UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA,	)
	)
v.	) **CRIM. NO. 03-10283-NG**
	)
RUDY FRABIZIO,	)
Defendant.	)

GERTNER, D.J.:

MEMORANDUM AND ORDER RE:
MOTION TO EXCLUDE EXPERT TESTIMONY
August 11, 2006

I.   INTRODUCTION

The government has charged defendant Rudy Frabizio ("Frabizio") with possession of child pornography under the Child Pornography Prevention Act ("CPPA"), 18 U.S.C. § 2252(a)(4)(B). To obtain a conviction under § 2252(a)(4)(B), the Supreme Court has held that the government must prove the defendant possessed images of real children, rather than images of virtual children, engaging in sexually explicit conduct. Ashcroft v. Free Speech Coalition, 535 U.S. 234 (2002); United States v. Hilton, 386 F.3d 13, 18 (1st Cir. 2004). The task is a difficult one, becoming more difficult by the minute, as digital imaging techniques become increasingly sophisticated.[1]

To meet its burden of proof, the government seeks to introduce the testimony of Thomas Musheno ("Musheno"), a forensic

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[1] For example, modern computer technology has enabled graphic artists to manipulate images by air-brushing photographs, cutting and pasting from one image onto another, changing colors, stretching shapes, and even creating images from scratch on the computer.

examiner of photographic evidence in the FBI's Forensic Audio, Video, and Image Analysis Unit. Specifically, the government offers testimony that, after visually examining the photographs Frabizio allegedly possessed, and without using any specialized equipment, Musheno concluded that six of the nineteen images definitely depict real children and ten others "appear to be" real children.[2]

Frabizio moves [docket entry # 87] to exclude the proffered testimony under Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993), on the grounds that Musheno's technique is unreliable because it has not been tested, has not been subjected to independent peer review, has an unknown error rate, has no real standards or controls, has not achieved general acceptance, and satisfies no other set of reasonable reliability criteria. See Daubert, 509 U.S. at 593-94; Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137, 158 (1999). Accordingly, I held a hearing to determine the admissibility of Musheno's proffered testimony on May 5, 6, and 11, 2005. See Daubert, 509 U.S. 579.

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[2] Musheno offers testimony that is the polar opposite of the type of expert testimony the government first proposed. The government initially offered Professor Hany Farid, a Dartmouth College professor of computer science and neuroscience. Professor Farid sought to distinguish real and computer-generated images through a computer, rather than using visual inspection. Farid's computer program purported to measure statistical consistencies within photographs and computer-generated images to determine whether or not an image was real.

After one day of a hearing, the government withdrew Dr. Farid as an expert witness. Defense counsel noted that 30 percent of the time, Farid's program classified a photograph [i.e. a real image] as a computer-generated image, and she highlighted these errors. One stood out in particular: an image of a cartoon character, "Zembad," a surrealistic dragon, falsely labeled "real."

After the hearing, however, I noted a far more fundamental issue lurking beneath the questions about Musheno's particular methodology or error rate. However skilled he may be, he bases his testimony on observations of the photographs. The threshold question is whether visual observation is at all appropriate to the task at hand: distinguishing real images from virtual ones.

If it is possible to distinguish the real from the virtual with the naked eye, then the specialized observational skills of a Daubert-qualified photograph expert could help the jurors make their own observations of the evidence. As such, the photograph expert's testimony might be admissible, assuming Daubert's other requirements were satisfied. See United States v. Shay, 57 F.3d 126, 132 (1st Cir. 1995) (noting that Federal Rule of Evidence 702 requires that, to be admissible, expert testimony must "assist the trier of fact").

On the other hand, if visual observation, even by a seasoned observer, cannot distinguish real and computer-generated images in this case, then observation alone fails to address the threshold question and is therefore irrelevant. The testimony of a photograph expert would be inadmissible; an individual with expertise in computer-generated images would be required.

The First Circuit has left this issue open. In the instant case, I am obliged to resolve it. Based on the evidence presented to me about the current state of technology and the specific images involved here, I conclude that neither an expert

witness nor a lay jury, using only visual means, can determine

whether the images in this case are real or virtual to the level

of certainty required in a criminal prosecution. I therefore

find that Musheno's testimony is not helpful and must be

excluded.[3]

II. <u>THE STATE OF TECHNOLOGY AND VISUAL OBSERVATION OF IMAGES</u>

Because the threshold question in determining the

admissibility of Musheno's testimony is whether it is possible to

create wholly computerized images that are visually

indistinguishable from real photographs, my analysis begins

here.[4] This question raises both factual and legal issues. The

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[3] This opinion could be construed to indicate that Musheno's testimony
alone would not be sufficient to meet the government's burden at trial to
prove the pictures are real. Given the current posture of this case, this
Court does not reach the issue of sufficiency of the evidence. Instead, I
find that because it may be impossible to evaluate the images in this case
based only on visual observation, Musheno's testimony, standing alone, is
inadmissible.

To be sure, if the government were to offer a computer expert whose
testimony arguably eliminated the possibility that the images in this case
were wholly computer-generated, then I would reconsider the admissibility of
Musheno's testimony. In that case, Musheno's testimony would be relevant to
determining the types of manipulated images involved -- for example, whether
the images depict real children in pornographic poses, as opposed to real
adults air-brushed to look like children or real children manipulated into
pornographic poses.

Obviously, even if another expert excluded the possibility that the
images are wholly virtual, Musheno would still have to meet the <u>Daubert</u>
standard. He cannot. His methodology is not adequate to support the
conclusions he so confidently offers; that the images downloaded from the
internet _are_ real children or _appear to be_ real children. I would only allow
Musheno to testify as an additional expert (supplementing a computer expert),
subject to the restrictions described in Section III, <u>infra</u>.

On the current record, however, with Musheno offered as the government's
sole expert, his testimony is not adequate to answer the question before the
jury: whether images are real or virtual. It is therefore inadmissible in its
entirety.

[4] This preliminary issue is key because the <u>Daubert</u> inquiry depends upon
the particular task to which Musheno's testimony is directed. As the Supreme
Court explained in <u>Kumho Tire</u>, the reasonableness of any given expert's

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factual inquiry involves the capabilities of modern computer

programs as well as the particular images in the case at bar.

The legal question concerns how much uncertainty about the

efficacy of visual observation can be tolerated in a criminal

case, where the burden of proof weighs heavily on the government.

After three days of hearings and multiple briefings on the

Daubert issue, I have serious doubts as to whether a person

visually studying the images in this case can distinguish real

pictures from manipulated or wholly virtual ones with the level

of confidence required in a criminal prosecution.

The Supreme Court acknowledged this difficulty two years ago

in Free Speech Coalition, even as it held that the government

must prove that the images are real:

> [T]he Government says that the possibility of
> producing images by using computer imaging
> makes it very difficult for it to prosecute
> those who produce pornography by using real
> children. Experts, we are told, may have
> difficulty in saying whether the pictures
> were made by using real children or by using
> computer imaging. The necessary solution,
> the argument runs, is to prohibit both kinds
> of images. The argument, in essence, is that
> protected speech may be banned as a means to
> ban unprotected speech. This analysis turns
> the First Amendment upside down.

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approach depends upon "the particular matter to which the expert testimony
[is] directly relevant." Kumho Tire, 526 U.S. at 154. See also, D. Michael
Risinger, "Navigating Expert Reliability: Are Criminal Standards of Certainty
Being Left on the Dock?" 64 Alb. L. Rev. 99, 99 n.2 (2000) (observing that
Kumho Tire stands, in part, for the proposition that the Daubert inquiry must
be made "in regard to the particular 'task at hand'"). The task at hand here
is excluding, as a threshold matter, the possibility that the images are
wholly virtual.

> The Government may not suppress lawful speech
> as the means to suppress unlawful speech.
> Protected speech does not become unprotected
> merely because it resembles the latter.

Ashcroft v. Free Speech Coalition, 535 U.S. at 254-55.

Although several circuits have held that expert testimony and extrinsic evidence are not required to meet the government's burden of proof, the First Circuit is not among them. See, e.g., United States v. Irving, 432 F.3d 110, 27-28 (2d Cir. 2006) ("We decline to hold the government is required . . . to present expert testimony proving the children in the unlawful images are in fact real children. . . . [A] reasonable jury could conclude that the images depicted real children solely on the basis of the images themselves," but limiting this holding to cases involving video images); United States v. Kimler, 335 F.3d 1132, 1142 (10th Cir. 2003) *cert. denied*, Kimler v. United States, 540 U.S. 1083 (2003) ("Juries are still capable of distinguishing between real and virtual images."); United States v. Slanina, 359 F.3d 356, 357 (5th Cir. 2004).

When the First Circuit first visited this issue in United States v. Hilton, the court held that the "government must introduce relevant evidence *in addition to* the images to prove the children are real." 363 F.3d 58, 64 (1st Cir. 2004), *vacated*, 2004 U.S. App. LEXIS 19528 (1st Cir. 2004) (emphasis added). Further, the court acknowledged that the "vast technological revolution underway . . . has made undeniable the

fact that sexually explicit images portraying children can be
produced by artificial means." Id. at 64-65. More recently, the
court again suggested that this question has yet to be resolved
in this circuit:

> In the First Circuit, it remains an open
> question whether, to prove the reality of an
> image, the government must present relevant
> evidence in addition to the image. The
> decisions of other circuit courts of appeals
> addressing this question are not binding in
> this court.

United States v. Rodriguez-Pacheco, CA No. 05-1815, Order entered
April 4, 2006 (internal quotation and citations omitted).

The government has previously conceded the difficulty of
distinguishing real from virtual or manipulated images. In its
brief in the Free Speech Coalition case before the Supreme Court,
the government acknowledged Congressional findings on digital
imagery:

> Congress found that 'new photographic and
> computer [imaging] technologies make it
> possible to produce *** visual depictions of
> what appear to be children engaging in
> sexually explicit conduct that are virtually
> indistinguishable to the unsuspecting viewer
> from unretouched photographic images of
> actual children engaging in sexually explicit
> conduct.'

Brief for the Petitioners at 4, Ashcroft v. Free Speech
Coalition, 535 U.S. 234 (2002) (No. 00-795), 2001 WL 432538
(citing 18 U.S.C. § 2251 note (Supp. V 1999) (Finding 5)).

Even Musheno, the government's supposed-expert in this case,
acknowledged that a trained artist might be able to create

realistic-looking images. He testified: "I don't know if I've

ever seen an image, a painting that is so photorealistic that it

appears to be real, although is it possible to generate that? I

guess it's possible."[5] (<u>Daubert</u> Hr'g Tr. 20, 37-38, May 11,

2005.)

A significant body of literature also indicates that

digitally manufactured images may be confused with real

photographs. Faculty in the Department of Computer Science at

Dartmouth College, for example, have noted "photorealistic images

can be created that are nearly impossible to differentiate from

photographic images." S. Lyu and H. Farid, "How Realistic is

Photorealistic?" 53(2) IEEE Transactions on Signal Processing

(2005) (available at

<u>http://www.cs.dartmouth.edu/farid/publications)</u>.[6] Other articles

suggest that such virtual image creation can be achieved using

current technology and that even "experts cannot know whether a

digital image is real or virtual." Timothy J. Perla, <u>Attempting</u>

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[5] Musheno also testified that he cannot determine whether a single image
is real because "it is possible to generate imagery or to manipulate imagery
that's undetectable." (<u>Daubert</u> Hr'g Tr. 29, May 11, 2005.) However, he
believed that if he looked at a series of images of the same person, he could
detect manipulation because the difficulty of manipulating images in a way
that is not obvious increases when there are more pictures. (<u>Daubert</u> Hr'g Tr.
25, May 6, 2005.) Although he may be able to detect manipulation of an actual
photograph by reviewing multiple images, I conclude, as he grudgingly
conceded, that he could not detect an image wholly generated on the computer.
Moreover, even Musheno's judgment that he can detect manipulation is not
meaningfully tested. <u>See</u> Section III, below.

[6] Notably, the co-author of this article, Professor Hany Farid, is the
same computer expert whom the government initially offered to prove the
photographs were real. <u>See</u> discussion of Farid's testimony in note 1, <u>supra</u>.

to End the Cycle of Virtual Pornography Prohibitions, 83 B.U. L.
Rev. 1209, 1216 (2003). See also, A.C. Popescu and H. Farid,
"Exposing Digital Forgeries by Detecting Traces of Re-Sampling,"
53(2)IEEE Transactions on Signal Processing (2005) (available at
http://www.cs.dartmouth.edu/farid/publications) ("[D]igital
images can be easily manipulated and altered. Digital forgeries,
often leaving no visual clues of having been tampered with, can
be indistinguishable from authentic photographs"); Caught On
Camera, NEW SCIENTIST, Sept. 6, 2003 at 5 ("Warnings about the
potential for faking digital images are not new. But the
proliferation of cheap digital cameras and computers, together
with programs for altering photos and editing video footage, is
turning that potential into reality. Where once a specialist was
needed to alter analogue images, even beginners can now create
digital fakes good enough to fool discerning experts."). But see
Susan S. Kreston, Defeating the Virtual Defense in Child
Pornography Prosecutions, 4 J. High Tech. L. 49, 62 (2004)
("Creating realistic images of people . . . continues to be very
difficult, with the difference between a real picture and one
created by a computer, even using today's best technology, being
discernable to the human eye.").

     In addition, the defendant has submitted examples of wholly-
computer-generated images that this Court finds to be nearly
indistinguishable from real photographs. See, e.g.,
http://forums.cgsociety.org/showthread.php?t=141461; (depicting a

nude woman in the fetal position);

http://forums.cgsociety.org/showthread.php?t=361465 (showing a

remarkable likeness of actress Jennifer Garner); see also

http://forums.cgsociety.org/showthread.php?t=160012 (revealing a

woman's nude back). Although this final image shows greater

signs of being computer-generated than the other two, the fact

that someone created an image of this quality in less than a week

using Photoshop suggests the range of technological

possibilities.

In this case, the government has not made the threshold

showing that a visual observer can reliably evaluate the relevant

pictures for signs of manipulation and computer-generation.

Rather, the evidence strongly suggests that it is extremely

difficult, if not impossible, for a photographic expert, let

alone a lay observer, to determine whether the images involved in

the instant case are real images or images created or manipulated

through digital technology.

To the extent doubt remains on this threshold issue, I must

resolve that doubt against the government. This is a criminal

case. Defendant's liberty hangs in the balance, and the

government bears the burden of proof.[7] See United States v.

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[7] Although the rules of evidence apply equally in civil and criminal
cases, the Court must be especially vigilant in applying evidentiary rules in
the criminal context, given the stakes for the defendant and the fact that,
ultimately, the government bears the burden of proof beyond a reasonable
doubt. See, e.g., Barefoot v. Estelle, 463 U.S. 880, 916 (1983) (Blackmun,
J., dissenting) (suggesting that expert testimony allowed in a civil case
should not necessarily be allowed in a capital case because "when a person's

Monteiro, 407 F. Supp. 2d 351, 356 (D. Mass. 2006) (noting in the

Daubert context that the "burden of proof with respect to

reliability remains on the proponent of the evidence").

Furthermore, as the First Circuit recently held, the defendant

has no obligation to refute the reality of the images. Rather,

it is the government's burden to establish that the pictures are

real:

> It bears repeating that the government is not
> released from its burden of proof by a
> defendant's failure to argue, or by an
> absence of evidence otherwise suggesting, the
> artificiality of the children portrayed.
> That the children in the images are real
> amounts to an element of the crime which the
> government must prove, the burden of which
> should not be displaced to the defendant as
> an affirmative defense.

United States v. Hilton, 386 F.3d 13, 18 (1st Cir. 2004).

Similarly, it is the government's burden to establish that the

naked eye could distinguish the real from the virtual. It has

not met that burden here.

I therefore conclude that visual observation is not adequate

to the task of differentiating the real from the virtual in this

case. My conclusion leads to two others: First, jurors cannot

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life is at stake . . . a requirement of greater reliability should prevail");
Michael H. Gottesman, "Scientific and Technological Evidence: Admissibility of
Expert Testimony after Daubert: The 'Prestige Factor,'" 43 Emory L.J. 867, 877
(Summer, 1994) (observing that "[t]he standards for admitting expert opinion
testimony must be calibrated" to the relevant standard of proof). See also,
Bonnie J. Davis, "Admissibility of Expert Testimony After Daubert and Foret: A
Wider Gate, A More Vigilant Gatekeeper," 54 La. L. Rev. 1307, 1333-34 ("The
prejudicial effect against the defendant of expert testimony presented by the
prosecution is very high, and thus this testimony should be very reliable
before it could pass the balancing test" for admissibility).

decide based on their own visual observations whether the images

allegedly possessed by the defendant depict real children, as

required by the Supreme Court's holding in <u>Free Speech Coalition</u>.

Some expert testimony is required.[8] Secondly, even a seasoned

observer, such as an expert in photography, cannot make this

distinction in the case at bar. Given current computer

technology and the images involved here, visual observation, by

either a jury or an expert, cannot identify which images depict

real children and which have been manipulated or generated by

computer.[9] An expert with greater knowledge of computers must

speak to that fundamental, threshold issue.

III. <u>MUSHENO'S PROFFERED TESTIMONY</u>

As discussed above, I find that visual observation alone is

inadequate to the task of evaluating the images in this case. If

photographic experts as a general matter are inadequate to the

task of identifying computer-generated images, then no level of

experience in that field will suffice to qualify one as an

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[8] My conclusions are, of course, limited to the images in this case. There may be cases in which the images involve crude manipulations of a child's image that do not require a computer expert's testimony, but this case is not among them.

[9] This case began in 2003, and technology has undoubtedly advanced since then. Even based on evidence from 2003, however, I find that the government has not met its burden to show that it is possible to visually distinguish between real and virtual images.

expert. Indeed, allowing Musheno to testify would be like allowing a dentist to identify the causes of glaucoma.

If the government offered an expert who eliminated the possibility of such imagery in this case, then Musheno's testimony might be admissible.[10] To address that possibility and to underscore the inadequacies of Musheno's technique as applied to the sophisticated task at hand, I will consider the application of Daubert to Musheno's proffered testimony.

Even if the government established that the images here were not wholly virtual, Musheno's methodology does not meet the Daubert standard. His technique amounts to little more than "eyeballing" the evidence and recording his conclusions on a checklist. Indeed, the Daubert discussion below underscores the limitations of Musheno's approach, especially with respect to sophisticated, downloaded computer graphics.

A.   **Background**

Thomas Musheno conducts forensic examinations of photographic evidence for the FBI's Forensic Audio, Video, and Image Analysis Unit ("FAVIAU"). Despite his experience with photographs,[11] Musheno lacks an important piece of evidence that

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[10] That is, Musheno's testimony might be relevant to the question of whether the images were real photos that had been manipulated. See note 1, supra.

[11] Musheno holds a bachelor's and a master's degree in photography. Daubert Hr'g, Ex. 3. He has taken courses in related fields, such as electronic imaging, and has been certified by the FBI as an Examiner of

would substantiate his supposed expertise: proficiency testing.
In addition, his computer training is decidedly dated. His most
recent course on Photoshop, perhaps the dominant image
manipulation software, was in 2000. (<u>Daubert</u> Hr'g Tr. 43, 45,
May 6, 2005.)

Musheno's examinations can be broken down into four
categories, including comparison analysis (for example, matching
the image of a bank robber caught on tape and a person in
custody); photogrammetry analysis (calculating measurements, such
as a robber's height, based on photographs); and information
extraction (enhancing an image to reveal additional details).
(<u>Daubert</u> Hr'g Tr. 7-8, May 5, 2005.) The fourth category, the
only one of Musheno's techniques directly relevant to this case
and the area in which Musheno's experience is most limited, is
image authentication: Musheno examines an image to determine
whether it has been manipulated or digitally created from whole
cloth. <u>Id.</u>

Musheno's image authentication analysis has several steps,
each of which involves simply looking at the pictures.[12] Upon
receiving an allegedly pornographic image to examine, he first
attempts to determine if the image depicts a known child victim.

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Questioned Photographic Evidence. (<u>Daubert</u> Hr'g Tr. 12, May 5, 2005).
Musheno also trains other FBI examiners in image authentication. <u>Id.</u> at 10.

[12] Although Musheno looks at the size of the digital file and whether it
has been compressed, he does not do any more substantial computer-based
analysis.

He compares the image with photographs from the National Center for Missing and Exploited Children database and images in his unit's Child Exploitation Obscenity Reference File ("CEORF") database.[13] Id. at 19, 20. If the image matches a child in either database, Musheno ends his examination because there is no question that the image depicts a real child.[14] Id.

Next, Musheno examines the image for artifacts consistent with manipulation, using what he called the "FAVIAU Single Image Evaluation Form." Id. at 21. However fancy the title, the form is nothing more than a checklist Musheno's unit created to provide a contemporaneous record of the examiner's observations. Daubert Hr'g, Ex. 1. The examiner records, for example, the media type in which the image was submitted; whether the image is in color, black and white, or monotone;[15] and the size of the digital file. Id. at 22-23. He looks for compression artifacts,

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[13] The CEORF database contains pornographic images produced prior to 1986, when – according to Musheno – many northern European publications legally published pictures of real children that would be considered pornographic under the CPPA. (Daubert Hr'g Tr. 20, May 5, 2005.) Because the publications were legal, they are presumed to contain unmanipulated images of real children. Id. at 10.

[14] Musheno conducted this analysis in this case and determined that three of the images depicted known child victims. I excluded those images on other grounds. See Order dated May 9, 2005 [doc. #90].

[15] A monotone image appears in white and a single other tone. For instance, rather than appearing in black and white, an image could be in green and white. (Daubert Hr'g Tr. 22-23, May 5, 2005.)

which are visible signs that a digital image has been condensed into a smaller file.[16] Id. at 24.

The checklist requires the examiner to search for visible inconsistencies in seventeen listed categories, including the image's content, perspective, scale, shadows, quality of light, contrast, textures and patterns, sharpness, focus, and pixel values.[17] Id. at 25, 27. An image would have inconsistent content, for example, if it depicted an elephant on a diving board and the diving board was not bent. Id. at 25. The examiner also inspects the image for rough edges that indicate digital cutting and pasting, as well as inconsistent grain structure[18] and resolution.[19] Id. at 27-28.

After noting any inconsistencies, the examiner considers fourteen listed human characteristics, asking a broad question – whether the image "look[s] human," looks "cartoonish," or falls somewhere in between. (Daubert Hr'g Tr. 10, May 6, 2005). This could not be a more subjective inquiry; it considers the

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[16] In fact, Musheno's testimony in this regard was telling. When asked whether compression was like a zip file, Musheno responded, "Oh, boy, I'm not a computer examiner, but basically what compression does, it will take a file and reduce the actual size of that, and in doing that you throw out detail." (Daubert Hr'g Tr. 25, May 5, 2005.)

[17] Pixel values are the building blocks of digital photographs; they have differing lightness and darkness values, as well as color values. (Daubert Hr'g Tr. 14, May 6, 2005.)

[18] Grain structure is the physical structure of the grains or dye clouds in a negative. (Daubert Hr'g Tr. 28, May 5, 2005.)

[19] Resolution is the fineness of detail in an image, which would be inconsistent if a digital image were cut and pasted into another digital image with a different resolution. (Daubert Hr'g Tr. 28, May 5, 2005.)

subject's skin tones and textures, skeletal structure, and flesh
and muscle movement to see what "appears to be real." Id. at 10-
11.

If the image in question is part of a series of images,[20]
Musheno conducts additional analysis. He compares the facial and
body features shown in the images, as well as the clothing and
background detail, to determine if the same person is depicted in
each image in the series. Id. at 16, 19, 26.

After completing the examination, Musheno drafts a report
summarizing his observations and conclusions. Id. at 15-16, 20.
There are four possible conclusions: that the person depicted is
real, that the person "appears to be real but no conclusion" can
be drawn, that the person is not real, or that no conclusion is
possible. Id. at 20-21. An examiner might reach the "appears to
be real" conclusion if the image appears to depict a real child
but there is insufficient detail to reach a definitive
conclusion. Id. No conclusion at all can be drawn, on the other
hand, if, for example, multiple compressions have degraded the
image. Id. at 21.

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[20] This situation could arise if the files submitted to the examiner
contain multiple images apparently of the same person or if existing files in
the FAVIAU unit appear similar to the image in question. (Daubert Hr'g Tr.
17, May 6, 2005.)

Significantly, Musheno conceded that it is possible to alter an image in a manner that is undetectable.[21] He testified that because of this, he never opines that an image is real on the basis of a single image. Id. at 23. In such cases, he limits his conclusions to "appears to be real" and no conclusion. Id. at 24-25. He assigns the "real" label only if there are "multiple images and they're of great detail and they're complex and there are no artifacts consistent with manipulation or creation."[22] Given the sophistication of this field, however, that approach is hardly adequate.

Musheno completes the authentication analysis by subjecting his conclusions to review, id. at 16, but this review is perfunctory. Rather than reviewing the images independently in a blind test, coming to his own conclusions and then comparing them to Musheno's, the reviewing examiner goes over Musheno's completed checklist, his report, and the images contemporaneously. Id. at 30-31. If the reviewer agrees with Musheno's conclusion, the process ends there. Id. at 31-32. If the reviewer disagrees, the reviewer and Musheno discuss the

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[21] At the same time, however, Musheno testified that he has never seen a child pornography image altered in a way that is not detectable. (Daubert Hr'g Tr. 29, May 6, 2005.) Such a conclusion, of course, begs the question whether Musheno has seen an altered pornographic image and simply been unable to tell.

[22] Of course, even the presence of inconsistencies alone would not necessarily lead to a conclusion that the image is not real because "some inconsistencies . . . are explainable." (Daubert Hr'g Tr. 22, May 6, 2005.) Musheno said it "depend[s] on the image." Id. at 25.

disagreement, which could lead to the drafting of a revised report that would also be reviewed. Id. at 32-33.

With regard to the images in this case, Musheno testified that he received an initial group of images for review in the summer of 2004. Id. at 34. He conducted the analysis outlined above, except that he did not even look for a series of images because it was not standard procedure at the time. Id. at 34-36. In approximately February 2005, he received additional images for review. Id. at 36. This time, he considered the images, along with images from another case, as a series. Id. at 37-38.

Musheno concluded that six of the images at issue depicted real children and another ten appeared to be real children.[23] Another examiner confirmed Musheno's conclusions using only the review process described above. Id. at 38.

B. Daubert Analysis

As I have explained, I find that the government has not established that visual expertise, such as that of a photograph expert, can distinguish the real from the virtual in the face of modern computer technology, however, even if visual observation were sufficient, Musheno's methodology does not meet the reliability standards that the Supreme Court delineated in Daubert.

1. Framework for the Analysis of Expert Testimony

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[23] Musheno did not examine the remaining three images because the government asserts that they depict identified child victims.

The FBI has only been studying pictures of child pornography for signs of manipulation since the mid-to-late 1990s. (<u>Daubert</u> Hr'g Tr. 15, May 5, 2005.) In addition, the basis for the alleged expertise is constantly in flux because of rapidly changing computer technology. Thus, as with "new" scientific techniques, "the <u>Daubert</u> analysis is critical, and the court should be an especially vigilant gatekeeper."[24] <u>Hines</u>, 55 F. Supp. 2d 62, 65 (D. Mass. 1999); <u>United States v. Monteiro</u>, 407 F. Supp. 2d 351, 358 (D. Mass. 2006) ("The Court's vigilant exercise of this gatekeeper role is critical because of the latitude given to expert witnesses to express their opinions on matters about which they have no firsthand knowledge, and because an expert's testimony may be given greater weight by the jury due to the expert's background and approach.").

Where, as here, the expert relies on his experience to justify his methodology, the Court must examine the experience underlying his conclusions. As the Advisory Committee noted in amending Federal Rule of Evidence 702, "no one denies that an expert might draw a conclusion from a set of observations based on extensive and specialized experience." Fed. R. Evid. 702

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[24] The Court recognizes that it is not its role to decide whether it agrees with a particular theory. It is the Court's duty, however, to ensure that the jury hears only qualified expert testimony. <u>See</u> <u>Ruiz-Troche v. Pepsi Cola</u>, 161 F.3d 77, 85 (1st Cir. 1998) ("Daubert neither requires nor empowers trial courts to determine which of several competing scientific theories has the best provenance. It demands only that the proponent of the evidence show that the expert's conclusion has been arrived at in a scientifically sound and methodologically reliable fashion."). Thus, the Court's focus is on the reliability of the expert's approach.

advisory committee's notes to 2000 Amendment (quoting <u>Kumho Tire</u>,

526 U.S. at 156). At the same time:

> If the witness is relying solely or primarily
> on experience, then the witness must explain
> how that experience leads to the conclusion
> reached, why that experience is a sufficient
> basis for the opinion, and how that
> experience is reliably applied to the facts.
> The trial court's gatekeeping function
> requires more than simply 'taking the
> expert's word for it.'

<u>Id.</u> (citing <u>Daubert v. Merrell Dow</u>, 43 F.3d 1311, 1319 (9th Cir.

1995)).

Specifically, <u>Daubert</u> outlined the following, non-exhaustive

list of factors to consider in determining admissibility: 1)

whether the expert's technique or theory can be or has been

tested; 2) whether the expert's technique or theory has been

subject to peer review and publication; 3) the known or potential

error rate; 4) the existence and maintenance of standards and

controls; and 5) whether the technique has been generally

accepted in the relevant scientific community. 509 U.S. at 593-

94.

<u>Kumho Tire</u> extended <u>Daubert</u> to non-traditional sciences,

notably expertise based on observational, clinical, and technical

judgments.[25] 526 U.S. at 147, 149 (holding that the courts'

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[25] In <u>Kumho Tire</u>, the Supreme Court approved the district court's
exclusion of proffered expert testimony based on observational experience
similar to that offered in this case. 526 U.S. at 153-58. Much of the
plaintiffs' case rested on the proffered testimony of a supposed "expert in
tire failure analysis," whose testimony was based on what the Supreme Court
termed "small observational differences." <u>Id.</u> at 142, 157. The district
court excluded the testimony because it found that none of the <u>Daubert</u> factors

"basic gatekeeping obligation" applies to "all expert testimony"

and concluding that "[t]he 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").

The Kumho Tire Court further instructed that the trial court

may consider the Daubert factors in determining the admissibility

of such testimony. Id. at 150. The Court emphasized, however,

that the Daubert factors are not a "definitive checklist." Id.

(citing Daubert, 509 U.S. at 593). The gatekeeping inquiry must

be "tied to the facts of a particular case," and the law grants

the trial judge "broad latitude" to identify the factors relevant

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indicated that the testimony was reliable. Id. Moreover, the district court
found no countervailing factors in favor of admissibility that could outweigh
those identified in Daubert. Id. at 156. Emphasizing that there was no
indication in the record that other experts in the industry used the proffered
technique or that it had been validated in any articles, the Supreme Court
ruled that the exclusion was well within the district court's discretion.
Id. at 157-58.

to admissibility.[26] <u>Id.</u> at 153, 150 (quoting <u>Daubert</u>, 509 U.S.

at 591 (internal quotation omitted)).

I addressed the application of the <u>Daubert</u>/<u>Kumho Tire</u>

framework to a technical field in <u>Hines</u>, where the government

sought to introduce expert testimony about handwriting, and I

concluded that handwriting analysis suffered a number of flaws.[27]

<u>Hines</u>, 55 F. Supp. 2d 62. It had never been subjected to

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[26] The Federal Rules of Evidence have been amended to incorporate the
teachings of <u>Daubert</u> and <u>Kumho Tire</u>. Rule 702, in particular, was amended in
2000 and now reads as follows:

> 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.

Fed. R. Evid. 702.

> This amended version of the Rule specifically

> rejects the premise that an expert's testimony should
> be treated more permissively simply because it is
> outside the realm of science. An opinion from an
> expert who is not a scientist should receive the same
> degree of scrutiny for reliability as an opinion from
> an expert who purports to be a scientist. . . . The
> trial judge in all cases of proffered expert testimony
> must find that it is properly grounded, well-reasoned,
> and not speculative before it can be admitted.

Fed. R. Evid. 702 advisory committee's notes to 2000 Amendment (citation
omitted).

[27] A growing body of literature addresses the application of
<u>Daubert</u>/<u>Kumho Tire</u> to technical fields. <u>See, e.g.</u>, Michael J. Saks, <u>Merlin
and Solomon: Lessons from the Law's Formative Encounters with Forensic
Identification Science</u>, 49 Hastings L.J. 1069 (1998) (questioning the
reliability of handwriting, fingerprint, and toolmark analyses, among others);
Jessica M. Sombat, <u>Latent Justice: *Daubert*'s Impact on the Evaluation of
Fingerprint Identification Testimony</u>, 70 Fordham L. Rev. 2819 (2002).

meaningful validity testing or to financially disinterested peer
review. I also took into account the fact that the testimony
about similarities and differences in handwriting could be
"understood and evaluated by the jury" and that the witness "can
be cross examined." Id. at 70. Accordingly, I admitted the
proffered expert to testify about his observations.

I reached the opposite conclusion with respect to the
expert's conclusions. I noted that there were no studies of the
technique's validity, no standards as to how many similarities it
took to declare a match. Id. at 69. The error rate was unknown.
Id. Unlike his observations, which could easily be understood
and evaluated by the jury, the ultimate conclusion would be based
only on the expert's experience -- a leap that "may not at all be
justified by the underlying data." Id. at 70. Accordingly, I
excluded testimony about the expert's conclusions.[28]

It is with this framework in mind that I examine Musheno's
proffered testimony.

2.   Application of the Daubert Factors

I will examine each of the factors delineated in Daubert
before considering what other factors, if any, speak to the
technique's reliability.

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[28] But see United States v. Mooney, 315 F.3d 54, 63 (1st Cir. 2002)
("[O]nce a trial judge determines the reliability of the proffered expert's
methodology and the validity of his reasoning, the expert should be permitted
to testify as to the inferences and conclusions he draws from it, and any
flaws in his opinion may be exposed through cross-examination or competing
expert testimony.").

a. Testing

The first inquiry under <u>Daubert</u> is whether the technique in question can be or has been tested. See <u>Daubert</u>, 509 U.S. at 593 (deeming testing a "key question"). Although observational fields such as image authentication need not be subjected to the laboratory tests that would be required of a traditional science, see <u>Hines</u>, 55 F. Supp. 2d at 68-69 (considering the lack of testing for proffered handwriting analysis testimony), the lack of testing here is startling.

During the <u>Daubert</u> hearing, I repeatedly asked Musheno whether his technique had ever been tested through, for instance, the use of blind testing, in which he would be asked to identify a variety of samples to determine whether they were real. The examiner, knowing which samples were, in fact, real and which were virtual, could then evaluate Musheno's performance. See (<u>Daubert</u> Hr'g Tr. 64, May 6, 2005). Musheno responded, "I've never been tested."[29] <u>Id.</u>

Absent this type of proficiency testing, neither this Court nor the jury can assess the reliability of Musheno's work. This is particularly true where, as here, the field as a whole has no known error rates, making it impossible to guess how often Musheno is likely to be right or wrong. See <u>Daubert</u>, 43 F.3d at 1319 ("We've been presented with only the experts'

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[29] The failure to conduct blind testing leads to the related problem of examiner bias. See Section III(B)(2)(b), <u>infra</u>.

qualifications, their conclusions and their assurances of reliability. Under Daubert, that's not enough."). Quite clearly, the first Daubert factor does not indicate that Musheno's technique is reliable.

b. Peer Review

The second Daubert factor considers peer review. The "peer review" process Musheno described leaves much to be desired. See (Daubert Hr'g Tr. 16, 30, May 6, 2005). Rather than conducting an independent examination of the images, Musheno's co-worker analyzed the images contemporaneously with Musheno's checklist and report, fully aware of Musheno's conclusions. Id. at 30. Musheno testified that no reviewer had ever disagreed with his conclusions – a result that could indicate either a flawless record or, equally likely, a review process that functions as a rubber stamp. Id. at 121-22. Indeed, the review process Musheno described runs a substantial risk of "examiner bias," a phenomenon by which an examiner who expects a particular result tends to find it. See William C. Thompson & Michele Nethercott, The Challenge of Forensic Science, 28 Champion 50, 50 (Sept.-Oct. 2004) (observing that "[t]he failure of forensic labs to use 'blind' procedures for interpreting test results contributes to the production of inaccurate conclusions in lab reports and courtroom testimony"). See also D. Michael Risinger et al., The Daubert/Kumho Implications of Observer Effects in Forensic

Science: Hidden Problems of Expectation and Suggestion, 90 Cal.
L. Rev. 1 (2002).

Technical fields need not be held to the standard of peer
review applicable to traditional sciences, which are often
considered in scholarly journals. See Daubert, 509 U.S. at 593-
94. It is nevertheless appropriate to consider whether the
fields have been subjected to meaningful peer review in
determining its reliability. See Hines, 55 F. Supp. 2d at 68.
The "peer review" conducted here is a far cry from the type of
independent review that would bolster the technique's
reliability.

c.   Error Rate

The third Daubert factor concerns the known or potential
error rate. This is perhaps the most problematic factor in this
case, as the Court has no way of determining whether Musheno's
years of experience add up to actual expertise. Although he has
looked at many images in his career, no one knows whether his
technique produces reliable results. Indeed, even if Musheno
were the world's most talented assessor of image manipulation,
this would mean little if the error rate in the field were
particularly high. This problem is of particular concern where,
as here, any expertise in the field of image *manipulation* would
not address the possibility of an image that was not a real
photograph manipulated by computer but rather was wholly digital.

On the current record, there is no way of knowing whether

Musheno's technique can recognize such computer-generated

images.[30] Lack of a known error rate also prevents the jury from

assessing the proper level of deference to accord the expert's

conclusions. Because Musheno's technique has never been tested,

its error rate is unknown and therefore does not support a

finding of reliability. See Hines, 55 F. Supp. 2d at 69.

d.   Standards and Controls

The fourth Daubert factor considers the existence and

maintenance of standards and controls. As noted above, Musheno

bases his analysis on the FAVIAU checklist. He described this

form as an "ever-changing document." See (Daubert Hr'g Tr. 93,

May 6, 2005.) Rather than providing true standards for

authentication, Musheno acknowledged that the form is an

"internal checklist for the FBI" that has never been subjected to

outside peer review.[31] Id. at 99. The form simply lists

characteristics that examiners thought might be important in

detecting virtual images and manipulations. Id. at 92-93.

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[30] Indeed, I have found that in this case it is not possible to
distinguish real photographs from those that are wholly digital based on
visual observation. See Section II, supra. This finding emphasizes the
potential error rate of Musheno's technique, which assumes that images are
either entirely real or real images that have been manipulated and discounts
the possibility of wholly virtual images.

[31] Explaining the origin of the form, Musheno stated that the form was
initially created for examinations of conventional imagery: "It existed in the
unit for a number of years, and then when the digital age hit, it was changed
to accommodate some of the digital items and then [h]as since evolved, there's
been a number of different evolutions of the form." (Daubert Hr'g Tr. 26, May
5, 2005.)

Nonetheless, the existence of the checklist provides a standard methodology and some level of consistency among FBI examiners.

More disturbingly, no standards govern the conclusions that examiners draw from the completed form. There are no guidelines for the number or type of factors that should be present to conclude that an image is real.[32] (Daubert Hr'g Tr. 35-36, May 11, 2005.) Indeed, Musheno testified that he would conclude that an image is not real if it "looks cartoonish." (Daubert Hr'g Tr. 22, May 6, 2005.) He went on to explain that he would reach the same conclusion "if there were something so gross, if the perspectives were so out of whack" and noted that his conclusions are "image specific."[33] Id. While the checklist provides a modicum of standardization for Musheno's observations, no standardization at all governs his final determinations. This

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[32] Musheno testified as follows:

Q: Are there a particular number of factors that need to exist
      for you to be able to conclude that an image is real?
A: Particular number of factors?
Q: For example, on that form that you're looking at?
A: No, No.
Q: And why not?
A: Well, it's image dependent. It has to do with a lot of
      things . . .

(Daubert Hr'g Tr. 35, May 11, 2005.)

[33] The government argues that Musheno and his colleagues are, in fact, governed by standards because "the FBI requires 100% certainty before opining that an image is real." Gov. Mem. at 6 (citing (Daubert Hr'g Tr. 29-30, May 6, 2005)). But Musheno himself acknowledged that one "can't quantify this type of examination," belying the notion that the FBI can enforce a 100% certainty requirement on its examiners. See (Daubert Hr'g Tr. 96, May 6, 2005).

degree of precision is insufficient to qualify as expertise when a defendant's liberty is at stake.

Likewise, Musheno testified that there are no objective criteria for determining when degradation has made it impossible to reliably analyze an image. See (<u>Daubert</u> Hr'g Tr. 40, May 11, 2005). An analysis of the images at issue in this case reveals the significance of this shortcoming. Musheno acknowledged that all of the images were compressed digital images in JPEG format. See (<u>Daubert</u> Hr'g Tr. 102-03, May 6, 2005). He further agreed that compression destroys information from the original image. <u>Id.</u> at 103. If an image is manipulated before being transformed into a JPEG file, some of the artifacts of the manipulation could "possibly" be discarded. <u>Id.</u> Musheno testified that he could not tell how many times (or when) the images in question had been compressed; he could only say for certain that compression artifacts were present. <u>Id.</u> at 106, 114. He also conceded that all six images that he identified as "real" had added text, a form of manipulation that could result in the further loss of information from the original image. <u>Id.</u> at 105-06. As a result, Musheno may draw conclusions from incomplete information without knowing what details were missing or how or by whom the information had been removed.

It appears that the <u>only</u> objective standard to which Musheno adheres in making his final determinations is his practice of not

declaring an image real on the basis of a single image.[34] Id. at

23. There are serious problems with even that criterion.

Musheno testified that he will not declare a single image real

because he "know[s] it is possible to create imagery or to

manipulate imagery that's undetectable. . . ." Id. He is,

however, comfortable declaring an image real "if there are

multiple images and they're of great detail and they're complex.

. . ." Id. at 25. This is not because the analysis itself

differs when multiple images are being considered.[35] Id. Rather,

Musheno stated that he is "aware of how incredibly difficult it

is to either manipulate or generate one image alone. If you

start to have multiples, then that difficulty increases." Id.

    But as Frabizio rightly argues, this conclusion is based on

the assumption that the computer artist started with a single

image, rather than, for instance, alterable images of a single

adult in multiple poses or from an entirely virtual image. This

single and highly questionable criterion alone surely cannot

satisfy the Daubert/Kumho Tire interest in the existence and

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[34] Musheno's unit also uses four documents that set out standard
operating procedures relating to image analysis. (Daubert Hr'g Tr. 33, May 6,
2005.) The relevant form for the analysis Musheno performed here is entitled
"Image Content Authentication." See Daubert Hr'g, Ex. 2. It does not,
however, provide true standards and controls, as it simply memorializes the
internally standardless analysis that Musheno performed in this case.

[35] Specifically, when asked whether the analysis differed when
considering multiple images, Musheno responded that "there's more information
and also . . . if you're looking at multiple images, you are comparing them to
see if they are the same individual, which is also added information."
(Daubert Hr'g Tr. 25, May 6, 2005.)

maintenance of standards and controls. See Hines, 55 F. Supp. 2d

at 69 (noting that one cannot "compare the opinion reached by [a

handwriting analyst] with a standard protocol subject to validity

testing, since there are no recognized standards"). See also

Fed. R. Evid. 702 advisory committee's notes to 2000 Amendment

("The more subjective and controversial the expert's inquiry, the

more likely the testimony should be excluded as unreliable.").

e. General Acceptance

Finally, there is no evidence that others in the field

generally accept this technique. See Kumho Tire, 526 U.S. at 151

(citing general acceptance among its examples of appropriate

applications of the Daubert standard to technical, experience-

based fields); Hines, 55 F. Supp. 2d at 68-69 (applying the

general acceptance factor to handwriting analysis). Musheno

testified that his unit at the FBI has been conducting image

authentication analysis since the mid-to-late 1990s.

(Daubert Hr'g Tr. 15, May 5, 2005.) He later clarified, however,

that his unit only began applying the technique in earnest within

the last *two to three years*. (Daubert Hr'g Tr. 86, May 6, 2005.)

It is clear, then, that Musheno's technique cannot claim a

history of general acceptance.[36] Rather, this technique is

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[36] Musheno has testified as an expert on image authentication in child
pornography cases only four times, see (Daubert Hr'g Tr. 16, May 5, 2005), and
the other members of his unit have testified in child pornography cases a
combined total of twelve times (though he did not clarify whether this
testimony related to the specific inquiry of image authentication). See id.
at 17. Furthermore, Daubert did not suggest that acceptance by a legal,
rather than a scientific or technical, community would suffice.

apparently the product of a group of FBI employees who endorse one another's work.

The criticism that the technique has only been considered by other FBI examiners is applicable to a wide range of technical fields. See, e.g., Hines, 55 F. Supp. 2d at 68 (observing that to the extent handwriting analysis had been "generally accepted," it was not by a "financially disinterested independent community, like an academic community") (quoting United States v. Starzecpyzel, 880 F. Supp. 1027, 1038 (S.D.N.Y. 1995). Many of these fields have withstood Daubert challenges. See, e.g., United States v. Crisp, 324 F.3d 261, 270 (4th Cir. 2003) (rejecting Daubert challenges to handwriting and fingerprint evidence). But fields such as handwriting and fingerprint analysis, though certainly not without their own problems, see Hines, 55 F. Supp. 2d at 68, can claim both more analytic rigor than image authentication and certainly a more venerable tradition of acceptance, id. at 69, 67. In Hines, for instance, I noted that expert testimony regarding handwriting analysis has been generally accepted for decades. Id. at 66-67.[37] The same cannot be said of Musheno's image authentication technique.

f.   **Helpfulness to the Jury**

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[37] Consideration of a history of acceptance could, of course, be equated with "grandfathering old irrationality." D. Michael Risinger et al., Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting "Expertise", 137 U. Pa. L. Rev. 731, 771 n.182 (1989). Thus, the Court must be wary of placing too much weight on this factor.

The First Circuit has held "'[t]he ultimate purpose of the Daubert inquiry is to determine whether the testimony of the expert would be helpful to the jury in resolving a fact in issue.'" Hochen v. Bobst Group, Inc., 290 F.3d 446, 452 (1st Cir. 2002) (quoting Cipollone v. Yale Indus. Prod., Inc., 202 F.3d 376, 380 (1st Cir. 2000)). In making this determination, the Court must consider, "given the proffered expert's background, whether the scientific, technical, or other specialized knowledge he offers will assist the trier better to understand a fact in issue." Gaydar v. Sociedad Instituto Gineco-Quirurgico y Planificacion Familiar, 345 F.3d 15, 24 (1st Cir. 2003) (internal quotation omitted). Although this inquiry is related to the question of the expert's reliability, the First Circuit has described assistance to the trier of fact as a "distinct" requirement of Federal Rule of Evidence 702. United States v. Shay, 57 F.3d at 132.

Clearly, Musheno's observational skills could be helpful to the jury, *if the threshold concern about the possibility of wholly virtual images were addressed.* His familiarity with Photoshop and the characteristics of images that have been manipulated would provide tools to assist jurors in their deliberations.[38] Essentially, Musheno's experience with image manipulation would guide the jury. Unlike his observations,

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[38] See note 1, discussing possible manipulation techniques.

however, Musheno's conclusions assert a level of certainty unjustified by his methodology and experience. See, e.g., United States v. Green, 405 F. Supp. 2d 104 (D. Mass. 2005). In addition, excluding these conclusions, which are of questionable merit, would reduce the danger that the jury would cede its decision-making entirely to him.[39]

On the current record, however, I cannot allow Musheno to testify even to his observations. As discussed in section II, supra, I find that the current state of technology prevents a lay juror, or any other visual observer, from assessing whether the images in this case depict real children, as opposed to computer-generated or digitally-manipulated images. Therefore, Musheno's observations - - without the conclusions, which I must exclude as discussed above – are not useful to the jury.

g.   Other Indicia of Reliability

In line with the Supreme Court's instruction that the Daubert factors should be applied flexibly to technical fields, it is appropriate to consider other indicia of reliability. Kumho Tire, 526 U.S. at 149-153, 156 (noting with approval that the district court had considered that there were "no countervailing factors operating in favor of admissibility . . . [that] outweigh[ed] those identified in Daubert"). The parties

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[39] The possibility of the jury ceding to an expert's findings is particularly of concern where, as here, the images are so unpleasant to look at that jurors might be tempted to avoid the task altogether by simply believing the expert without question.

here have pointed to no additional indicia of reliability, but one additional element of Musheno's technique concerns the Court.

Musheno explained that, when evaluating images, he looks for signs of manipulation – that is, signs that someone had tampered with a picture of a real person. (<u>Daubert</u> Hr'g Tr. 90-91, May 6, 2005.) Again, this assumes that real photographs have been manipulated. As defendant suggested in cross-examination, however, a wholly virtual picture would not show the same signs of manipulation as would a real picture. <u>Id.</u> Thus, the possibility of creating images that are entirely computer-generated and which therefore do not demonstrate the inconsistencies Musheno said he would expect in a real photo that had been digitally doctored, creates substantial doubts about the reliability of Musheno's technique.[40]

IV.   <u>CONCLUSION</u>

In a world of rapidly changing technology, where the availability and use of Photoshop and other, similar programs is widespread, substantial evidence suggests it may be possible to digitally create or manipulate photographs in a manner the naked eye cannot detect. The government has not shown otherwise. Under these circumstances, it is unreasonable to expect a lay jury to differentiate the real from the computer-generated. The

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[40] Indeed, it is because this Court finds that it is feasible to create such computer-generated images that Musheno's testimony must be excluded in its entirety.

government must therefore present an expert or other extrinsic evidence to prove that the images in question depict real children.

Whether the images in this case are real or virtual cannot be determined based on mere observation, however, even by a photographic expert. More specialized, computer-based knowledge is required to exclude the possibility that the pictures are wholly virtual. Furthermore, even if visual observation were sufficient, I would find that Musheno's qualifications and expertise do not justify the conclusions he proposes to make. I would allow him to testify to his observations, but not to his ultimate conclusions.

Here, however, the government has not established that the pictures at issue in this case are not wholly virtual or that visual observation can reliably detect manipulation, if any. I therefore **GRANT** defendant's <u>Daubert</u> motion, and pursuant to Federal Rule of Evidence 702, exclude Musheno's testimony in its entirety.

SO ORDERED.

Date: August 11, 2006   <u>**/s/NANCY GERTNER, U.S.D.J.**</u>

1:03-cr-10283-NG USA v. Frabizio
Date filed: 08/27/2003

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UNITED STATES DISTRICT COURT

DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA   )
)
          v.   )   CRIMINAL NO. 03-10283-NG
)
RUDY FRABIZIO   )

MOTION TO EXCLUDE TESTIMONY FROM DR. CELESTE WILSON

Defendant, Rudy Frabizio, moves that this Court exclude testimony from Dr. Celeste Wilson regarding observations she made that are unrelated to her opinion regarding the age of the minors allegedly depicted in the images found on defendant's computer.

As grounds for this motion, defendant states that the government has indicates that it intends to elicit from Dr. Wilson, a pediatrician, testimony regarding "anatomical and medical features observed in the children depicted in the images which may be unrelated to her determination of age but which she noted as a pediatric physician. Dr. Wilson will not be providing an opinion as to the reality of the children depicted." Letter from Dana Gershengorn ("Gershengorn letter"), dated July 3, 2008, attached hereto as Exhibit 1.

The government also has stated, "Dr. Wilson will also testify to her opinion that the images depicted in the reference images provided to you as part of Dr. Richard Vorder Bruegge's expert disclosure material contain similar anatomical features,

including birth-marks and moles, as the subject images to which they are related." Id.

At the first trial of this case, Dr. Wilson testified to her opinion regarding the age of the subjects of the images. Defendant objected to the government's last-minute proffer of testimony by her regarding the "physical and anatomical details unrelated to age". This objection was sustained, largely based on late disclosure of the government's intention to offer such testimony.

While the government now has provided timely disclosure of the additional topics about which Dr. Wilson will testify, defendant submits that the proffered testimony (apart from age) should be excluded. Even if Dr. Wilson does not offer an opinion that the images depict real children, her testimony will inescapably suggest her belief that the images appear to be or, are in fact, real. Defendant submits that, for the reasons set forth in this Court's earlier decisions in this case, this Court should exclude the evidence.

In its order excluding testimony from FBI visual analyst Thomas Musheno, this Court wrote:

> Whether the images in this case are real or virtual
> cannot be determined based on mere observation,
> however, even by a photographic expert. More
> specialized, computer-based knowledge is required to
> exclude the possibility that the pictures are wholly
> virtual. Furthermore, even if visual observation were
> sufficient, I would find that Musheno's qualifications
> and expertise do not justify the conclusions he

proposes to make. I would allow him to testify to his
observations, but not to his ultimate conclusions.

United States v. Frabizio, 445 F. Supp. 2d 152, 170 (D.Mass.

2006.

The government subsequently sought clarification as to

whether it could elicit similar testimony regarding observations

from Dr. Wilson. The Court excluded such testimony, explaining:

> Dr. Wilson's approach was to visually examine the
> images in question. As I indicated, until the
> government offers testimony to address the question of
> whether the images were wholly virtual, the testimony
> of Dr. Wilson, like that of Mr. Musheno (the subject of
> the August 11, 2006, Order) cannot assist the trier of
> fact. An expert whose testimony relies on visual
> observation cannot reliably evaluate pictures for signs
> of computer generation.

United States v. Rudy Frabizio, No. 03-10283, Memorandum and

Order Re: Motion for Reconsideration and Clarification, slip op.

at November 22, 2006.

Now, the government proposes to elicit Dr. Wilson's

testimony regarding her observations of the photographs, but has

not indicated how it will make the threshold showing that the

images are unaltered or wholly virtual.[1] The government's

assertion that Dr. Wilson will not testify as to any conclusion

regarding whether the images depict real children (or,

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[1]The government has proffered testimony from Dr. Richard
Vorder Bruegge, which is the subject of a Daubert hearing
scheduled for November 21.

presumably, even <u>appear to</u> depict real children) does not render her observations admissible.

As a practical matter, it is difficult to imagine how the questions and answers would be framed in a way that did not imply the conclusion. In a separate discovery letter dated July 3, the government states, for example, that "Dr. Wilson will testify to the following observations in this image: The crease on left lower abdomen; the crease created by the child's left arm and torso; the shading around area of neck and clavicles." Letter summarizing Dr. Wilson's testimony, dated July 3, attached hereto as Exhibit 2.

Presumably the prosecutor will elicit these observations with a question such as, "Other than observations you made regarding characteristics of the subject's age, what other observations did you make?" The answer would be irrelevant, absent some suggestion that these observations tended to make it more likely that the subject was a real child.

Dr. Wilson has no experience or training in the area of digital photography or computer graphics. <u>See</u> <u>United States v. Wilder</u>, 526 F.3d 1, 11 (1st Cir. 2008).[2] Thus, to the extent that her testimony would suggest that the images must be real simply

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[2] In <u>Wilder</u>, the Court of Appeals rejected the defendant's claim that the evidence presented was insufficient to prove that the subjects of the images were real children. The First Circuit did not address the question of whether Dr. Wilson's testimony was admissible.

because they look real, she cannot provide the threshold that this Court has required.

Finally, defendant objects to the government's proposal to elicit Dr. Wilson's opinion regarding "similar anatomical features, including birth marks and moles," that she observed when comparing the images in this case with so-called "reference images" identified by Dr. Vorder Bruegge. First, the government promised four months ago to provide "a more detailed breakdown of the similarities noted in the near future," id., but none has been provided to date. Second, defendant submits that the evidence is inadmissible under Fed. R. Evid. 403, as it seeks to give the imprimatur of medical science to something that is no more than a visual comparison of two images.

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>
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Certificate of Service

I hereby certify that this document, filed through the ECF system, will be sent electronically to the registered Participants as identified on the Notice of Electronic Filing (NEF) and paper copies will be sent to those indicated as nonregistered participants on November 5, 2008.

> /s/ Miriam Conrad

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