

IN THE HIGH COURT OF THE
HONG KONG SPECIAL ADMINISTRATIVE REGION
COURT OF FIRST INSTANCE
PROBATE ACTION NO.8 OF 1999

IN THE MATTER of the estate of WANG
TEH HUEI, deceased

BETWEEN

WANG DIN SHIN

Plaintiff

AND

NINA KUNG alias NINA T.H. WANG

Defendant

Coram: Hon Yam J in Court

Dates of Hearing: 6 August 2001 - 9 July 2002, 7 and 15 October 2002⁽ⁱ⁾

Date of Handing Down Judgment: 21 November 2002

J U D G M E N T

*"Man is a mere phantom as he goes to and fro :
He bustles about, but only in vain;
he heaps up wealth, not knowing who will get it."*

ii Psalm 39:6, (NIV)

(EXCERPTS)

Section III & IV Ink-Dating & Final Conclusion

List of abbreviations

ADR Alternative Disputes Resolution

ASTM American Society for Testing and Materials

Mr Brunelle Mr Richard L. Brunelle

Daubert *Daubert v. Merrel Dow* 509 US 579 (1993)

EJS	Mr Erich J. Speckin
EJS 1	First Report of Mr Erich J. Speckin dated 15 November 2000
EJS 2	Second Report of Mr Erich J. Speckin dated 19 February 2001
EJS 3	Third Report of Mr Erich J. Speckin dated 3 August, 2001
<i>Frye</i>	<i>US v. Frye</i> 293 F 1013 (1923)
JSM	Messrs Johnson Stokes & Master
MAFS	Mid-Western Association of Forensic Scientists Mr Lee Mr Huy Lee
PVT	Mr Peter Tytell R-ratio The rate of extraction
SOFIA	Society of Forensic Ink Analysts
STD	Standard deviation
TLC	Thin Layer Chromatography
VAM	Valid Analytical Measurement Programme
VNA	Dr Valery N. Aginsky

Chapter 1 - Prologue

1.1 Mr Teddy Wang Teh Huei ("Wang"), the deceased, was kidnapped on 10 April 1990. He did not appear again. On 22 September 1999, this court granted leave to his father, Mr Wang Din Shin ("Wang Sr"), the plaintiff herein, for him to swear to the death of the deceased to have occurred on or since 10 April 1990.¹

1.2 The deceased originally made a will in 1960 (prepared by Messrs P.C. Woo and Co.) and bequeathed all his estate to both the plaintiff and his wife Mrs Nina Wang also known as Madam Nina Kung Ru Xin, the defendant herein. By this 1960 Will, it was further provided that : "if there are children by my said wife [i.e. Mrs Wang] living at the

date of my death my said wife shall hold half share or part of the share so bequeathed to her UPON TRUST for my said children as tenants in common in equal shares".² The intention of the deceased there and then was clearly that the children's share should come out from the wife's half share rather than the father's half share.

1.3 Eight years later the deceased however made another will dated 15 March 1968, revoking his earlier will and bequeathing *all* his estate to the plaintiff only ("the 1968 Will"). The 1968 Will was prepared by Mr Donald Cheung ("Mr Cheung"), solicitor who also acted as one of the two attesting witnesses. The other attesting witness was Mr F. Zimmern, the other partner of his solicitors' firm. Mr Cheung gave evidence by video link from Vancouver in this trial. He described how he was instructed by the deceased and how the 1968 Will was prepared and executed. His evidence was not challenged on cross-examination. Consequently, the plaintiff has proven the due execution of this 1968 Will.

1.4 The plaintiff instituted the present proceedings on 24 September 1999 seeking a grant of probate in solemn form in respect of the 1968 Will.

1.5 The defendant filed a defence and counterclaim. The defendant alleges that there is in existence a later will in Chinese dated 12 March 1990. There are four documents ("the 1990 Documents/ 1990 Will"). The defendant is the sole beneficiary under this 1990 Will. She therefore counterclaims for a declaration in solemn form in favour of the 1990 Will and against the validity of 1968 Will.

MATTERS NOT IN DISPUTE

1.6 It is common ground between the parties' handwriting experts that the body of the questioned 1990 Documents A, B and C are not written by the deceased. It is also common ground that the author of the body of Document A is not the same as the author of Documents B and C, whereas the author of Documents B and C is probably the same person.

THE PLAINTIFF'S CASE

1.7 The plaintiff's case is that the 1968 Will is the last valid will of the deceased and that the 1990 Will was not signed by the deceased. In particular, the plaintiff alleged that neither the deceased nor the purported witness Mr Tse Ping Yim ("Mr Tse") signed the 1990 Will (Mr Tse was a domestic servant of the deceased and the defendant). The plaintiff alleged that their two signatures were forged.

1.8 The plaintiff's two handwriting experts (Mr Gus Lesnevich and Mr David Tsui) both opined that the signatures of both the deceased and the purported witness Mr Tse on the 1990 Will were forged. The plaintiff further called the Government Chemist Mr Patrick Cheng Yau Sang who is a handwriting expert in the document section of the Government Laboratory. He opined that the purported signatures of Mr Tse were forged

and that the purported signatures of the deceased on the 1990 Will "might not have been written by him".

1.9 The plaintiff's ink-dating expert Mr Erich J. Speckin opined that the 1990 Documents A and C were not written on or near the purported date in 1990 but at a later time "at least in 1996 or later".

THE DEFENDANT'S CASE

1.10 The defendant's three handwriting experts from the Mainland, who compiled one report, opined that both the signatures of the deceased and the witness Mr Tse on the 1990 documents were all genuine.

1.11 The defendant did not ask her expert to perform any ink-dating examination on the 1990 documents. However her two experts both asserted that the ink-dating methods performed by the plaintiff's expert were not reliable. One of the defendant's experts also expressed the view that the samples extracted from the questioned documents were contaminated during the process of examination.

1.12 In respect of Mr Tse's signatures, the defendant produced a statutory declaration of Mr Tse dated 6 September 1999 and his affirmation dated 9 September 1999 to the effect that he was asked by the deceased to sign his name on certain documents in the evening on 12 March 1990 inside the deceased's office. Since then Mr Tse passed away on 6 December 1999.

THE ISSUES

1.13 The first issue for the plaintiff as regards the 1968 Will is whether the 1968 Will was validly executed. At the trial this was not disputed by the defendant as appeared in no cross-examination of Mr Donald Cheung on this issue. Thus the remaining issue is whether this 1968 Will has been validly revoked by the 1990 Will.

1.14 As regards the 1990 Will, the main issues are :

(a)	whether the signatures of the deceased on the 1990 documents were signed by the deceased;
(b)	whether the signatures of the witness Mr Tse were genuine. This issue would not <i>per se</i> affect the validity of Documents A, B or C as a Will, but it would have some important bearings on the previous issue (a); and
(c)	whether the defendant could dispel all the suspicious circumstances surrounding the 1990 Will, including its execution and surfacing, and her subsequent conduct in propounding the 1990 Will.

1.15 In deciding the aforesaid issues, the court would have to decide the evidence given by all handwriting experts and the ink-dating experts. Before that, I shall consider

the background of the plaintiff's business and the business of the deceased leading up to his disappearance in April 1990 in the next chapter.

Chapter 18 - Ink-dating - The Analysis And Method

18.1 The plaintiff has instructed one Mr Erich J. Speckin ("EJS") from Michigan of the United States, who professed that he could identify whether a writing in ink was still in the drying process or was completely dry.

THE ANALYSIS

18.2 On 1 August 2001 a quantity of small microplugs was removed by EJS from designated characters in Documents A, B, C and D where there was ink-writing and they were separated into vials containing six plugs each.

18.3 Upon analysis, EJS found (which is not disputed by the defence) that Documents A and B were written by the same type of ink viz. Formulab ink, and Document C was written by ink of a different formulation viz. Papermate. The ink used for Documents A and B were manufactured in 1982. Both the Formulab ink and the Papermate ink used were commercially available in 1990.¹ The Papermate ink is still available commercially today.²

18.4 I accept the plaintiff's submission that, although there is no direct evidence available on this point, if it is established that both Documents A and C were written sometime in or about 1996, then it is extremely unlikely that Document B would have been written in 1990 or before. In fact for the same reason it is probable that Documents A and B were written at or about the same time. This is because :

(a)	On the defendant's case especially the suggestion that it was Tse Ping Yim who witnessed the deceased's signatures on all four documents at the same time in March 1990, the four documents should have come into existence at more or less the same time; and	
(b)	It is most likely that Documents A and B were written by the same pen at about the same time since :	
ii	(i)	the ink on both documents was of the same make and the same year; and
ii	(ii)	the writing on both Documents A and B showed the same phenomenon that the flow of the ink in the pen was not smooth. This could be seen from the much lighter colour in the characters after the pen had been used for writing for a short while.

THE METHOD

Three different methods were used:

(a)	The rate of extraction (i.e. R-ratios) would measure the rate at which the dyes in the ink were extracted in a weak solvent by taking samples at different time intervals.
(b)	The percent of extraction would measure the ratio of the amount of ink that could be extracted in a weak solvent and the same would be compared to the total amount of ink on the paper which was extracted by using a strong solvent.
(c)	The Dye-ratio would measure the relative concentration of each dye to one another.

THE RESULTS

18.12 The data from the R-ratios, Percent Extraction and Dye-ratio were analysed statistically to determine if the differences were statistically significant or not. The standard threshold used was one standard deviation ("one STD"). EJS contended in his First Report ("EJS 1") dated 15 November 2000 that⁹ :

"the data obtained for the rate of extraction, percent extraction and dye-ratio meets this threshold of analysis 'significant statistical difference', meaning in this case that the samples tested from documents A and C were not dry. Based on these differences it is my opinion, the question documents were not written on or near the purported dates but at a later time at least in 1996 or later."

18.13 EJS submitted a Second Report ("EJS 2") dated 19 February 2001 and a further Third Report ("EJS 3") dated 3 August 2001. I shall consider them hereinbelow when the validity of EJS's method and results are considered.

18.14 EJS contended that his conclusion was drawn upon results he obtained from the Dye-ratio method, which he claimed to be a well-established method having been in use worldwide (including law enforcement agencies in the United States) for many years, and accepted universally by the scientific community at large and numerous courts at various levels in the United States and in other countries.¹⁰ He said that the research has already been done to show the reliability of the relative ink-dating procedures using the Dye-ratio method of analysis,¹¹ and that the data collection in this case was performed on accepted standards in the field of forensic ink analysis and in a manner that has been tested and proven reliable on many occasions in the past.¹²

18.15 He claimed that there are many publications that show the method utilized by him in this case is valid, reproducible, and reliable.¹³

18.16 He contended that he has personal knowledge of at least two cases in which the United States Secret Service has performed testing in the same manner as he performed in this case and it has used this technique between 1995 and today.

18.17 In the end, EJS also contended that his testing is based upon sound objective scientific testing and his opinion is based upon sound scientific principles.

THE DEFENCE

18.18 The defence contended otherwise. They said that the contrary is true, EJS was cross-examined in depth and the defence called two experts, Dr Valery N. Aginsky ("VNA") and one Mr Peter Tytell ("PVT"). They did not perform any tests on the documents but they have put in reports in contradiction to EJS's reports with their critical analysis.

18.19 Before I consider the validity of the methods and findings of EJS and their scientific theory and validity, I would like to approach the problem from a layman's point of view first which I think ordinary people would understand. This is what the defence called "the true proficiency or blind test".

Footnote:

1 p.409, E4-E5

2 p.409, E4-E5 and T35:62:9

3 p.409, E4-E5

4 T35:54-55

5 p.923, E13

6 T35:58-61

7 T35:61:17-62:10

8 T35:62:18

9 p.413, EJS 1, E4-E5

10 para.5, p.909, EJS 3, E13

11 para.15, p.885, EJS 3, E13

12 para.42, p.897, EJS 3, E13

13 para.47, p.898, EJS 3, E13

Chapter 19 - The True Proficiency Or Blind Test

19.1 The defence solicitors JSM instructed a firm called fJ Cleveland, who is a patent agent. fJ Cleveland wrote to EJS and under the disguise that they had a certain problem in 12 documents, or 12 signatures in 12 documents, which they would like to date, i.e. whether they were made recently or some years ago. In short, this is, to put it crudely, a sort of "set-up" made by the defence in order to find out whether or not the method used by EJS for ink-dating is valid, reliable and accurate.

19.2 The test was conducted in January 2001. EJS used two out of the three relative aging methods, namely, R-ratio and Percent Extraction methods. There was no mention of the Dye-ratio method until much later after the examinations.

19.3 The results of EJS's "proficiency" tests are as follows¹ :

<u>Samples</u>	<u>EJS's Conclusion</u>	<u>Date on Documents (Not disclosed to EJS)</u>	<u>Result</u>
1	dry	12 October 1998	wrong
2	dry	10 January 1990	correct
3	dry	18 June 1998	wrong
4	dry	29 July 1994	correct
5	dry	2 August 1994	correct
6	dry	25 and 26 May 1989	correct
7	dry	5 July 1989	correct
8	dry	9 August 1990	correct
9	dry	11 December 1996	correct
10	dry	3 March 1999	wrong
11	dry	5 June 1990	wrong
12	dry	13 November 1993	correct

There was no challenge by the plaintiff as to the dates of each and every document used by fJ Cleveland and they were sampled from letters of these various dates they have kept in their respective files. I accept the defence submission that Mr Cleff's affirmation (for fJ Cleveland) has established the dates of the aforesaid documents beyond any doubt. He was even offered to be cross-examined by Counsel for the plaintiff when his affirmation was already admissible because he was beyond the sea, but this offer was not taken up.² Those appalling allegations against Mr Cleff and the solicitors handling the case from Messrs Johnson, Stokes & Master amounted to allegations of dishonesty, fraud, forgery, and/or attempting to pervert the course of justice, should not have been made by the plaintiff's side. They are made without a shred of proof at all.

19.4 EJS concluded that³ :

"A relative ink aging examination was conducted on *each* ink found on *each* piece of paper within the 12 envelopes. Since most inks take approximately 3 to 3 1/2 years to dry completely on paper, if the writings were written within the last three years the ink should still be in the drying

process and show differences dry or near dry. In this case, the [sic] *all* inks were found to be dry and showed no evidence of still being in the drying process except sample #11. Sample #11 showed some indication that it was still in the drying process, [sic] however due to the amount of overall evidence it cannot be concluded to any degree of certainty that this ink is still in the drying process. The difference in values obtained in the relative ink aging analysis (except for sample #11) showed no indication that the ink was still in the drying process.

Based on the above testing, it is my opinion that the writings were written at least 3 to 3 1/2 years ago." [emphasis added]

19.5 The defence contended that EJS was marked at 67% as the probability that he would wrongly date an ink is one out of three. However, in my view the matter is more serious than this. The result should be an accurate one and there should not be any mistake at all in order to be certain that the method is reliable. Otherwise when the dates of documents are not known, it would not be certain which result is reliable and which result is not. The result of this so-called "proficiency" test shows that the conclusion of EJS cannot even satisfy the civil standard of a balance of probability, i.e. it cannot be said that "*all 12 signatures in these 12 documents were probably dry except Sample #11*". The aforesaid contention containing two elements are both wrong! Thus, in my view, the defence is very lenient in their submission that EJS was marked at 67%. In fact when both elements in the aforesaid contention are wrong, EJS is 100% incorrect in his concluding statement.

19.6 Sample #11 is of particular importance and significance to this case. EJS said :

"The sample of ink in sample #11 is more likely than not, still in the drying process at the time the testing was performed, [sic] this means that the ink is less than three and one half years old."

and

"Based on this and the ink dating results that were obtained, the ink in sample #11 was not dry. Therefore, the conclusion is that the ink was not written eleven years ago, but was written sometime in the last three and one-half years."

19.7 The document from which Sample #11 was obtained was dated 5 June 1990, which was about three months after the stated date on the 1990 Will. EJS concluded that the ink on Sample #11 was still in the drying process and must therefore be less than three to three and half years of age. But in fact, the document and the signature thereon had been in existence for 11 years. I fully accept the defence submission that on the basis of this error alone, this court should be slow in accepting EJS's evidence in this case, in particular, his conclusion that the 1990 Will was not written on or near 10 April 1990 "but at a later time at least in 1996 or later".

19.8 Further, the ink-dating examinations were conducted under similar circumstances in both cases.

19.9 Further, the same statistical analysis was performed and the conclusions were both drawn at "one standard deviation" to determine if there was a "significance statistical difference".

19.10 EJS did not use the Dye-ratio method in his "proficiency" test. He never advised fJ Cleveland of its availability⁴ even when he was asked what additional examinations he could undertake to date ink on the documents. He expressed the following view of the Dye-ratio method only when fJ Cleveland explicitly asked of "the dye method", namely⁵ :

"The dye ratio is another method of relative ink age analysis that can be used in conjunction with the rate and percent extraction that were used in this case. This would have added to the expense and is not typically the most discriminating test. It could have been run and could still be run. It is possible that this method would show differences that the other methods did not show in the other 11 samples. The primary reason for not performing this test is cost to benefit ratio."

19.11 However, in his cross-examination, he gave the following contrasting view⁶ :

"Q.	Before you started this test, or any test for that matter, do you know which of the three tests is likely to be more discriminating?
A.	No.
Q.	You do not?
A.	No.
Q.	You do not say, because of the age of the ink, this one is likely to be more discriminating than the other?
A.	I would say if you have an ink that is very close to the end of the drying process that typically the dye-ratios would be, but not always. For instance, the Bic black example that I just gave - it would not be the dye-ratios. So you have an idea, but you cannot be certain that one would be more discriminating than others."

19.12 But in fJ Cleveland's first letter to EJS dated 3 October 2000, it was stated that⁷ :

"The purpose of this preliminary enquiry is to ask whether your laboratory undertakes this type of work, and secondly, what the approximate costs are likely to be in examining 10 to 12 signature inks on various documents which are alleged to have been signed over a period of 12 years or so."

19.13 In short, EJS was or should be aware that he might be dealing with "old" inks. In other words, EJS would or should have examined the 12 samples with the Dye-ratio

method or at least, advised fJ Cleveland of its availability and use, should he be concerned with the "cost to benefit ratio".

19.14 In EJS3, he said⁸ :

"... each test (rate of extraction, percent extraction, and dye ratios) is independent of the others. The tests do measure different parameters of the ink."

In that case, that would be an additional reason for EJS to conduct the examinations with the Dye-ratio method, which he did not.

19.15 In EJS2, he said⁹ :

"The data from all three methods was evaluated and the Dye-Ratio method is the method that leads to the conclusion that the documents were not written on the dates that they purport to have been written. *It is common for only one method to show a significant statistical difference while the other two methods overlap.*"

19.16 However, in his evidence, he gave the following contrary views¹⁰ :

"If the rate and per cent [sic] extraction do not show a difference, typically it is not. The only time it ever is found to be - or I should not say "the only time", but in general - *is when you are dealing with an old ink, the rate of extraction and per cent [sic] extraction may be at the end of their curves and then it can be more discriminating. But typically, the rate or per cent [sic] would show a difference.*"

and¹¹ :

"Because I just said that, based on my experience, *[the Dye-Ratio method] is not typically the most discriminating test. In some instances, it is. Typically, if you see a difference with the dye-ratios, you will see it with the rate or the per cent [sic] as well. You do not always, but typically that is the case.*"

19.17 There is no justification for these different and opposite approaches as submitted by the defence and, as EJS submitted, there is nothing atypical about this case.

19.18 In view of his failure in the "proficiency" test, EJS made four contentions thereto. *First*, he claimed that the conclusion was *not* strong to a reasonable degree of certainty.¹³ However, in EJS 3 when he adopted one standard deviation he said that the opinion stated was *"to a reasonable degree of scientific certainty"*.¹⁴

19.19 *Secondly*, EJS blamed the fact that the instructions given to him were unclear. However, from the documents before me, it is quite clear that the instructions were clear or as clear as EJS stated : *"That all these documents are questioned, and let us see if we can find anything about them"*.¹⁵

19.20 *Thirdly*, EJS blamed fJ Cleveland for not giving him "a relevant timeframe and information about the samples, as to what the sides are, how to interpret it."¹⁶ However, if the method is accurate and reliable and it can determine the age of the ink as alleged, in the absence of any evidence of such prerequisite, it should not be necessary for the examiner to be given the "relevant timeframe ... as to what the sides are".

19.21 *Lastly*, EJS claimed that he was under the "misapprehension" that all 12 documents were prepared around the same time, which he claimed was the basis on which he drew his conclusion for his "proficiency" test.¹⁷ There was in fact no "misapprehension" in EJS's conclusion for his "proficiency" test, as it was stated by him that¹⁸ :

"all inks were found to be dry and showed no evidence of still being in the drying process except sample #11."

19.22 The sequences of exchanges between the parties all show that EJS changed his opinion to his client's, or what he perceived to be his client's need as follows :

Re : Sample #11 :

(a)	EJS's initial conclusion was that ¹⁹ : despite the indication that it was still in the drying process, it could not be concluded that the ink on Sample #11 was still in the drying process due to the amount of the overall evidence.
(b)	Letter from fJ Cleveland, dated 25 May 2001 ²⁰ : "... However, as you have probably gathered, the question is raised as to whether your tests can show that any of these documents are less than four years old. A finding that any of these documents were written within the time period you have indicated of 3 1/2 years would be of considerable significance. Your finding that one signature is still drying is of particular interest, especially bearing in mind the nature of the document itself. Because of the particular nature of this document, we would like to pursue the matter as far as possible and as indicated in our earlier letter, it is agreed that the remainder of the signatures could, if necessary, be submitted for further study if that is likely to assist your analysis."
(c)	Letter from EJS, dated 25 May 2001 ²¹ : "3. The testing showed that one of these documents is still in the drying

	process. The sample of ink in sample #11 is more likely than not, still in the drying process at the time the testing was performed, this means that the ink is less than three and one half years old."
(d)	Letter from fJ Cleveland, dated 8 June 2001 ²² : "Point 3 - Hopefully the knowledge that this document is said to be eleven to twelve years old may assist further. ..."
(e)	Letter from EJS, dated 12 June 2001 ²³ : "3. Based on this and the ink dating results that were obtained, the ink in sample #11 was not dry. Therefore, the conclusion is that the ink was not written eleven years ago, but was written sometime in the last three and one-half years."

19.24 In conclusion, in light of EJS's failure in the "proficiency" test, I accept the defendant's submissions that the court should reject EJS's opinion offered in this case for the following reasons, inter alia :

(a)	EJS's method has proven to be unreliable in light of his failure in the "proficiency" test.
(b)	EJS failed to date an ink on a letter which was written about three months after the date of the 1990 Will.
(c)	The Dye-ratio method was not "typically discriminative", and there was no sound scientific justification as to why in this case, a conclusion drawn on the basis of this method should be received in favour of the overwhelming negative results obtained from the Dye-ratio method as well as the other four methods.

19.25 Before I shall consider other aspects of EJS's method and its reliability and validity, I shall first of all consider the legal position of expert's evidence first in the next chapter.

Footnote:

1 pp.2327-2328, G9 and p.3075, G10, JMC-14

2 T47:60:7-13

3 p.3075, G10, JMC-14

4 pp.3023-3024, 3028-3029 and 3033, G10, JMC-10

5 pp.3105-3107, G10, JMC-15

6 T38:23:6-20

7 p.3020, G10, JMC-10

8 para.46, p.898, EJS 3, E13

9 p.433, E4-E5, EJS 2

10 T47:44:13-20

- 11 T47:110:7-12
- 12 pp.3088-3108, G10 at p.3104 and confirmed on T47:87:17-22
- 13 T47:74:12-20
- 14 para.20, p.888, EJS 3, E13
- 15 T47:60:5-6
- 16 T47:79:15-17
- 17 T47:91:10-19
- 18 p.3075, G10, JMC-14
- 19 p.3075, G10, JMC-14
- 20 pp.3093-3094, G10, JMC-15 at p.3093
- 21 pp.3097-3098, G10, JMC-15
- 22 pp.3099-3101, JMC-15, G10
- 23 pp.3103-3104, JMC-15, G10
- 24 p.3075, JMC-14, G10
- 25 pp.3089-3090, JMC-15, G10
- 26 pp.3093-3094, JMC-15, G10
- 27 pp.3097-3098, JMC-15, G10
- 28 pp.3099-3101, JMC-15, G10
- 29 pp.3103-3104, JMC-15, G10
- 30 pp.3088-3108, G10 at p.3104 and confirmed on T47:85:5-87:22

Chapter 20 - The Law

20.1 *In The Ikarian Reefer* [1993] 2 Lloyd's Reports 68, at 81-82, Cresswell J formulated the duties of an expert and what is expected of him as follows :

"The duties and responsibilities of expert witnesses in civil cases include the following :

1.	Expert evidence presented to the Court should be, and should be seen to be, the independent product of the expert uninfluenced as to form or content by the exigencies of litigation (<i>Whitehouse v. Jordan</i> , [1981] 1 W.L.R. 246 at p.256, per Lord Wilberforce).
2.	An expert witness should provide independent assistance to the Court by way of objective unbiased opinion in relation to matters within his expertise (see <i>Polivitte Ltd. v Commercial Union Assurance Co. Plc.</i> , [1987] 1 Lloyd's Rep. 379 at p.386 per Mr. Justice Garland and <i>Re J</i> , [1990] F.C.R. 193 per Mr. Justice Cazalet). An expert witness in the High Court should never assume the role of an advocate.
3.	An expert witness should state the facts or assumptions upon which his opinion is based. He should not omit to consider material facts which could detract from his concluded opinion (<i>Re J sup.</i>).
4.	An expert witness should make it clear when a particular question or issue falls outside his expertise.
5.	If an expert's opinion is not properly researched because he considers that insufficient data is available, then this must be stated with an indication that the opinion is no more than a provisional one (<i>Re J sup.</i>). In cases where an

	expert witness who has prepared a report could not assert that the report contained the truth, the whole truth and nothing but the truth without some qualification, that qualification should be stated in the report (<i>Derby & Co. Ltd. and Others v Weldon and Others</i> , The Times, Nov. 9, 1990 per Lord Justice Staughton).
6.	If, after exchange of reports, an expert witness changes his view on a material matter having read the other side's expert's report or for any other reason, such change of view should be communicated (through legal representatives) to the other side without delay and when appropriate to the Court.
7.	Where expert evidence refers to photographs, plans, calculations, analyses, measurements, survey reports or other similar documents, these must be provided to the opposite party at the same time as the exchange of reports (see 15.5 of the Guide to Commercial Court Practice)."

20.2 The aforesaid observations had been adopted by the Court of Appeal in England in *Stanton v. Callaghan* [1998] 4 All ER 961, at 991a and, specifically, *post-Woolf reforms*, in *Stevens v. Gullis* [2000] 1 All ER 527. In the *Chief Justice's Working Party on Civil Justice Reform*, paragraphs 496 and 497, it was said :

"496. After the CPR came into operation, in the English Court of Appeal's decision in *Stevens v Gullis* [2000] 1 All ER 527, Lord Woolf pointed out that the duties in *The Ikarian Refeer* continue to be reflected in, and given emphasis by, the new rules.

497. Reforms adopted in various jurisdictions all begin with the same premise, namely, that the function of the expert is to help the court by providing independent and impartial advice - not to act as an advocate for his client. This is reflected in rules which emphasise that the expert's duty to the court overrides his duty to his client."

20.3 The Court's approach to the reception and evaluation of expert testimony was stated in *Davie v. Magistrates of Edinburgh* [1953] SC 34, at 40 :

"Expert witnesses, however skilled or eminent, can give no more than evidence. They cannot usurp the functions of the jury or Judge sitting as a jury, any more than a technical assessor can substitute his advice for the judgment of the Court. Their duty is to furnish the Judge or jury with the necessary scientific criteria for testing the accuracy of their conclusions, so as to enable the Judge or jury to form their own independent judgment by the application of these criteria to the facts proved in evidence. The scientific opinion evidence, if *intelligible, convincing* and *tested*, becomes a factor (and often an important factor) for consideration along with the whole other evidence in the case, but the decision is for the Judge or jury."
(my emphasis)

This authority was followed in Hong Kong in a case of *R. v. Yeung Kwok Fai* [1996] 1 HKC 754, at 757H-1 and also in Australia in :

(a) *R. v. O'Callaghan* [1976] VR 676, and

(b) *R. v. Lucas* [1992] 2 VR 109.

20.4 In the United States, two cases have been referred to in evidence as setting the standards for admissibility of scientific evidence in the United States :

(a) *US v. Frye* 293 F 1013 (1923) ("*Frye*"), and

(b) *Daubert v. Merrell Dow* 509 US 579 (1993) ("*Daubert*").

20.5 *Frye* was a case concerning the admissibility of polygraph or lie-detector tests. What is referred to as "the *Frye* test" is satisfied if the scientific theory advanced is established to have gained general acceptance in the particular field in which it belongs. Thus, the "general acceptance" theory is still the underlying basis for the admission of scientific theories in the United States. The *Frye* test has been stated to be in accord with the approach in England in the following cases :

(a) *R. v. Gilfoyle*, *The Times*, 13 Feb 2001 per Rose LJ, and

(b) *R. v. Clarke* [1995] 2 Cr. App. R 425.

20.6 *Daubert*, to some extent superseded *Frye* in the United States, because thereafter the Federal Rules of Evidence were promulgated which had some limiting effect. The US Supreme Court in *Daubert* held that the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant but reliable. Proposed scientific testimony must be supported by appropriate validation, that is good grounds, based on what is known to science. The law requires that expert scientific testimony pertains to "scientific knowledge" and establishes a standard of evidentiary reliability, i.e. trustworthiness. Evidentiary reliability is based on scientific validity. Thus, in effect, *Daubert* added reliability to the requirement of general acceptance in *Frye*.

20.7 In the more recent case of *Nelson v. American Sterilizer Co.*, 223 Mich. App. 485 (1997), the Court emphasised on the proposed testimony of an expert must be derived from "recognized scientific knowledge" and the inferences or assertions must be supported by appropriate objective and independent validation based on what is known in scientific and medical literature.

20.8 From the aforesaid authorities, I accept the submissions of the Counsel for the defendant, Mr Clive Grossman, SC, who appeared together with Ms Alice Lee (in this area of ink-dating only), that certain principles may be derived, and each and all of which must be fulfilled if the Court is to accept the evidence of a specific scientific theory, novel or not :

(a)	The person propounding the scientific theory must have the necessary qualifications, expertise, experience and integrity to ensure that the Court can have confidence that his testimony is worthy of consideration.
(b)	The theory must have a sound scientific basis, comprehensible to the Court.
(c)	The theory should have gained widespread support amongst that sector of the scientific community which would be likely to utilise it or its results.
(d)	The methods used to carry out the scientific test should be safe and reliable, and follow an established protocol, i.e. one that has been published, disseminated and acknowledged to be reproducible.

20.9 The defence submitted that EJS's evidence fails at every single hurdle. I shall consider in the next chapter whether that is the case and I shall start with the underlying scientific theory of the Dye-ratio method. But before I do, I should point out that Counsel for the plaintiff did not submit otherwise contrary to the defence submissions hereinbefore.

20.10 They only drew the Court's attention to the decision of the Court of Final Appeal in *Aktieselskabet Dansk Skibsfinansiering v. Brothers & Others* (2000) 3 HKCFAR 70, where the Court of Final Appeal reiterated the importance of putting to witnesses things which the Court is invited to make findings adverse to the opposite party. In that case, because the allegation was not sufficiently and clearly put to the party Mr Brothers, the Court of Final Appeal had taken the unusual course of reviewing concurrent findings of fact in the courts below and reversed it. Lord Hoffmann NPJ said, at p.91J :

" In addition to particularity in the pleadings, fairness requires that the adverse findings which the Judge will be invited to make should have been put squarely to the witness in cross-examination, so that he can have the opportunity to offer an explanation."

20.11 Lord Hoffmann NPJ in fact considered all other relevant pieces of evidence concerning the issue of whether Mr Brothers had dishonestly concealed the cash flow position of the borrower company. His Lordship said at p.92A that :

"The Court has examined in detail the relevant parts of the cross-examination of Mr Brothers and I cannot find any place in which the two allegations about his state of mind were adequately put to him."

20.12 His Lordship then examined in detail all the pieces of evidence (see pp.92-96) and came to the conclusion that the evidence to contradict Mr Brothers is insubstantial, and thus the lender company Aktieselskabet Dansk Skibsfinansiering had failed to discharge the burden of proof that Mr Brothers "deliberately withheld the cash flow and, notwithstanding his belief in support, he was dishonest in doing so".

20.13 The plaintiff relied on the case of ADS v. Brothers and submitted that some of the allegations against Mr Speckin have not been put to him. I shall examine the evidence in the following chapters the effects of such failure.

Chapter 21 - The Underlying Scientific Theory Of The Dye-ratio Method

21.1 The Dye-ratio method was developed by a Mr Richard Brunelle ("Mr Brunelle") and a Mr Huy Lee ("Mr Lee"), who was then only a student. The scientific basis upon which the Dye-ratio method is founded can be found in "*Determining the Relative Age of Ballpoint Ink Using a Single-Solvent Extraction, Mass Independent Approach*".¹ This paper appears to be the only paper which discussed the underlying theory of the Dye-ratio method.

21.2 At pages 746 and 748, Brunelle and Lee said :

"Methanol is a fairly strong solvent for extracting ballpoint inks, yet it still produced a good aging curve in Fig.10. It was this finding that led to the *speculation* that *perhaps* subtle dye deterioration *or* fading *or* both *may* also be a factor of aging.

.....

Therefore, the authors *believe* that *extractability* and subtle fading/*decomposition of dyes* are both aging factors ..."

21.3 Thus, the two hypotheses presented for the Dye-ratio method are :

(a)	The ratio of dye-ratios changes as a consequence of changes in their <i>extractability</i> as the ink ages on paper (the "First Hypothesis"); and/or
(b)	The ratio of dye components changes as a consequence of some of them <i>decompose</i> with age (the "Second Hypothesis").

In short, according to Brunelle and Lee, the Dye-ratio method purports to measure the *extractability* of dye components, or the *decomposition* of dye components, *or* both, with a view to determining the age of ink.

21.4 However, whilst no results were presented by Brunelle and Lee to verify the First Hypothesis, VNA pointed out² that their experimental data presented in this paper did verify the Second Hypothesis. Each of the two Hypotheses are considered in turn hereinbelow.

THE FIRST HYPOTHESIS (EXTRACTABILITY)

21.5 VNA considered that the First Hypothesis should be rejected.³ He said that generally ballpoint inks consist of three main ingredients, namely :

- (a) Dyes;
- (b) Solvents (which are used to dissolve or disperse the dyes); and
- (c) Resins (which are used to thicken the inks).

21.6 As soon as the ink is placed on paper, various processes of aging will start. These processes would include :

- (a) gradual decomposition of some or all ink dyes;
- (b) evaporation of solvents; and
- (c) hardening of ink resins.

21.7 The ink will become harder to extract in weak solvents as it ages, as a consequence of the age-transforming process of the hardening of ink resins. VNA considered that only the solubility of ink resins changes (decreases) with time, whilst the solubility of dye components remains constant as the ink ages. The extractability of dye components also decreases with time, but this is only because the dye components become more difficult to be extracted from the hardening or hardened (depending on the age of the ink) "matrix"-ink resin.

21.8 Extraction of ink in weak solvents is a complex process. Dye components are sort of "trapped" in ink resins. Therefore, before the dye components may be extracted, the ink resin has to be dissolved. However, the solubility of ink resin differs by a number of factors including the type of ink resin, the age of the ink and the strength of the solvent used for extracting the ink. As the ink ages, its ink resin also hardens. It follows that the older the ink, the harder thus the longer it will take to dissolve the ink resin. But when the ink resin is gradually dissolved, the dye components start to come into contact with the extracting weak solvent. VNA described it as "layer by layer" by using a simplified example illustrated at G11, p.3229. The trouble is if the solubility of dye components in weak solvent :

(a)	is not too weak to make it an irrelevant factor for consideration, and
(b)	does not differ dramatically for different ink dye components (bearing in mind that solubility is a physical property which remains constant irrespective of the age of the ink),

the dye components will be dissolved very quickly.

21.9 In other words, as VNA explained in evidence, when an aging ballpoint ink is being extracted in a (weak) solvent, the main limiting factor for it to be extracted quickly is the dissolution of the hardening or hardened, if the ink has already ceased aging, ink resin. As far as the ink dye components are concerned, their rate of extraction or their

extractability is *a priori* significantly larger than the rate of extraction of the hardening or hardened ink resin. For this reason, the rate of extraction of the ink dye components would depend only on the solubility of the ink resin in the weak solvent (provided, of course, the dyes are also soluble in the weak solvent), which in turn, depends on the age of the ink. In short, the extractability i.e. the rate of extraction of the ink dye components will practically be equal to the extractability or rate of extraction of the ink resin.

21.10 As VNA pointed out, the experimental results published in Brunelle and Lee's paper show that the Dye-ratio method was not measuring changes in the extractability of the dye components, but the decomposition of dye components, as the ink ages⁴ (i.e. the Second Hypothesis as explained hereinbelow). This is because the extractability of dye components is not an aging factor.⁵ These will be considered further below.

21.11 Thomas Andermann and Roderick Neri published a paper in which they said they also had difficulty in understanding why the extractability of a dye component, methyl violet homologues (which are used by Mr Brunelle in all his papers to demonstrate the validity of the Dye-ratio method) should change as the ink ages on paper, given that the methyl violet homologues are chemically closely-related substances, and therefore have almost identical physical and chemical properties, including their solubility in butanol and other solvents.⁶

21.12 By reason of the aforesaid matters, the First Hypothesis that the Dye-ratio method measures the difference in the extractability of dye components in ink on the premise that the extractability of dye components will change or decrease differently as the ink ages, must not be accepted. There is no scientifically sound explanation and it has not been supported by any published experimental data.

THE SECOND HYPOTHESIS (DECOMPOSITION)

21.13 The Second Hypothesis is that some ink dye components decompose as the ink ages, hence the change in ratios of dye components in an ink. Using this property of the dye components, EJS claimed that one can, therefore, determine the age of an ink by measuring the change in dye ratio due to the decomposition of dye components.

21.14 Thus, the Dye-ratio method measures the decomposition of ink dye components as follows⁷ :

(a)	VNA showed that all published experimental data related to the Dye-ratio method clearly indicate that what this method actually measures is changes in the relative content of ink dye components as a consequence of the gradual decomposition of some ink dyes as the ink ages. ⁸ It is suggested therefore, that the Second Hypothesis can be accepted. However, whilst this is the case, the decomposition of dye components could <i>not</i> be used for the purpose of determining the age of an ink as this process continues indefinitely and does <i>not</i> depend on the age of the ink.
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(b)	The experimental data obtained by Brunelle and Lee verified the validity of the Second Hypothesis. They obtained the two dye-ratio aging curves for Formulab 587 black ballpoint ink as shown in Figure 11 at p.748 in E7-E10.
(c)	The upper curve shows the dye-ratios using pyridine, a "strong" solvent, and the lower curve shows the dye-ratios using n-butanol, a "weak" solvent. Both curves show similar shape. It means that the strength of the extracting solvent has no effect on the relationship between the dye-ratio and the age of the ink. <i>Therefore, the Dye-ratio method does not measure the extractability of dye components in ink, but their decomposition.</i>
(d)	In VNA's research paper : " <i>A Microspectrophotometric Method for Dating Ballpoint Inks - A Feasibility Study</i> ". ⁹ VNA's findings are in agreement with the results published in Brunelle and Lee's paper. VNA conducted the experiments which measured the ratios of ink dye components as a function of aging of ink as Brunelle and Lee did, using a different analytical method, i.e. microspectrophotometry. He found that whilst the ratio of comparatively unstable methyl violet and stable copper phthalocyanine dyes gradually decreases with age during a six-year period i.e. (up to six years old writings) made by a Parker blue ballpoint ink were available in that study, <i>no satisfactory correlation was established between the age of the ink analysed and the content of its dye components.</i>

21.15 Even in the aforesaid paper of Brunelle and Lee, it also confirmed that ink takes more than five years to "dry".

21.16 VNA pointed out in his evidence that neither of the aging curves in the said Figure 11 show any indication of levelling off after a five-year period of time.¹⁰ This is a clear indication that the process of decomposition of ink dyes components will continue and does not stop (or in the case of Formulab 587, does not even slow down) after five years contrary to EJS's claim that this process will stop after three to three and a half years. This is also in agreement with VNA's own finding that the decomposition of dye components does not stop after six years.¹¹ As VNA said¹² :

"But the problem is that this process does not stop after 3 years, 3 1/2 years, or 4 years that are used by Mr Speckin to draw a conclusion that the ink [on the document] is still in the aging process. This decomposition goes further and it does not stop after 5, 6, 10, 20 or 30 years; *it is a process that we cannot even find out when it will stop.*"

21.17 In light of the continuing process of decomposition of dye components, which process has no means of determining its termination, it is not possible to obtain a reference sample of an unknown ink (which has reached the end of its natural aging curve with the age of the ink known to us), to which samples under examination could be compared. Thus, although the Dye-ratio method does measure the decomposition of dye components, it could not measure the age of the ink or it cannot be certain whether

certain ink is beyond five or other years of age and definitely could not determine whether the ink is or is not more than three or three and a half years old.

21.19 Thus in conclusion in respect of the Second Hypothesis, on one hand, the Dye-ratio method measures decomposition of dye components and this hypothesis can be accepted because its validity has been established and verified by the published experimental results obtained independently by Brunelle and Lee and by VNA. However, on the other hand, the decomposition of dye components *cannot* be used as a reliable parameter for the purpose of determining the age of an ink because :

(a)	The process of decomposition will not stop and does not even slow down as shown by Brunelle and Lee, and VNA after five or six years; and/or
(b)	In light of the existence of the sources of errors as discussed above.

21.20 In reply, counsel for the plaintiff submitted that the allegation of the behaviour of the resin and the ink dye in solvent was not in VNA's Report nor was it fully put to EJS. Whilst I would accept that it is something less than what would be desired, the circumstances of this case is somewhat different from the case of *ADS v. Brothers*.

21.21 EJS was in Court whilst VNA was cross-examined. EJS's answer to VNA's allegation of the behaviour of resin can be put to him. (This was done in respect of other points not specifically or fully put to EJS by the defence.) In the end, it would depend on the soundness of the reason or the lack of it and not on the demeanor of the witness. Thus, in spite of the failure of the defence in putting fully this allegation to the plaintiff's expert, I find the contention of VNA has casted grave doubt on the scientific validity of the Dye-ratio method.

Footnote:

1 pp.736-753, E7-E10

2 T57:20:11-22:24

3 T51:11:17-12:11

4 T54:28:7-31:15, T57:20:11-22:24

5 See Figure 11 at p.748, E7-E10 (VNA 2)

6 pp.781-797, E7-E10 (VNA 2)

7 T51:12:12-14:3

8 T54:28:7-31:15, T57:20:11-22:24

9 pp.693-697, E7-E10 (VNA 2)

10 T54:30:20-31:11

11 p.694, E7-E10, Figure 2 in VNA-4 (VNA 2), and T57:23:15-24

12 T51:12:25-13:6

Chapter 24 - Arbitrary Separation Of Fused/Overlapped Chromatographic Peaks

24.1 The chromatographic peaks shown on EJS's densitochromatograms were not smooth and bell-shaped but they were like a "range of mountains". EJS did not know why they were so overlapped.¹ Thus they required him to manipulate the integration marks between the poor separation of the dye components or chromatographic zones on the TLC plates he developed. VNA has the strongest objection in this kind of manipulation. He considered that in no circumstances should EJS have manipulated with the raw data provided by the video densitometer by arbitrarily separating almost completely fused/overlapped peaks on the densitochromatograms. As a consequence of him doing so, the data upon which he conducted statistical analysis are subjective, possibly pre-determined and therefore utterly unreliable.

24.2 VNA is an acknowledged world expert in chromatography. He explained that the prerequisite of obtaining reliable data/results was that the chromatographic peaks have to be properly resolved to the baseline, if the purpose of their analysis is to obtain *quantitative* data. The very basis of chromatographic technique is to separate one substance from another. The dye components on the TLC plates should be well separated and the peaks on the densitochromatograms should be resolved to the baseline. VNA said his contention is borne out by all the articles and textbooks on chromatography, some of which were exhibited.² The problem of analysing fused chromatographic peaks is summarised as follows³ :

"The experimental errors in the determination of the area of fused non-Gaussian peaks are so large as to shed doubt on the usefulness of such methods for quantitative purposes."

24.3 Contrary to what EJS had argued, VNA said the same principles of evaluating the peaks would apply to both thin-layer and gas or liquid chromatography.⁴ Since EJS's densitochromatograms have the poor quality of fused/overlapped peaks, he had to manipulate the integration marks to "help" the computer to separate the unseparated peaks. This manipulation is subjective and are prone to produce erroneous results. The most important ones are those from the densitochromatograms of Vial 2 at the 30 seconds time frame. These are the worst resolved chromatograms.⁵ These are important chromatograms, because according to EJS, they gave a "significant statistical difference" upon which EJS relied heavily.

24.4 EJS's manipulation and subjective marking of the demarcation line would have the four following pitfalls. *First*, EJS claimed that the ink dye components separated on the TLC plate were "... scanned using white light and the amount of absorption was measured using a computer driven video densitometer with automatic integration".⁶ This was misleading and untrue. On the contrary, the integration marks were manipulated and arbitrarily placed by EJS. The data were used to calculate dye ratios and they were subjective, possibly pre-determined, and are therefore unreliable.

24.5 According to VNA, usually, the dye components applied closer to the sides of a TLC plate would travel somewhat further than the same dye components applied closer to the middle of the TLC plate. They would also have different shapes.⁷ This is because the solvent, an eluent used to do chromatographic separation, evaporates faster from the side than the middle of the TLC plate.⁸ When the chromatographic peaks are fused, it is impossible to know how each of them behaved within the area where they fused.⁹

24.6 EJS claimed that it does not matter where you put the vertical line as long as it is in the same on both [compared] chromatograms,¹⁰ however, VNA's measurements (combined in Slide 29) show that the integration marks placed by EJS were not in the same place in both densitochromatograms. Consequently, EJS had to admit that the integration marks could only be placed at "... *the same relative position with the peak*" but not at identical position.¹¹ He said he could only "... *chose where the peaks were separated as best [he] could tell.*"¹²

24.7 *Secondly*, EJS claimed that he was comparing one peak to another. As considered hereinbefore, the area under each of the chromatographic peaks could not be ascertained. Any comparison of these peaks is, at best, guesswork. Thus it cannot be ascertained whether he was comparing one dye component to another dye component or a group of components to another dye components or a group of dye components to another group.

24.8 But more importantly, the concept of measuring a composition of dye components has never been published, or ever referred to or raised in any published paper. EJS himself was unable to refer to any support for his own method. The scientific basis of such a comparison is also unclear.

24.9 EJS further claimed that if Mr Brunelle were faced with the same problem of fused chromatographic peaks, he would also "*lump them together*".¹³ In fact, Mr Brunelle suggested the contrary. He considered that if the dye components were not separated adequately for accurate densitometer readings, the test should be repeated using another solvent.¹⁴ This is in line with the suggestion of VNA.

24.10 *Thirdly*, EJS claimed that if the integration marks were moved as he did in this case, no significant change occurs in the data or the results.¹⁵ This must be mathematically incorrect since he was comparing the values of each of the peaks by dividing them against each other. His manipulation would obviously affect the values of the area under the peaks, which were values used as numerators and denominators in his analysis.

24.11 *Fourthly*, EJS claimed that "... *you could move it [i.e. the integration mark] one click one way or the other and it is not going to affect the data or the results.*"¹⁶ This, too, is untrue.

24.12 VNA demonstrated with the aid of Slides 27 to 29, G8A, that one click would drastically change the results of the Dye-ratio method. He demonstrated further the sensitivity of the placing of integration marks at 30 seconds for dye 2/dye 3 of Vial 2. In

such circumstances, the ratio would overlap and therefore, show no statistically significant difference.¹⁷ Thus, the slightest shift of the integration marks will give a completely opposite conclusion.

24.13 Further, EJS took no account of the small peaks in the chromatograms which contained dirt and impurities collected from the solvent front, for example, the peak for dye 1 in Vial 2.¹⁸

HIGHER RESOLUTION SHOULD BE USED

24.14 In light of the poor quality of the chromatography, VNA considered that EJS should have, at least, scanned the TLC plates at the highest optical resolution possible. The difference of using high and low resolution can be found at p.3228, G11.¹⁹ However, EJS inexplicably only used the standard resolution of his video densitometer even when scanning at a higher resolution was available. Consequently, the amount of pixels inside each chromatographic zone was too low for the video densitometer to give good images. Although this point was not specifically and satisfactorily put to EJS, yet again VNA's contention could be refuted in cross-examination of VNA upon EJS's instructions. Similar incidents occurred in a few points raised by counsel for the plaintiff. Whilst this court is not encouraging the other party for not putting certain points to a witness, yet the special circumstances of this long case when each party is trying to improve his case in this kind of complicated matter, the other party's failure of putting certain matters have been carefully assessed in the scale before accepting the other party's contention. (This same point would not be repeated in similar situations hereinbelow). In the end, it was demonstrated that EJS was actually unfamiliar even with his own video densitometer by his ignorance as to the meaning of "Max" and "Wide" which appeared on the monitor next to "Area".²⁰ He later admitted that he had no idea what their functions were or what they were used for.²¹

24.15 VNA suggested that EJS should re-do the chromatographic separation with another solvent and re-scan the TLC plates at high resolution until he obtained satisfactorily resolved chromatographic peaks by his video densitometer, subject to such video densitometer being properly calibrated. This view is actually shared by Mr Brunelle who developed the Dye-ratio method.²²

CONCLUSION

24.16 In the circumstances, the data obtained from the video densitometer after EJS's admitted manipulation were subjective and unreliable. Any conclusion drawn on the basis of the dye-ratios calculated using these unreliable data cannot be accepted.

Footnote:

1 T42:29:10-32:9; T42:46:7-12

2 pp.2209-2241, G8

3 Quantitative Analysis using Chromatographic Techniques, E. Katz (Ed.) John Wiley & Sons, New York, 1987 - Slide 19, G8A

4 T51:66:1-8
5 Slides 26-1 and 27-1, G8A
6 p.412, EJS 1
7 T51:40:3-5
8 T51:40:6-41:24, Plates V and VI
9 T51:70:16-22, Slide 18, G8A
10 T42:25:16-19
11 T42:89:22-23
12 T44:124:5-6; T44:147:19-24
13 T44:29:6-17
14 p.526, F2-3
15 p.896, EJS 3, para.41, as illustrated in VNA-12 on p.755, E7-E10
16 T42:16:13-14
17 Slide 51, G8A
18 VNA's Slide 22-1, G8A and his contention at T51:60:15-61:24
19 See also VNA's explanation at T55:92:21-94:11
20 T40:38:4-12
21 T42:14:11-21
22 p.526, F2-3

Chapter 25 - Illogical Results Of Dye-ratio Method

25.1 The validity of the Dye-ratio method depends, inter alia, on obtaining reliable raw data after each of the ink dye components separated on the TLC plates were evaluated using the video densitometer. According to EJS, he would be measuring the extractability or the decomposition of the dye components of the ink samples obtained from Documents A and C, or both. It is just remarkable that the dye components extracted in the weak solvent (*n*-butanol) exhibited illogical behaviour, which is inexplicable.

25.22 The range of possible explanations offered by EJS were :

- (a) It was as a consequence of "some interaction once the dye is extracting with the solvent to reduce the optical density of the dye".²¹
- (b) "It could have some leaching back into the paper, or something like that".²²
- (c) "...depending on the size of the difference, could just be a variation in the measurements".²³
- (d) This "variation" within samples had been "factored" into the calculations by applying 1 STD.²⁴

25.23 In the end, none of the possible reasons offered by EJS were acceptable as pointed out by VNA. EJS should have at least investigated into the reasons of his examinations which gave him the illogical data or as VNA suggested, simply re-do the examination. As EJS did not conduct any scientific research with the view to evaluating the capabilities and limitations of the Dye-ratio method, he was therefore unable to offer any scientifically sound explanation as to why the method he used in this case produced such illogical results. For example, if he suggested boldly that there could have been some leaching back into the paper or something like that, there is no reason why, after the decrease in the 90 seconds reading because the colour somehow leach back into the paper,

the concentration increased again after 180 seconds. Even if that is so, how can any measurement be accurate if there is such a "leaching back" factor.

25.24 By reason of the aforesaid matters, I accept VNA's contention that the illogical data primarily attributed to EJS arbitrarily separating the badly resolved chromatographic peaks into dyes 1, 2 and 3. This is supported by the fact that before they were separated by thin-layer chromatography, the dyes behaved logically according to the visual examination of the TLC plates and the data obtained from the Percent Extraction and R-ratio methods.²⁵

CONCLUSION

25.25 By reason of the aforesaid matters, the Court cannot and should not place any reliance whatsoever on the illogical and unreliable results obtained by EJS using the Dye-ratio method in this case. The conclusion drawn by him from these results cannot be accepted.

Footnote:

1 Slides 1 to 13, G8A, pp.2270-1 and 2270-2, G8, and in VNA-5 and VNA-6 of VNA 2

2 pp.2207-2208, G8

3 T40:88:17

4 T44:76:1-2

5 Slide 13, Bundle G8A

6 T38:20:24-22:1; T22:22-23:5

7 Slide 6, G8A

8 Slide 13, G8A

9 T44:77:2-11

10 T51:32:16-25

11 p.1073 (lines 4-8) and p.1089 (lines 3-14), F5

12 T44:57:1-12

13 T44:79:24-25

14 T44:77:8-19

15 T44:100:23-101:23

16 pp.699 and 701, E7-E10 (VNA 2) and T51:27:18-29:4

17 T56:12:10-18:5

18 pp.1929-1934, F7

19 pp.699 and 701, E7-E10 (VNA 2)

20 T56:17:9-17

21 T41:70:6-9; T48:71:21-23

22 T41:70:14-15

23 T41:70:15-17

24 T40:85:12-16

25 See illustrations at pp.2270-1 and 2, G8

Chapter 26 - Mass Independence

26.1 Both VNA and EJS agreed that to obtain Dye-ratios that would be independent of the amount of ink on the samples of microplugs taken from Documents A and C, (i.e. the mass of the ink) the data (optical signals) received by the video densitometer must be

directly proportional to the concentration (contents) of the ink dyes in the corresponding chromatographic zones on the TLC plate. Such relationship is known in analytical chemistry as *Beer's law*.

26.2 In others, if two measurements are directly proportional to the amount of ink sampled, then their ratio is independent on the amount of ink sampled. Such ratios are therefore mass independent. There is no dispute that in order for the data obtained from the Dye-ratio method to be reliable, it must be mass independent.

26.3 If for each of the ink dyes, a graph is plotted with optical signal against content, the graph should be a straight line going through the origin (0,0).¹

26.4 VNA and EJS however differed as to whether or not the data obtained from the Dye-ratio method and relied upon by EJS in arriving at his conclusion in this case, were mass independent. VNA disagreed with EJS's claim that they were.

26.5 VNA explained that Beer's law does not apply to thin-layer chromatography.² The only theory that applies to TLC is the *Kubelka-Munk theory*. According to this Kubelka-Munk theory, the optical signal received by the video densitometer is inherently non-linear to the content of a substance applied on a TLC plate.³ This is due to the presence of the absorbent particles (silica gel) on the TLC plates which are strongly light scattering during the scanning process.⁴ Consequently, the signal received by the video densitometer would not be the total amount of light that passes through the TLC plate but only part of it, whilst the rest would be lost (*scattered*), with the loss being both unpredictable and unquantifiable. By simply dividing the data obtained from the video densitometer by each other and comparing their ratios, EJS claimed that the results derived therefrom became mass independent. According to VNA, that did not and could not eliminate the underlying uncertainty and did not make the results mass independent.

26.6 EJS disagreed. He relied on Brunelle and Lee's paper. By relying on Figure 4 therein⁵ where an artificial dotted line was projected through the origin (0,0), he claimed that Beer's law only operates within a certain range⁶ (which range he labelled as between 5 to 25 microplugs),⁷ and that the graph would not be linear at the lower and higher range.

26.7 According to VNA, it is apparent that the relationship between "signal-content" on the said Figure 4 does not obey Beer's law as the graph does not go through the origin (0,0).⁸ VNA considered that whilst it is possible to approximate the curve with a straight line within a short interval of concentration, e.g. as Brunelle and Lee did in the said Figure 4, it will never go through the origin. Instead, it will intercept the y-axis at some point higher than the origin which means that the relationship between the optical signal and content will not be a directly proportional one.

26.8 Further, as VNA pointed out,⁹ the dye ratio data obtained as EJS did in this case would always be mass-dependant, even if EJS were to work within the alleged working

range of the video densitometer he used, as the relationship of signal-content would not obey Beer's law.

26.9 VNA was cross-examined in relation to a graph in Figure 3 therein,¹⁰ reproduced from Brunelle and Lee's paper. In an attempt to illustrate that the relationship between signal and mass was directly proportional, it was suggested to VNA (presumably on the instructions of EJS who was in Court) that the reading from the lines *artificially* plotted should be relied upon instead of the actual reading as illustrated by circles, triangles and squares.¹¹ When this apparent mistake was pointed out by VNA, it was then conceded that the relationship was not directly proportional, and that there was in fact a 15% error.¹²

26.10 VNA's view is in conformity with all the books on analytical chemistry and all the leading authorities, e.g. Professors Poole¹³ and Sherma. In "Thin-layer Chromatography",¹⁴ Professor Sherma clearly stated that¹⁵ :

"... Because of light scattering from the sorbent particles, a simple, well-defined mathematical relationship between the amount of the analyte and the light signal has not been found. Curves relating [to] absorption signal (peak height or area) and concentration or weight of standards on the layer are usually nonlinear, especially at higher concentrations and do not pass through the origin."

26.11 Further, even Dr Cantu, who developed the methodology that measures ink extractability as a function of age, recently acknowledged that in TLC, the relationship "detector response-concentration" does not obey Beer's law, i.e. this relationship is not directly proportional. In "*A Sketch of Analytical Methods for Document Dating - Part II, the Dynamic Approach*", Dr Cantu emphasized that¹⁶ :

"... transforming a TLC density measurement into a parameter that is linear with concentration (Kubelka-Munk theory) is not as simple as transforming a transmission measurement into absorbance in solution spectroscopy (Beer's law)".

26.12 Thus the evidence of VNA should be accepted.

WHAT EJS COULD HAVE DONE

26.13 VNA considered¹⁷ that in order to obtain reliable data, it was necessary to calibrate the video densitometer for each analysis by applying "external standards with known concentrations of the dye components and to find out what is the relationship between the concentration of each of the dye components and the detector [or video densitometer] response". His view again was supported by the leading experts, Professors Poole and Sherma.

26.14 On the contrary, EJS admitted that he did not calibrate his video densitometer when he did his tests in this case.¹⁸ However the User's Manual of EJS's video densitometer detailed how it may be calibrated using external standards.¹⁹

EJS'S CLAIM

26.15 EJS claimed that VNA's view that the presence of silica gel would distort the data was wrong.

26.16 *First*, he claimed that a presentation by himself and Dr Lyter in Orlando in 1999 had showed that "if the concentration was doubled the signal was doubled"²⁰ notwithstanding apparently, the presence of silica gel. However despite this assertion, no data or paper in relation to this research has ever been published, nor was any evidence adduced in support of this claim.

26.17 *Secondly*, EJS seemed to have attributed this scenario to the capability of the densitometer used by him, which he said was different from the one used by Mr Brunelle.²¹ He claimed that the capability of the software used by his video densitometer took into account the presence of silica gel on the TLC plate.²²

26.18 Such claim is however contrary to what is stated in the User's Manual of the video densitometer used by him. An option of "Include Origin" is provided.²³ It states that:

"When Include Origin is activated the standard curve will be drawn such that the coordinate (0,0) is included in the curve. In a sense it represents a peak with zero area and hence zero amount."

26.19 If the data obtained by the video densitometer would result in a straight line passing through the origin (0,0), i.e. direct proportionality, it would be completely unnecessary both to detail how the video densitometer should be calibrated, or to have this option of artificially drawing the calibration curve to (0,0). Further, there was nothing in the User's Manual to support EJS's supposition.²⁴

26.20 In "*Accomplishments of SOFIA since incorporation in August 1997*"²⁵ it was claimed that:

"Completion of a study which determined that measurements made with the Shimadzu TLC Scanning Densitometer [the one used by Brunelle] and the Analtech Video Densitometer [the one used by EJS] are in fact linear and go through zero. (Again this is contrary to claims made by Valerie Aginsky)"

However, if there is any truth in the capability of EJS's video densitometer as he claimed, the type of video densitometer appears to have made no difference to the results obtained. Again, there is no evidence before the Court of such a study.

26.21 EJS argued in EJS 3²⁶ that if there is any difference in mass, it "is so minimal between samples that no significant change will be noticed". If EJS's evidence is accepted to the extent that the difference in mass might be one of the reasons for the illogical behaviour of the readings taken at different time intervals, the difference of up to 31%²⁷ cannot be said to be "minimal and insignificant".

26.22 Further, EJS argued in EJS 3²⁸ that : "these differences, if any exist, are accounted for in the multiple sampling and statistical analysis". This statement demonstrated further that EJS did not realize that there was a possible source of error due to non-adherence to Beer's law in TLC. If he did not recognize that there might be an error which cannot be quantified for his failure to run external calibration, he could not therefore factor this unpredictable and unquantifiable error into his analysis of the data obtained. Further the so-called "Multiple sampling" in this case means two which is the minimum possible in any analytical chemistry testing and certainly if any substance is to be compared. "Statistical analysis" means the application of 1 STD in this case (which will be considered in the next section), and cannot be equated with the term "error analysis"

CONCLUSION

26.23 In light of EJS's failure to take step to calibrate the video densitometer using external standards, to eliminate the mass dependence of his dye ratio data, it renders the data unreliable and thus no responsible conclusion can be drawn, and such conclusion cannot be accepted by the Court.

Footnote

1 Illustrations of such a relationship can be found on p.735, E7-E10 and Slide 33, G8A

2 Slides 31-34, G8A

3 pp.2221-2233, G8

4 See illustration on p.2271, G8

5 Slide 36, G8A

6 T45:64:22-65:10, 81:7-84:23

7 T43:25:5-7

8 T52:3:23-4:4

9 T53:111:12-112:1

10 Slide 37, G8A

11 T54:90:17-91:11

12 T54:92:17-20

13 pp.2242-2252, G8

14 pp.2253-2270, G8

15 p.2266, G8

16 pp.715-730, F2-3, at p.721

17 T52:16:22-17:13

18 T44:136:14-15

19 Slide 35, G8A, pp.2150-2186, G8 at p.2168, and explained by VNA at T52:11:17-13:22

20 p.893, para.29, EJS 3

21 p.893, para.29, EJS 3

22 T45:64:7-15

23 p.2170, G8

24 T45:65:24-66:7

25 p.1445, G5
26 p.892, para.29, EJS 3, E13
27 Slides 6 and 13, G8A
28 p.892, para.29, EJS 3, E13

Chapter 27 - One Standard Deviation

27.1 In *R. v. Lucas* [1992] 2 VR 109 at 114 (where in evidence concerning DNA, 3 STDs (or 99.7%) were proffered as the standard) the Court refused to accept the testimony of scientists because they were not expert statisticians.

27.2 EJS acknowledged that he was deficient in statistical theory.¹ Thus, what degree of confidence did EJS have in his results?

27.3 EJS claimed that the use of one standard deviation approach gave him 68% level of confidence in his result or as he put it, "at least 68%".² He even boldly claimed during cross-examination that everyone in the field adheres to 1 STD.³ However, no evidence was adduced to support this claim by any forensic expert including members of SOFIA. Indeed in "SOFIA Ink-dating Project" 2 STDs or 95% certainty was recommended as the basis on which to calculate the data obtained.⁴ This is in line with the basic tenets of analytical chemistry.

27.4 For two replicate measurements, as VNA pointed out, the confidence probability that a true mean is located within the range (confidence level) of "arithmetical mean \pm 1 STD" is equal to approximately 60%.⁵ This is what EJS did in this case. VNA considered that⁶ :

"... it is just a little bit higher than the probability of tossing a coin, equal to 50%. But it is far away from 95% which is an agreed upon standard in analytical chemistry. This 95% is not even a satisfied value, because for responsible analysis, it is advised - there is a recommendation to use a higher degree or level of confidence, like 99% or even 99.7%. That in simple terms is equal to 3 standard deviations."

27.5 Further, EJS's proposed use of the "one standard deviation" approach to compare two sets of data appears to have been completely abandoned in the cross-examination of VNA in favour of the Student's *t*-test, despite EJS "strongly" disagreeing with it in EJS 3⁷ and when giving evidence in Court⁸ for an analysis having only two samples. The Student's *t*-test has been accepted in analytical chemistry for comparing two means calculated for samples of small size. This appears to be supported by the plaintiff's counsel.⁹

27.6 VNA was not cross-examined on the 1 STD. Apparently it appears that the plaintiff is not now relying on this theory. There is no justification for its use in analytical chemistry.

27.7 In EJS's reports, the weakness of the confidence level was concealed within such phrase as "to a reasonable degree of scientific certainty". The question is how confident EJS himself is in the results obtained and what weight should be attached to the opinion or conclusion of him.

27.8 The trouble is the criterion of 1 STD and its meaning, did not become apparent until VNA 2 dealt with EJS 2, and therefore it was only in EJS 3 that EJS attempted to justify the criterion of 1 STD.¹⁰ It might not be apparent to a reader to detect that his opinion was buried beneath the term "1 STD" or "to a reasonable degree of scientific certainty" but then the confidence level of the opinion or conclusion is only about 60% and not "beyond a reasonable doubt".¹¹ EJS contented that 1 STD is still an acceptable statistical criterion upon which one can reach a conclusion. But such acceptance was only limited to some members of SOFIA.¹² EJS claimed in EJS 3¹³ that the 1 STD was arrived at by combining the experience of four examiners namely, Messrs Brunelle, Lyter, Kuranz and himself. However, in *Ambassador Faith Whittlesey v. John Wilson Espy*, Mr Brunelle testified that¹⁴ :

"As far as standard deviations are concerned, I don't use standard deviations because quite frankly I don't know what they mean."

27.9 Further from the evidence, it appears that Mr Kuranz (one of the alleged supporters of 1 STD and the Vice President of SOFIA) did not adopt this standard in his own tests. He was criticized by EJS in a deposition dated 30 March 2001 in the case of *Lizzack v. Markowitz* on the basis that there was no statistical analysis in his report.¹⁵

27.10 The unilateral departure from the accepted norms of analytical chemistry has neither been published nor propagated. I accept the defence submission that this is a tenuous statistical basis.

2 STDS (95%) OR 3 STDS (99.7%) SHOULD BE USED

27.11 On the other hand, VNA considered that the 1 STD approach provided an irrelevant low level of confidence, had never been published, and was contrary to all books on analytical chemistry. He considered that the minimum level of confidence acceptable in analytical chemistry, upon which analytical data could be evaluated and a responsible conclusion could be drawn should be 95%. He suggested that an even higher level of confidence - 99.7% (or 3 STDs) - should be used for responsible analyses. His view is supported by all books on analytical chemistry.¹⁶ Ink-dating is simply one application of analytical chemistry. There is nothing that distinguishes it and takes it out of the scientific mainstream.

27.12 At a meeting held in August 2000, Dr Cantu, Mr Larry Stewart and others representing the US Government also indicated that 95% confidence level was acceptable for the type of work they did.¹⁷ This accords with all the suggestions in the books on analytical chemistry and paper entitled : "*A Sketch of Analytical Methods for Document Dating - Part II, the Dynamic Approach*" published by Dr Cantu.¹⁸

27.13 But whichever standard one chooses (whether between 2 STDs or 3 STDs), 1 STD fails to approach any way near being acceptable. The defence has also made reference to p.3 of an article titled *Pesticide Analysis : Reliable Analytical Results in a Pesticide Residue Laboratory*, where the following appears :

"The probabilities 95 per cent, 99 per cent and 99.9 per cent have been chosen because an American Chemical Society Committee (Rogers et al (1982)) dealing with scientific aspects of regulatory measurements noted the similarity of these scientific terms and the following lawyers' phrases:

- preponderance of evidence
- clear and convincing
- beyond reasonable doubt"

27.14 EJS boldly stated that 1 STD has been accepted by courts all over the world.¹⁹ This overstatement "all over the world" was eventually confined to the United States, Mexico and maybe Malaysia.²⁰ However later during his cross-examination, it transpired that he used "accepted" as being synonymous with "testified in".²¹ But EJS was unable to name a single case in which 1 STD was contested and eventually accepted.²²

27.15 According to the authors of : "*Principles and Practice of Criminalistics - The Profession of Forensic Science*"²³ the phrase "a reasonable scientific certainty" is a *nonsequitor*. The authors pointed out that the notion of scientific certainty does not exist and opined that scientific experts should refrain from resorting to that phraseology in expressing their opinions. The phrase does no more than concealing from the reader the inherent uncertainties in the results propounded.

27.16 If the Court accepted the results of the experiment based on 1 STD, this would amount to placing a higher degree of confidence in the results than any analytical chemist would do.

THE STUDENT'S T-TEST

27.17 A proper comparison of the data from two samples of small size (two in this case), assuming of course that it is reliable in the first place, must be the province of the Student's t-test as VNA said. He considered that the "one standard deviation" approach adopted by EJS was not appropriate to this case. This view was supported by textbooks on statistics and analytical chemistry as well as dictionaries on statistics.²⁴ Although there are variations in the equation of Student's *t*-test, VNA adopted the more conservative one which slightly reduces the confidence probability by 7% to 10% that the means of two small samples would be considered statistically significantly different.²⁵ At the end of the day, it matters not which the Student's *t*-test equation is adopted, because except for dye 2/dye 3 at 30 seconds in Vial 2,²⁶ none of the results come anywhere near the 95% threshold. Thus even when some of the figures approach 80% or 90% confidence level, it is still ineffective since they fall so far short of a standard that is acceptable in the field of analytical chemistry.

27.18 One must also bear in mind that a 60% level confidence *or an average of 80% or so confidence probability* relates only to the ratio obtained from the *five calculations which allegedly showed some difference between the [...] samples*. What the conclusion "to a reasonable degree of scientific certainty" completely ignores is the results obtained from all the *other* tests i.e. a total of 23 negative results and only five "positive" ones. Applying Student's *t*-test, none of these allegedly positive results obtained by EJS from his examination was able to reach 95% level of confidence, except one of them. That is, only *one out of 18 results* obtained from the Dye-ratio method, or *one out of 28 results*, if results of the other tests are also taken into account. Although EJS claimed to have taken the 23 negative results into account, this is patently not true. The combined concepts of "reasonable degree" and "certainty" must include a consideration of the negative as well as the positive results.

27.19 EJS admitted in evidence that the more samples that were run, the more accurate the results would be.²⁷ However, only two samples were run in this case using the Dye-ratio method. EJS's explanation as to why he did not conduct the examinations on more samples say, run the Dye-ratio method in triplicates was inconsistent with the reasons offered by him.

27.20 If there is any error in one of the two samples, this Court is forced to consider a conclusion based on one sample only. It is impossible for the Court to know whether such result is reliable or not - although the plaintiff/EJS appears to claim (at one time) that it is possible to conduct statistical analysis with one sample.

CONCLUSION

27.21 The data obtained by EJS and the conclusion and opinion drawn by him thereon, is based on too weak a statistical foundation. The Court cannot accept them as being reliable.

Footnote

1 T45:119:18-25; 132:17-22

2 This percentage of level of confidence in statistics should not be confused with the legal standard of balance of probabilities which sometimes was expressed (quite wrongly) in terms of percentage as well.

3 T40:58:24-59:1

4 p.2104, G8

5 Slides 38-49, G8A

6 T51:15:11-20

7 p.890, paras.24-25, E13-E17 (EJS 3)

8 T45:107:15-23

9 T99:65:13-19; 68:6-7; 70:8-14

10 pp.888-891, paras.20-26, E13-E17 (EJS 3)

11 p.889, para.22, E13-E17 (EJS 3)

12 As discussed in para.2 above, SOFIA recommended the use of 2 STDs

13 p.888, para.20, E13-E17 (EJS 3)

14 pp.344-440 at p.372, G2

15 pp.1073, 1204-1205, G4

16 e.g. pp.2272-2289, G8

17 pp.2313-2320, G8, and PVT's evidence on this at T48:99:17-100:25

18 p.717, F2-3
19 p.433, E4-E5 (EJS 2)
20 T41:109:17-111:2
21 T41:111:7-17
22 T41:114:19 - 115:3
23 Extract at p.2292, G8
24 e.g. pp.722-726, E7-E10 (VNA 2) and pp.2113-2149, G8
25 T56:75:10-19
26 pp.1883-1894, F7
27 T37:87:7-17

Chapter 29 - EJS's Qualification And Integrity

QUALIFICATIONS

29.1 Mr Erich Speckin was born in 1972. He was only 27 when he performed the ink-dating analysis in 2000 and 29 when he gave evidence in this case. Under "education", he gave the following description :

- (a) "Purdue University at age 15 to study engineering";
- (b) "Albion College at age 17 to study biology and pre-medical"; and
- (c) "Michigan State University graduated with a degree in Chemistry".¹

29.2 In fact, he had only studied in Purdue University for two summers and he had not finished high school. Further he only has a BA degree in chemistry instead of a BSc degree. In other words, all three descriptions given by him were misleading. It certainly misled Ms Emily Will, the editor of the Journal of the National Association of Document Examiners² in that she assumed EJS had a BSc degree.

29.3 Under forensic training, EJS gave the following description :

- (a) "*Two-year residency with Leonard A. Speckin [his father] in the examination of questioned documents*"; and
- (b) "*One year residency with Brunelle Forensic Laboratories in the identification and dating of inks.*"

29.4 His alleged residency with his father, as he admitted, has no bearing to this case.³ His alleged residency with Mr Brunelle lasted about 50 days only over a period of one year, whilst during the same period, he was attending the Michigan State University, ran a number of businesses on the side as well as serving his residency with his father for two months. Further it appears that his residency did not include training in (at least) TLC and statistics, both of which are fundamental to mastering the Dye-ratio method.

29.5 He did not study statistics either in his BA degree and that is why he was not awarded a BSc degree. He is plainly deficient in his knowledge of statistics⁴ and chromatography⁵, disciplines one would have thought essential for an analytical chemist,

essentially one who offers himself to the Court as an expert. It is even more so for one who claims to be one of the world's leading experts in one particular branch of analytical chemistry i.e. ink-analysis.

29.6 His limitations were illustrated by his inability to do other than guesswork in relation to the underlying scientific bases for so much of his proffered methods and results. He could not answer the following questions, which in my view is important as to the validity of the Dye-ratio method. They are as follows :

- (1) Why did some dye-ratio tests show a significant difference but not Percent Extraction or R-ratio?⁶
- (2) Why did the rate of extraction test not show a difference?⁷
- (3) Which technique works best for which ink?⁸
- (4) Why do dye-ratios change as a function of age?⁹
- (5) Why do some dye-ratio tests show a difference while others do not?¹⁰
- (6) Why do different inks behave differently?¹¹
- (7) In the Dye-ratio method what is being measured?¹²
- (8) Why do some measurements reduce despite longer extraction time-intervals?¹³
- (9) What is the cause of the dye leaching back into the paper?¹⁴
- (10) Why is reduction in optical density a possible reason for the measurement aberrations?¹⁵
- (11) Why is error in sampling also a possibility?¹⁶
- (12) Why are there differences (expressed in percentages) between the figures for the different extraction times?¹⁷
- (13) Why was there poor resolution between the peaks?¹⁸

29.7 It is doubtless that EJS acquired some learning in his association with his father and Mr Brunelle, but given the absence of any formal curriculum¹⁹ and again given his penchant for exaggeration, this Court cannot really draw any conclusions as to the extent of his knowledge. In November 1996 Mr Brunelle in the case of *Ambassador Faith Whittlesey*,²⁰ considered EJS as an inexperienced document examiner. At that time he only had 11 months of experience after the completion of his training in ink-dating.

29.8 He attempted to magnify his experience by claiming to have examined over 100,000 documents. When the sheer mathematical impossibility of this was pointed out to him (as it would have taken him 274 years to do it), he claimed that simply flicking over pages looking for something else, amounted to an "examination".²¹ Obviously he has examined many documents in his short experience, but there is no way that this Court can evaluate the extent or depth of that experience. This lack of experience may account for the reason why neither he himself nor his laboratory are included in ASTM's Directory of Scientific Technical Consultants and Expert Witnesses.²²

29.9 Under the third column of "Scientific papers presented", he claimed to have had papers published in peer-review journals. The only published paper is : "*Technical Report with Case Studies on the Accelerated Aging of Ball-point Inks*",²³ but then this one was

ostensibly written with Mr Brunelle. The paper mostly related to work done by Mr Brunelle long before EJS joined him and EJS could not even remember which portion he wrote.²⁴

29.10 His paper : "*An Independent Assessment of Ink Age Determination by a Private Examiner*" 1996, Nashville Tennessee, *American Academy of Forensic Sciences Annual Meeting*, was just his sketchy student essay. He was brazen enough to include this student essay under the rubric of peer-reviewed papers.²⁵

29.11 His biodata published twice in *Lawyers Weekly* was inaccurate in nearly every respect.²⁶ The same inaccurate biodata was later substantially repeated in the *Michigan Bar Journal*.²⁷ The latter provision of biodata was made at a time when he knew that the information he had submitted or at least was attributed to him, had been published and was misleading. His attempts to cast the blame on the editors was disingenuous.²⁸

29.12 EJS was *not* involved in any of the "famous cases" listed in his CV. Although they were handled by his laboratory, he had *nothing* to do with these cases. In fact, all these cases (except the Watergate Investigation, which was a case in 1972/1973, that is around the time when EJS was born) pre-dated him. What enabled him to make this misleading representation was the consequence of him having bought the laboratory from Mr Brunelle. This was admitted by EJS. He also admitted that *none* of these cases were relevant to this case²⁹ and did not know why they were in his CV.³⁰ Even the list of EJS's Court cases and depositions is exaggerated by duplications and a triplication.

29.13 It is an understatement to say that EJS's resume is inaccurate and misleading, to say the least.

THE DEFENCE EXPERTS

29.14 By contrast, VNA's experience and eminence in the field, set out in his CV,³¹ and as acknowledged by his peers,³² are impressive by any standards. Not only is he a true scientist but an expert who has had many articles published in peer-review journals on analytical chemistry in general, and the two major areas pertaining to this case : ink and chromatography. I accept the defence submission that VNA was an impressive, authoritative and fair witness, knowledgeable, helpful and quite prepared to concede a point.

29.15 The dismissive manner in which EJS treated any statement of VNA which did not accord with his own limited knowledge of the subject was plainly wrong. Further, his attempts to analyse and criticize VNA's publications³³ were ineffective.

29.16 The cross-examination of VNA was largely limited to an attack on his paper "*Measuring Ink Extractability as a Function of Age*"³⁴ in which VNA demonstrated the shortcomings of Mr Brunelle's methods. As far as the "attack" goes, it was completely unsuccessful and, if anything, simply enhanced VNA's testimony as it allowed him to

explain his own theory and demonstrate in an informed, careful and measured manner the flaws and fallibility of Mr Brunelle's.

29.17 Whilst the "Speckin method" failed the proficiency test, the "Aginsky method" established its validity and efficiency via outside proficiency testing, when it was subjected to "blind" testing in the Division of Identification and Forensic Science, Israel Police HQ and found to be 100% accurate. Further, VNA's method is utilized by one important law enforcement agency, namely the Canadian Customs Laboratory.³⁵

29.18 VNA made it clear at the outset that the ink (at least two years and seven months old at the time of EJS's examination) would have been dry. VNA maintained that inks age continuously and infinitely. As the ink age passes a certain threshold however, the difference becomes too small for it to be reliably measured by any scientific method.³⁶ According to the extensive researches he conducted on a number of inks, generally speaking, he opined that the threshold was two years, and he considered that one could reliably date an ink up to two years only.

29.19 On the other hand PVT is also a well qualified and impressive and fair witness. He is admittedly not an ink-expert, but he is well qualified to testify about laboratory procedures in ink analysis. He is the Chairman of the Subcommittee on Questioned Documents of the ASTM which produced document E1422-01 : "*Standard Guide for Test Methods for Forensic Writing Test Comparison*".³⁷

29.20 PVT's narration of the incident concerning the panel of world-class scientists at the State University of New Jersey who dismissed EJS's report out of hand is particularly telling.³⁸ At the disciplinary tribunal of The State University of New Jersey, a panel of chemists who were highly regarded by their fellow members of the profession, gave the following views of EJS's evidence³⁹ :

"The faculty member who had the problem had made a presentation about Mr. Speckin's technique, which was, if not in my view, then in the view of his faculty colleagues, extremely persuasive. Because Mr. Speckin had done the analysis which had originally resulted in the dropping of the patent suit, et cetera, et cetera, et cetera, he was asked to come in and to present his findings and the bases therefor, which he did, and he made, as he does, a very effective presentation.

He did say one thing, which I recall, about averaging the results from two different pages or two different runs, and I noted that one of the faculty members sort of cut him off, and I subsequently found out that they just wanted to stop him from saying something that would have hurt their delicate ears as chemists.

When Mr. Speckin left the room, [the panel of eminent chemists] all sort of looked at each other and said, 'Okay, now what do we do to prove whether or not this notebook is phony or not?' They just said, 'This is not going to get us anywhere. We cannot accept this evidence. We have to find something else.' And we did."

EJS'S INTEGRITY

29.21 In the *Chief Justice's Working Party on Civil Justice Reform*, it has been said⁴⁰ :

"Where experts are used as 'hired guns' the consequences are counter-productive and unacceptable. Far from helping the court to resolve expert issues, competing partisan experts tend to make resolution of such issues more difficult and confusing. The court may sometimes be compelled to try to evaluate to some degree the credibility of each expert - an exercise that should have no place in the assessment of expert evidence."

29.22 Here, apart from the methods used and the results obtained by EJS as discussed hereinbefore, the Court is compelled to try to evaluate to some degree the credibility of him as to whether he is a man whose word it can trust. An expert must be a man of integrity and indeed EJS himself accepted this readily.⁴¹ A Court should not doubt the integrity of an expert unless there is compelling evidence to the contrary with concrete basis. Regrettably, however EJS failed under this closest scrutiny.

29.23 It has already been pointed out that EJS's resume was deliberately framed in a misleading way. They covered his : education, forensic training, scientific papers presented, famous cases handled by members of his firm, peer-reviewed publications, and his court cases and depositions.

29.24 EJS's statement that he was "currently conducting research with the US Secret Service and IRS" was simply untrue. It was not just an exaggeration but untrue,⁴² and this incorrect claim continued to be made in evidence where he equated *discussing* the prospect of conducting research in a meeting with Secret Service as being "in his opinion" the same as *conducting* research.⁴³

29.25 He aroused the wrath of the American Board of Forensic Document Examiners ("ABFDE")⁴⁸ for stating that he was eligible for certification at a time when he did not even yet have a degree. That letter dated 4 May 1998⁴⁸ was written in the following strong words :

" It has been brought to the attention of the ABFDE Board of Directors that on several occasions you have cited as a qualification that you are 'eligible for certification by the American Board of Forensic Document Examiners' and 'expect to take the National Board Examinations in February, 1996.' Our records indicate that as of May 1, 1998 you are not in the process of nor have you applied for certification by the American Board of Forensic Document Examiners.

....

Therefore, it is the unanimous consensus of the ABFDE Board of Directors that your representation is, at the least, inaccurate, and at worst, could be viewed as a fraudulent misrepresentation. You are requested to cease and desist referring to yourself as 'eligible for certification' until you are authorized by the ABFDE to do so."

29.26 He was brazen enough to imply that the letter written to him accusing him of inaccuracy or fraudulent misrepresentation was motivated by the President of the Board's professional jealousy.⁴⁹ His failure to grasp why lawyers had made "a big deal" out of the allegations of fraud says much about his indifference to attacks on his honesty.⁵⁰

29.27 Perhaps the most illuminating aspect of all this is the manner in which EJS dealt with the letter from the American Board of Document Examiners, Inc. He threw it away.⁵¹ His "couldn't-care-less" attitude implied that the letter merited no acknowledgement, reply or explanation, exemplifies EJS's cavalier attitude to the truth. No worse fate can befall a person who values and who trades on his integrity than to be accused of fraud. He however took it nonchalantly in his stride.

29.28 Much the same offhand attitude categorises his dismissal of the letter from Rodgers J⁵² who had similar misgivings about EJS's attitude to the rigorous demands of the truth.⁵³

29.29 Further in examination-in-chief, EJS slipped in⁵⁴ that he was a member of the Questioned Document Section of the Mid-Western Association of Forensic Scientists ("MAFS") which was not mentioned in his CV. When the letter from the President of the MAFS pointed out that indeed EJS was not a member of the Questioned Documents Section, never had been and had never applied to be,⁵⁵ EJS without a blush, simply said that he thought he was and had not realised that he needed to apply.⁵⁶

29.30 EJS's unqualified claim that VNA himself used the Dye-ratio method and had published a paper about it, is illustrative of his readiness to state facts which are, at the least, misleading and probably uncheckable to most opponents. The falsity of his claim was exposed only when VNA's paper "*Determination of the Age of Ball-point Pen Ink by Gas and Densitometric Thin-layer Chromatography*" was produced.⁵⁷ It would have been impossible to test this part of his evidence had this paper not been available to the defence.

29.31 A number of areas of EJS's reports are either exaggerated or blatantly untrue. They included the following examples :

- (a) In EJS 1 under the heading "Statistical Analysis" he said : "*The data obtained for the rate of extraction, percent extraction **and** dye ratio meets this threshold of analysis significant statistical difference ...*".⁵⁸ If this conjunction were true, and the unscientific and casual reader might well accept it at face value, the evidence of the documents still being in the drying process would be overwhelming. In fact the data for rate of extraction and percent extraction were negative. Only some of the dye-ratio data apparently show some positive results. The threshold of significant statistical difference is only 1 STD.
- (b) In EJS 3 regarding dyes he said : "*The method in this case was not comparing the three homologues to one another, but the overall methyl violet bands to a Victoria blue component and other dyes including another blue dye.*"⁵⁹ His evidence was completely different in that he said that he just lumped dyes

together.⁶⁰ His attempts to rationalise the conflict were unconvincing.⁶¹

- (c) In EJS 3 regarding protocols he said : "*The testing in this case was performed as the protocols are written and as generally performed by other examiners in the field*".⁶² When it was pointed out that there were no written protocols, he at first claimed that the procedures for the Dye-ratio method [...] were in his office and undertook to have them faxed over.⁶³ The next day, when he was asked whether he had obtained a copy of the protocols, he said he checked and they did not have anything for the Dye-ratio method.⁶⁴ In answer to a question from the Court, EJS said what he meant by protocol in EJS 3 was there was no protocol to run reagent blanks.⁶⁵ This answer is in any event in stark contrast to the answers that he had given the day before⁶⁶ :
- (d) Another point which perhaps might reflect more on EJS's careless presentation of works than on his integrity, is the transformation of the ink being "*consistent*" with Papermate⁶⁷ to having been "*identified*" as Papermate⁶⁸ to "*the ink was manufactured by Papermate*".⁶⁹
- (e) The constant reiteration that the negative results of the percent extraction and R-ratio tests were considered and taken into account, is simply untrue.⁷⁰ Similarly, the repeated references to "*multiple sampling*", was an attempt to disguise the fact that there were only two sample runs.
- (f) EJS was caught out completely by the "proficiency" test given to him through fJ Cleveland. The suggestion that he had misunderstood the plain instructions given to him, that is he thought that the 12 samples were written at the same time,⁷¹ is so farfetched that, even had this stood alone, it would be enough to destroy his credibility. The suspicion that EJS tailored his results to suit his client's requirements must inevitably linger when the following questions remain unanswered :

ii

(i) Why else did he not perform the dye-ratio tests when conveniently the Percent Extraction and R-ratio tests showed no positive result?⁷²

(ii) Why else seek to obtain "background information" about the documents⁷³ when the state of ink can be determined scientifically and objectively? and

(iii) Above all, as per his examinations for fJ Cleveland, why else give an unqualified and unrestricted opinion about the age of a document⁷⁴ which happened to conform (he believed) to his client's interests?⁷⁵

One cannot help but echoes the *Chief Justice's Working Party on Civil Justice Reform* in para.497 which says :

"Reforms adopted in various jurisdictions all begin with the same premise, namely, that the function of the expert is to help the court by providing independent and impartial advice - not to act as an advocate for his client. This is reflected in rules which emphasise that the expert's duty to the court overrides his duty to his client."

29.32 Accordingly, quite apart from and independent of the criticism of the shortcomings of the technique itself, its methods and procedure, EJS's credibility falls far short of the high standards of integrity which one expects from an expert witness or indeed an witness who has taken the oath, and his evidence is thus devalued. His evidence cannot be accepted.

Footnote:

1 p.388, E4-E5

2 p.1527, F6

3 T38:84:3-85:14

4 e.g. T37:14:14-15; T45:119:18-25; T132:17-22

5 T42:31:24-32:9

6 T35:71; T38:20-23; T40:53; T41:75-76

7 T40:51-52; T44:105

8 T43:139

9 T43:4-5

10 T40:55-56

11 T41:71; T48:72-73

12 T41:83-84, 86; T42:64

13 T40:82; T41:70, 72-73, 90-95, 97; T44:96, 110; T45:15-17

14 T46:104

15 T44:96-97; T46:87

16 T45:11-12

17 T44:103-104

18 T42:32

19 T46:17:8-18:15

20 pp.395-396, G2

21 T39:86:24-87:22

22 pp.1410-1411, G5

23 p.1386, G5

24 T44:54:7

25 pp.893-4, EJS 3, E13

26 pp.1363-1364, G4

27 p.1366, G4

28 p.2187, G8

29 T38:160:24-161:1

30 T38:161:2-8

31 pp.686-687, VNA 2, E7-E10

32 e.g. Dr Cantu in "A Sketch of Analytical Methods for Document Dating" p.715 at p.723 F2 - 3

33 pp.901-909, EJS3, E13

34 pp.705-721, E7-E10

35 Letter from Marc Gudreau p.3249, G11

36 It should be by any scientific method at the moment as no one can say whether in the future by any micro-analysis, the age of an ink may be identified correctly. There is no limit to any scientific discovery and invention. Just recently the University of Science and Technology has been successful in producing a conducting thread at 0.4nm.

37 pp.3133-3140, G11. His evidence on his work in this regard is at T48:85:15-87:3

38 T49:123:15-126:17; T133:7-11

39 T49:124:1-24

40 para.494

41 T38:42:2-9

42 pp.2091-2092, p.2197 and pp.2309-2311, G8

43 T38:115:8-9

44 pp.2197-8, G8
45 T39:81:3 - 84:11
46 p.2313, G8
47 pp.2313-20, G8
48 p.691, G3
49 T48:7:18-8:18
50 T38:117-118, 148-149
51 T38:119:24-120:24
52 p.2088, G8
53 T38:147:4-149:11
54 T35:31:23-32:2
55 p.2201, G8
56 T39:90:8-24
57 pp.2294-2300, G8, T46:31:22-34:20
58 p.413, E4-E5
59 p.884, para.13
60 T40:21:17-23:8
61 T44:62:15-70:12
62 p.916, para.20
63 T38:51:18-53:23
64 T39:5:20-6:5
65 T39:7:23-8:15
66 T38:51:15-22
67 p.409, EJS 1
68 p.883, para.11, EJS 3
69 T35:62:3
70 e.g. p.898, para.44, EJS 3
71 T47:55:15-23; T47:62:7-64:12
72 pp.833-836, G3
73 p.3092, G10; T47:105:1-22; T47:114:12-24
74 p.3103, G10
75 T47:100:7-101:25