity of microcrystalline tests to confirm the presence of cocaine is not reasonably in question. It is clear from the peer-reviewed literature and other evidence that these tests are highly sensitive and have been accepted for decades. Madden testified that the microcrystalline testing procedures used by the SFPD Crime Lab were the same tests she was taught when she was a criminalistics student at the University of California at Berkeley thirty years earlier. Additionally, Mudge testified that other forensic laboratories in California continue to employ microcrystalline tests to identify cocaine, including laboratories in Alameda, Oakland, Santa Clara, and San Bernardino. Even defense-expert Norris testified that during the years he was a forensic analyst, he never questioned the validity of the microcrystalline tests. This order finds that the cobalt thiocyanate, gold chloride, and platinic chloride tests are generally-accepted procedures in the forensic science community that may be used to confirm the presence of cocaine.

3. ANALYSIS OF *DAUBERT* FACTORS FOR IDENTIFICATION OF MARIJUANA.

Turning now to the marijuana tests, the evidence was different but the ultimate result was the same under *Daubert*-the science was good enough to go before the jury.

A. Whether the Theory or Technique Can Be or Has Been Tested.

The SFPD Crime Lab used a combination of microscopic examination and the Duquenois-Levine color test to conclusively identify the unknown substances in this case as marijuana. In the literature discussion below, this order demonstrates that these methods employed by the SFPD Crime Lab can be and have been tested for decades. One 1960 publication, for example, discussed using the modified Duquenois test and a microscopic test to identify marijuana (PX 25). The theory that marijuana can be confirmed using microscopic examination and the Duquenois-Levine color test has been tested, and can be retested.

B. Whether the Technique Has Been Subject To Peer Review and Publication.

The government proffered significant evidence that the SFPD Crime Lab's method of identifying marijuana has been subjected to peer review. One study by George Nakamura entitled "Forensic Aspects of Cystolith Hairs of Cannabis and Other Plants," appeared in the January 1969 issue of the *Journal of the Association of Official Analytical Chemists.*In that study, researcher George Nakamura identified 82 species of plants that possessed cystolithic hairs similar to those found on

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marijuana leaves. Of the 82 species, however, Nakamura found that only marijuana yielded a positive result in the Duquenois-Levine test. The article concluded: "Only after a studied examination, under high magnification, can the cystolith hairs of marihuana be tentatively identified. Microscopic identification of marihuana, therefore, depends not only on the presence of cystolith hairs but on its association with the longer clothing, or nonglandular hairs, on the other side of the leaf, and if present, the fruits and their hulls, the glandular hairs, and the flowering tops as set forth in the U.S. Treasury Department manual. The [Duquenois-Levine] test should be used in final confirmation" (PX 26 at 16).[FN9]

***11** Another article also confirmed that observing the characteristic botanical features of marijuana coupled with a positive Duquenois-Levine color test provided confirmation of marijuana. In *The Specificity of the Duquenois Color Test for Marihuana and Hashish,* published in a 1972 issue of the Journal of Forensic Sciences, the authors stated that "it is believed that if the criteria for a positive Duquenois test are rigorously adhered to, and botanical evidence is also available, then the Duquenois color test is a reliable screen for cannabinoids" (PX 28 at 699). Mudge testified that the practice recommended by these authors was consistent with the procedures used by the SFPD Crime Lab. [FN10]

FN9. A similar study by Nakamura and co-researcher J.I. Thornton was published in the 1972 issue of the *Journal of Forensic Sciences.*The abstract of that study stated: "[C]ystolith hairs cannot be used as a sole criterion for marijuana identification. The Duquenois-Levine test is found to be useful in the confirmation of marijuana, since none of the 82 species possessing hairs similar to those found on marijuana yield a positive test. Where marijuana cannot be morphologically delineated, thin-layer chromatographic methods are indicated" (PX 27 at 461).

FN10. The article went on to state: "However, if botanical evidence is not available, the ubiquitousness of phenols in nature and their diversity of structure makes it mandatory to supplement the colorimetric test with chromatographic evidence. This conclusion is substantiated by the recent report that certain commercial brands of coffee give a positive Duquenois-Levine color test" (PX 28 at 699). In none of the samples in this case was it alleged that the botanical features were not apparent or available.

In "A Study of False Positives in the Chemical

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Identification of Marihuana," published in the 1978 *Journal of Forensic Sciences*, researchers attempted to generate false positive results using the Duquenois-Levine test. It was found that "only fresh coffee might be misleading when the modified Duquenois-Levine test is used."More importantly, the article concluded that "if the glandular, clothing, and unicellular cystolithic hairs are present then either a modified Duquenois-Levine test or [thin-layer chromatography when] sprayed with Fast Blue B salt are positive evidence that *Cannabis* is present in the sample" (PX 29 at 309). Accordingly, while coffee and marijuana might produce similar results under the DuquenoisLevine test, the presence of cystolithic and clothing hairs is sufficient to distinguish coffee from marijuana. Put differently, a qualified analyst can distinguish coffee from marijuana without even needing the chemical test.

Finally, in "The Value of the Duquenois Test for Cannabis-A Survey," published in the *Journal of Forensic Sciences* in 1979, the researcher compiled published data regarding the Duquenois tests. The article concluded: "The D-L test for cannabis relies on the presence of cannabinoids, which produce chloroform-soluble purple colors on reaction with the reagent. Coupled with a simple inspection for gross appearance and odor and microscopic examination, it continues to be used for the identification of samples of hashish and marihuana."The article also noted that "[s]ince the D-L test is very simple and rapid, it should be applied to suspected cannabis samples; unless special circumstances dictate otherwise, negative results indicate that testing for cannabis need proceed no further" (PX 30 at 839).[FN11]

> FN11. The article also recommended using thin-layer chromatography on samples to "further ensure[ ] the correctness of the identification."

Based on this overwhelming evidence, it is clear that the theory that marijuana can be identified by observation of botanical features and a positive Duquenois-Levine color test has been peer reviewed in published articles.

C. Known or Potential Rate of Error.

The error rate for marijuana identification is subject to many of the problems that prevent the computation of an error rate for cocaine identification. Nevertheless, this order finds that the potential for error in the SFPD's method for identifying marijuana is acceptable under *Daubert.*

***12** As with cocaine, there is no evidence in the record that disproves the theory that marijuana

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can be conclusively identified by macroscopic examination, microscopic examination of its botanical characteristics, and a positive Duquenois-Levine color test. Although the peer-reviewed literature encourages the use of thin-layer chromatography and GCMS, as long as an analyst observes the botanical features and generates a positive Duquenois-Levine color test, thin-layer chromatography and GCMS are merely supplemental, rather than necessary. Accordingly, it has been well-settled for decades that if performed by a competent analyst, macroscopic examination, microscopic examination, and the Duquenois-Levine color test together are sufficient to confirm material as marijuana.

As with the analysis of cocaine, the potential for error lies with the analyst, rather than the tests themselves. There is no published error rate for the identification of marijuana. As with cocaine, however, the record suggests that there is a low potential for error in the hands of a qualified analyst. For example, Norris' blind proficiency tests in the SFPD Crime Lab-some of which dealt with marijuana-never generated an erroneous result. Additionally, there was evidence presented regarding the twenty retests of marijuana for court purposes done between 2005 and 2006. In none of the retests were the results different from the conclusions of the original analysts.

When performing the marijuana-identification analyses, the analyst must have possessed the adequate skill to identify the botanical features and the correct shade of purple in the Duquenois-Levine color test. Although there was some potential for error given the possibility that various analysts may have had different skill levels, the record here demonstrates that there is a sufficient showing of low error rates so that this factor does not weigh against the admissibility of marijuana-identification testimony under *Daubert.*Because the process is generally reliable, questions about the potential for error can be "brought to the attention of the jury through cross-examination and the testimony of other experts." *Prime*, 431 F.3d at 1153.

D. The Existence and Maintenance of Standards Controlling the Technique's Operation.

As with cocaine, there were internal and external standards controlling the SFPD analysts' procedures for marijuana identification. The 1960 "Methods of Analysis" document published by the Internal Revenue Service described the microscopic test and modified Duquenois test. The guide explained that an analyst should observe that "leaves, small twigs, seed hulls and flowering tops exhibit a characteristic warty appearance due to the presence of nonglandular hairs which contain at

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their base a spheroidal cystolith of calcium carbonate.... Many of the cystolith hairs appear in the shape of bear claws" (PX 25 at 49).

In describing the Duquenois-Levine test, an article published in the *Journal of Forensic Sciences* explained: "The Duquenois reagent consists of vanillin (0.4 g) and acetaldehyde (0.06 g) dissolved in 95% alcohol (20 ml). The procedure was to pour 2 ml of reagent onto the petroleum ether extract (preferably still warm) in an evaporating dish, stir to complete solution, and add 2 ml concentrated hydrochloric acid. Duquenois originally stated that the reaction is specific if one considers the succession of tints (for cannabis: sea-green, slate, followed by indigo within 10 min; within 1/2 h the color turns to violet and within an hour to intense violet).... Butler reported the modified Duquenois test in 1962. Known as the Duquenois Levine test, it was introduced in 1941. The important change is to incorporate extraction of the color into chloroform (2ml), which is added 10 min after the addition of the hydrochloric acid" (PX 30 at 818).

***13** The 1995 version of the SFPD Crime Lab SOP listed "macroscopic appearance" as a screening test for marijuana identification, with microscopic analysis and the Duquenois-Levine color test identified as "preferred confirmatory tests." [FN12]For "concentrated Cannabis," the Duquenois-Levine test was a screening test and microscopic analysis was identified as a "preferred confirmatory test." The SOP explained: "Microscopic analysis is used to identify the presence of cystolithic hairs which are highly characteristic of the marijuana plant. A small portion of the material is placed on a slide and covered with a cover slip. Chloroform is added to the material and the preparation examined under 40-100x for the presence of cystolithic hairs."The SOP also explained that "Duquenois-Levine is a rapid and sensitive screening test that will produce an extractable purple color in the presence of THC" (PX 9 at 30-31). The SOP also standardized the recipe for the Duquenois reagent: "To 0.5 ml acetaldehyde (30 drops) in 50 ml ethanol, add 1 g. vanillin. For 10 ml: 0.1 ml acetaldehyde (6 drops), 0.2 g. Vanillin in 10 ml ETOH"(*id.* at App. 5).[FN13]

FN12. Thin-layer chromatography and GCMS were identified as "supplemental tests."

FN13. The 2005 version of the SOP was even more detailed. That version described the cystolithic hair: "The shape of the protruding cystolithic hair is significant: it is curved and tapered, reminiscent of a bear claw. Secondly, the presence of a calcium carbonate formation at the base of the hair is important."The 2005 SOP also described the "[s]imple (or clothing) hair: Present

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> on the underside of the leaf. The shape of the hair is not as characteristic as cystoliths: they are more numerous and longer but do not curve or taper in a well-defined way."Additionally, the Duquenois-Levine color test was described in detail: "1) About 10 seconds after adding the Duquenois reagent and concentrated hydrochloric acid to the plant material, a violet color develops. The color deepens with time. 2) A fainter violet color extracts into the added chloroform layer from the Duquenois/acid solution. 3) Confirmation is achieved only if the botanical screen and color test are both positive" (DX 7 Tab 14).

As with cocaine, the SFPD Crime Lab SOPs did not require the analysts to follow all procedures recommended by the peer-review literature for marijuana identification. For example, the literature recommended that the suspected sample be compared with authentic samples of marijuana. That step was not required of SFPD analysts. Nor did the SFPD Crime Lab SOP require analysts to do a chemical test for calcium carbonate on marijuana (PX 25).

This order finds that the identification of marijuana via microscopic identification of botanical features and the Duquenois-Levine color test was and is heavily standardized. As with cocaine, this order finds that the differences between the SFPD procedures and the peer-review recommendations are not enough to undermine the reliability of the tests for *Daubert* purposes.

E. General Acceptance.

As the foregoing discussion has demonstrated, the confirmation of marijuana with microscopic examination, macroscopic examination, and the Duquenois-Levine color test is generally accepted in the forensic community. Indeed, the SFPD Crime Lab exceeds the SWGDRUG recommendations for identifying marijuana. SWGDRUG does not require the Duquenois-Levine color test to identify marijuana: "An identification of botanical material may be made utilizing morphological characteristics *alone* provided sufficient botanical features appropriate for identification are observed. Such examinations shall be made by analysts competent in botanical identifications" (PX 15 at 16). Mudge testified that the Alameda County and San Bernardino County crime laboratories also use microscopic examination and the Duquenois-Levine color test to identify marijuana. Although many laboratories, including the DEA laboratory, use instrumentation to identify suspected narcotics, it is beyond dispute that the science underlying the procedures used by the SFPD Crime Lab, while venerable, are accepted in the relevant

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community.

4. FURTHER CONSIDERATIONS.

A. Instrument Analysis and Reviewability.

***14** At the hearing, the adequacy of the SFPD Crime Lab narcotics-analysis report sheets was called into question. At the top of the worksheets, the analyst recorded his or her name, the incident report number, and the date of the examination. Beneath that, the analyst recorded his or her examination results. For example, one worksheet indicated that (1) the tests performed on the sample were "C1a-bl, X2-B1, X3-B3," (2) the sample weighed "8.50 g gross," and (3) the result was " cocaine base." Below the examination results was a key that explained the tests performed: "C=Color test, C1=Cobalt Thiocyanate, C1a=Cobalt Thiocyanate/acid ... X=Crystal test, X2=Gold Chloride (tetrachloroaurate), X3=Platinic Chloride ... bl=blue" (PX 13). The appendix to the SOP then provided photographs of "Approved Crystal Forms," and showed the X-shaped crystal of the gold chloride test on cocaine, labeled X2-B1, and the feathery crystals of the platinic chloride test on cocaine, labeled X3-B3 (DX 7 Tab 14 at 62-63). Finally, the report concluded with a signed declaration by the analyst and also a signature by a reviewer (PX 13).[FN14]

FN14. One example of a marijuana analysis report documented the tests performed as "( )M, C7 p -> p," with the tests corresponding to: " C7 = Duquenois-Levine, ... M=Microscopic exam, M =botanical features indicative of marijuana observed, ... p=purple, ... ->=turns to" (PX 14). Mudge explained that "p -> p" meant that purple was achieved when the Duquenois reagent was first added, then purple was extracted to the chloroform layer when chloroform was added, indicating a positive Duquenois-Levine color test for marijuana.

This order finds that although these worksheets were conclusory, they documented (1) the tests the analyst performed, and (2) the analyst's conclusions from those tests. They did not, as the peer-reviewed literature recommends, require the analyst to describe with specificity the crystals observed or the botanical features observed. Nevertheless, the fact that the worksheets did not contain documentation of the precise observations of the analyst does not mean that the analyst did not perform the tests or did not actually observe the crystal shapes or botanical features. Although more detailed documentation would be preferable, the mere fact that the analysts' reports are cursory is not a

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basis for exclusion under *Daubert*.As the Supreme Court has explained, "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence." *Daubert*, 509 U.S. at 596.

* * *

This case presents the interesting question whether crime laboratories must keep up with the times and use the prevailing technology as opposed to reliable but no longer prevailing tests. Mudge testified that many other laboratories, including the DEA, use GCMS and FTIR instrumentation to identify suspected narcotics. As explained, instrumentation has become the preferred method for identification of cocaine and marijuana because the instruments themselves produce a print-out that can be reviewed by an independent analyst. One of defendants' principal contentions is that the microcrystalline tests fall short under *Daubert* because the instrument analyses provide better reviewability of results.[FN15]

> FN15. Mudge explained that the SFPD Crime Lab uses microcrystalline tests to identify cocaine because, in addition to their reliability, they can be done quickly. The SFPD Crime Lab tests approximately 12,000 samples each year. The San Francisco District Attorney usually requires a positive drug identification in hand for arraignments on drug crimes. Often, this leaves the SFPD Crime Lab with about six hours to analyze suspected drug evidence. With the volume of cases, analysts have to analyze about two to four samples in an hour. According to Mudge, microcrystalline tests can be done in about four minutes. With GCMS, it can take up to forty minutes to test one sample.

It seems conceded that instrument techniques are ideal for drug-identification testimony in court. According to the experts who testified, instrumentation results can be independently reanalyzed by a different analyst, even if he or she does not have the sample. Indeed, one of the peer-reviewed articles proffered by the government states that "since the results obtained by GC/MS analysis are validated with standards, and there is a 'paper trail' of measurable results, it is more reliable for the analyst to present and defend the results in court" (PX 23 at 4). The defense has made much out of the failure of the SFPD Crime Lab to keep up with the times.

***15** It does not follow, however, that the old art has been subtracted from the realm of the

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reliable. It is uncontradicted that the cobalt thiocyanate tests and microcrystalline tests are valid and reliable tests. It is also beyond dispute that marijuana can be identified by observation of unique botanical features and a positive Duquenois-Levine color test. The science underlying those tests cannot reasonably be questioned.

Although instrumentation is "better," the procedures used by the SFPD Crime Lab are still reliable. As one district court stated: "Daubert ... was not intended to limit scientific and technical testimony to results obtained through a single, superior method of inquiry, and alternative hypotheses and means of testing remain permissible topics of expert testimony as long as each is reliable and helpful. *Daubert* does not set up a test of which opinion has the best foundation, but rather whether any particular opinion is based on valid reasoning and reliable methodology." *Eclipse Elec. v. Chubb Corp.*, 176 F.Supp.2d 406, 412 (E.D.Pa.2001) (internal citations and quotations omitted).

The Sixth Circuit has also emphasized this point: "In some instances, there may be several different theories or procedures used concerning one type of scientific evidence, all of which are generally accepted. None may have the backing of the majority of scientists, yet the theory or procedure can still be generally accepted. And even substantial criticism as to one theory or procedure will not be enough to find that the theory/procedure is not generally accepted." *United States v. Bonds*, 12 F.3d 540, 562 (6th Cir.1993).

The laws of physics and chemistry are immutable. A chemical test that worked in 1933 will still work in 2006. Old science does not equate to bad science. The science was good then. It is good today. It will be good tomorrow-and forever. It is immutable.

B. Experts' Judgment.

As this order has emphasized, all of the tests used by the SFPD Crime Lab to identify marijuana and cocaine require the analyst's exercise of judgment. The mere fact that judgment must be exercised is not fatal to the expert testimony. An analyst, however, must be qualified and competent to recognize the crystal shapes in the microcrystalline tests, botanical features in a microscopic examination of marijuana, and correct shades of color for the cobalt thiocyanate and Duquenois-Levine color tests. The record is currently inadequate to conclude whether each of the analysts in this case was competent to perform the tests. At trial, the government must prove the individual qualifications of the specific analyst.

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C. *Daubert* Violation in Non-Testing of Multiple Packages.

At the hearing, a small bombshell exploded. Criminalist Deborah Madden testified that the SFPD Crime Lab failed to test all packages of suspected marijuana. If, for example, multiple packages of suspected marijuana were sent to the SFPD Crime Lab in one exhibit envelope, the analyst would weigh all of the packages together. The analyst then would perform a microscopic analysis on individual samples from all of the packages. *The Duquenois-Levine color test, however, was only applied to one of the many packages submitted.* Despite this lapse, the analyst would nonetheless indicate that *all* packages contained marijuana even though the full (and necessary) battery of tests was performed only on *one* package.

***16** Following the hearing, the Court requested counsel to address whether the SFPD Crime Lab followed a similar procedure for multiple packages of suspected cocaine. The government submitted a supplemental declaration by Madden. Madden explained that the same procedure was followed for cocaine, *i.e.*, if the contents of the packages were similar in appearance, an analyst would subject only *one* package of suspected cocaine to the color and microcrystalline testing, assuming (without full testing) that *all* the other packages were chemically identical (Madden Decl. ¶ 6).[FN16]

FN16. Defendants moved to strike the late-filed declaration. The motion is denied because the Court invited the clarification and the declaration is being relied on only to grant relief to defendants, not against defendants.

This order holds this procedure invalid under *Daubert* and Rule 702. For evidence to be admissible under Rule 702, it must be shown that "the witness has applied the principles and methods reliably to the facts of the case."As shown above, the full battery of tests must be performed to support a scientifically reliable conclusion. The SFPD Crime Lab's testing procedure for multiple packages skipped the Duquenois-Levine test for all but one of the packages. Doing only half the tests on a package was insufficient as to *that* package.

The same is true with cocaine-positive results were needed *under all three* of the cobalt thiocyanate, gold chloride, and platinic chloride tests to confirm the presence of cocaine. After confirming the presence of cocaine in only one package, the SFPD Crime Lab did not submit *any* of the other suspected cocaine packages to full testing.

If one package contained a controlled substance,

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it did not (and does not) follow as a matter of chemistry and science that the remaining packages *necessarily* contained the same substance. Although the police officers often submitted multiple packages to the SFPD Crime Lab in a single envelope, it did not follow as a matter of science that all packages were the same. If, for example, the packages had been retrieved from a car in which a driver and passenger had been riding, some of the packages could conceivably have belonged to the driver and others to the passenger. Different origins for the packages could have meant different substances within them. Even if they came from the same person, it would not have followed-as a matter of chemistry-that they were all identical. For example, Madden also testified that approximately five percent of the samples the SFPD Crime Lab examines were either fake marijuana or "bunk" cocaine. The analyst could not assume that because the packages all arrived at the SFPD Crime Lab in the same envelope that they all held the same substance.

If police officers find four .45 caliber bullets in a body, we could not assume, on the basis of the forensic examination of only one bullet, that the other three bullets must have come from the same gun. Similarly, that the top bill of a bundle of bills is counterfeit does not necessarily mean that the remaining bills are also counterfeit.

This order cannot find that the acceptable methodology was applied reliably to the multiple-package samples in this case. The Third Circuit has recognized: "[A]ny step that renders the analysis unreliable ... renders the expert's testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that methodology." *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 745 (3d Cir.1994). More specifically, the First Circuit has acknowledged that "courts have endorsed statistically based drug-quantity extrapolations predicated on random test samples in circumstances where the government was able to demonstrate an 'adequate basis in fact for the extrapolation and that the quantity was determined in a manner *consistent with the accepted standards of [reasonable] reliability.*' " *United States v. Scalia*, 993 F.2d 984, 988 (1st Cir.1993) (quoting *United States v. McCutchen*, 992 F.2d 22, 23 (3d Cir.1993)) (emphasis added); *see also United States v. Pirre*, 927 F.2d 694, 697 (2d Cir.1991). Here those accepted standards of reasonable reliability are not present.[FN17]

FN17. The Appellate Court of Illinois reversed a conviction for this very reason.

> In the case at hand, however, the chemist did not, in fact, express an opinion as to the whole. She looked at both bags, she weighed them

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> individually, and she subjected the contents of one bag to chemical analysis which revealed cannabis. What inference can be drawn concerning the composition of the bag not tested? The answer is none at all in the absence of expert opinion testimony. And in this case, there was none. It is difficult not to speculate that the second bag contained cannabis. But that is not enough. The verdict must be based on evidence and not upon guess, speculation or conjecture.
>
> *People v. Games*, 418 N.E.2d 520, 520 (Ill.App.Ct.1981); *see also Campbell v. State*, 563 So.2d 202, 202 (Fla.Dist.Ct.App .2002).

***17** As to multiple-package exhibits, the SFPD analyst may only testify as to what they actually did. The analyst may testify at trial as to the chemical composition of only one of the packages, the one fully tested. The analyst may not extend his or her scientific opinion to the packages not fully tested. If no record was kept as to the weight of the fully-tested package, as evidently was the case, then the analyst may not guess at what the weight was. With proper foundation, the analyst may testify to the procedure actually followed as to the other packages, such as their gross appearance and their overall weight but in doing so may not imply that those packages were fully tested or offer an opinion as to their chemical composition. For multiple packages of suspected marijuana, the analyst may, with proper foundation, testify that all of the packages contained plant material with botanical features characteristic of marijuana. For suspected cocaine, the analyst may testify, with proper foundation, that the rocks in all of the packages were similar in appearance. On cross-examination, the defense may make clear that only one package was tested and that no record of its weight was kept.

This ruling is without prejudice to the government trying to prove that *all* the packages were cocaine or marijuana, as the case may be, based on: (1) the contents of the one package tested and confirmed as cocaine or marijuana, and (2) the surrounding circumstances of the seizure suggesting that all of the packages were similar. For example, if a police officer testifies that all the packages were taken from a single defendant's coat pocket, a jury could reasonably conclude that they were all the same. It might also conclude, based on the circumstances, that some were different. That issue is one within common lay experience, not one of specialized science. The point of sending the envelope to the laboratory was so the scientists could do the science. If they did not do the science, they may not dress up ordinary lay inference as science.

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D. Testimony of Dr. Whitehurst.

Defense expert Dr. Whitehurst offered some testimony of limited value. Although he had a bachelor's degree and a doctorate in chemistry, he never worked or had any training as a narcotics analyst. Whitehurst conceded that drug identification is an analytical chemistry, and that his experience and training was in quantum chemistry. While he had studied the chemistry of crystal tests, he had never performed any of the microcrystalline tests at issue in this case. He had, however, performed the color tests discussed above. While at the FBI, Whitehurst was involved in writing quality assurance and quality control protocols. He did not focus on narcotics-analysis protocols, however, and was generally more concerned with the validation of protocols in general. Based on his background, his testimony at the hearing was limited to the topics of color tests and protocols.

***18** One of Whitehurst's main points was that the SFPD Crime Lab's protocols were not "validated." Techniques are "validated" when an analyst determines that a particular technique can be reliably used for its intended purpose. Whitehurst did not contend that the tests in general were not valid for their purposes, but claimed that the specific procedures used by the SFPD Crime Lab were never formally validated. This order disagrees with Whitehurst that the SFPD Crime Lab procedures are unreliable because they were not "officially" validated. The government presented significant evidence at the hearing that the tests used by the SFPD Crime Lab were suitable for their intended purposes. The SFPD Crime Lab procedures fell within a range considered acceptable by the forensic community. The SFPD Crime Lab procedures did not deviate from those procedures used by the rest of the forensic community enough to require an entirely separate validation of the techniques.

Whitehurst also criticized the SFPD Crime Lab SOP for its vagueness. Whitehurst essentially contended that even if the science underlying a test is reliable, the test is still unreliable if there are not standards controlling every minute aspect of the test. But Whitehurst's criticisms were either wrong or countered by Madden and Mudge. For example, Whitehurst claimed that the SOP did not specify a reagent concentration. But as discussed in detail above, reagent concentrations and recipes *were* specified by the SOPs. Whitehurst also claimed that the procedures did not indicate how to perform microcrystalline tests when adulterants were present. Madden, however, explained that when adulterants were present, the expected crystals appeared misshapen, and an analyst would then turn to GCMS for final confirmation of a suspected narcotic.

Whitehurst's critiques paid no deference to the

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training and experience of the analyst. For example, he also questioned what a cystolithic hair looked like and what shade of purple should be expected in a Duquenois-Levine color test. As this order has stated repeatedly, in the case of the drug-identification techniques used by the SFPD Crime Lab, the analyst's training and experience are essential bases for the tests' reliability. Moreover, a trained and experienced analyst could account and correct for what would seem ambiguous to an individual untrained in performing chemical tests or unfamiliar with marijuana's unique botanical features. In the Court's opinion, the “problems” identified by Whitehurst are not problems at all.

There are further reasons to find Whitehurst's testimony of limited value. Throughout the hearing and in their papers, the defense argued that instrumentation was the best and most reliable method of analysis. But Whitehurst even doubted the general efficacy of the instruments based on what he alleged was a similar lack of controls and protocols. Furthermore, Whitehurst had audited and reviewed many laboratories but could not identify any laboratory protocol he would have approved. The Court has a hard time believing that every crime laboratory in the country follows deficient protocols. Whitehurst has too extreme a view of what is required of crime laboratories.

***19** There have been thousands of defendants in San Francisco who have been convicted or pled guilty after the SFPD Crime Lab used the same procedures to test samples in their cases. All of those defendants, including defendants here, had an incentive to countertest the SFPD procedures. Yet there has not been a single documented occurrence of a false-positive confirmation of marijuana or cocaine. The abstract criticisms Dr. Whitehurst lodges against the SFPD Crime Lab protocol have limited value in light of the practical efficacy of the procedures used by the SFPD Crime Lab.

* * *

In conclusion, the science behind the tests used by the SFPD Crime Lab passes muster under *Daubert.* The science, however, was not applied as needed in the cases of multiple packages, and the expert testimony will be limited as above. Furthermore, whatever deficiencies an individual expert may have is a subject for cross-examination at trial.

CONCLUSION

Defendants' motions to exclude the testimony is **GRANTED IN PART AND DENIED IN PART.**

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IT IS SO ORDERED.

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