

Mr S Marcroft
Criminal Cases Review Commission
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11th April 2005

Dear Scott

I enclose my report and invoice for some of the work that I have done on Susan May's case.

I trust that the report is useful. There are perhaps one or two issues that could be explored further in relation to the reports of Dr Whitaker, but as I say in the report I believe the entire approach there to be flawed.

If you wish to discuss anything by phone, please call me on my direct number of 0123 645 7872.

Yours sincerely

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Director



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Prof Jamieson's Report

2005



Scene Log (Document D6)

This provides an incomplete record of the events at the scene. Ideally, the log should allow an accurate reconstruction of who was in the scene at all times, and preferably their reason(s) for being there.

Specifically;

- a) There are two references to switching the bed light on, one at 1005, and the other at 1026 with no reference to it being switched off between these times.
- b) The whereabouts of PC Kelly and DS Hooley at the scene on 12th March are unclear (There is no mention of DS Hooley leaving the house after entering at 1032).

A spreadsheet derived from the scene log is appended.

Statement of Geoffrey Abbott 29/4/92

DS Abbott was a fingerprint expert with "22 years experience". He states that he identified hand and finger impressions made in blood on the wall.

Although he states that the finger and palm marks, "had both been placed in the wall at the same time", there is no way of knowing this other than estimating a timeframe if they were both still wet. His statement about them being made by a wet hand is superfluous – wetness is required for a transfer.

I am curious to know how the right forefinger was identified as such if, "all friction ridge detail [was] obliterated by a wet fluid". If it required the presence of the palm mark to identify it, then my previous comment on timing is germane.

He identified a smear to the right of that impression, made by a left hand.

It is not noted anywhere what this requires of the person making the marks, if indeed it was the same person at the same time. If the marks were made by the perpetrator as they left the room, then this would require them to place their right hand on the wall, turn to put their left hand on the wall. Although there are inferences subsequently drawn about the timing and donor of these smears, there is nothing in DS Abbott's description of the physical evidence that would support such an inference.

It would be useful to consider the results of the examination of the other fingerprints recovered.



Statement of Mark Stuart Naylor 15/4/92 (S44)

Although there is mention of other fingerprints (H1-H5), these do not seem to have been reported.

The labelling process for these is apparently not using the same principle applied to the other exhibits. Why H?

MSN14 and 15 were obtained by him during his visit on 18th March 1992. He records his arrival as 0930hrs; the scene log identifies him, and Smith, as entering the scene at 0940 and leaving 15 minutes later (simultaneously with Smith). Smith returned on 25th March with Marsden at 1040 and stayed for 45 minutes.

Statement 19/5/92 (S44B)

He identifies MSN14 and 15 as having come from the area near the light switch. He possibly quotes the label detail;

MSN 14 – “blood and paint sample deceased bedroom”

MSN15 – “control sample deceased bedroom”.

Statement of Ludovic Antony Snitynski 13/7/92 (S94)

DC Snitynski is the Exhibits Officer.

According to his statement he attended the scene and the later formal identification of the body at the mortuary at 1719 on 12th March 1992.

The next day he transferred a number of exhibits to Chorley FSS laboratory. Between then and 18th March he received a number of exhibits. (On 17th he attended the scene, “found and took possession of”, a towel, tea towel, and handkerchief from “*behind* the kitchen radiator.” (Are there photos of the scene showing their location?)) On the 18th March, at Oldham Police Station, he received MSN14 and 15, the samples and controls from the wall. These were possibly labelled, “Blood and paint sample”, and, “Control sample”. The only other exhibit received that day was MSN11, “Negatives of footwear”.

On Friday 20th March he took MSN14, 15, and the ‘negatives of footwear’ to Chorley FSS.

This officer has attended the scene, met Susan May, and handled all of the main exhibits.

There is no note in his statement about the storage conditions at the police station.

The quality and integrity of packaging is crucial. Any material, such as samples or photographs of these should be assessed.



FSS Records

FSS Article Submission Form (18/3/92?)

Shows MSN14 and 15 received at Chorley.

Although the notes with the form state that, "The description and identification mark given below must correspond exactly with that on the label", the entries do not match in detail those used in the statements of Snitynski and Naylor.

The specific purpose of the request was, "to examine articles to determine if blood on wall of deceased bedroom".

Section 11 suggests that other exhibits from this case had been submitted previously.

No details of storage conditions or time are noted.

PCR Profiling Submission Form and Case Transfer Form

These forms appear to be a request from Michael Davie at the FSS Chorley lab to FSS Chepstow to perform PCR.

The Profiling Submission Form lists only MJD28 (paint scrapings from above the kitchen radiator), WL19 (Blood from Hilda Marchbank), and MSN14 in the articles forwarded for examination, but mentions MSN15 only as a control for MSN14 in the description column.

The Case Transfer Form lists four items, including MSN15 being transferred from Chorley to Birmingham and on to Chepstow. The Continuity Record is not at all clear and has been altered at some stage; '3' items being changed to '4', and the description of MJD28 being changed.

Although dates are entered in the 'Comments' column, only the first (25/3/92) is clear on what it refers and where. Inked stamps have been applied to the form showing Chorley at 2nd April, Chepstow at 8th April, and Chorley at 18th April. There are no details regarding the storage and transportation arrangements between these.

Statement of Wilfrid Anthony Basley (20/5/92)

He states that he received 4 items at FSS Chorley as described in the Case Transfer Form; MSN14, MSN15, MJD28, and WL19.

He concludes that MSN14 was human blood, but that DNA testing was unsuccessful.



General Examination Record

Probably completed by Mr Basley, the description of the contents of the bag labelled MSN14 starts, "bag containing piece of unlabelled, folded paper – inside which is: numerous flakes of paint...".

There is no reference to the source of the folded paper. This is relevant when considering it as a potential source of contamination. It may, for example, have been used to scrape the wall.

The handwritten note states "LMG+ve", presumably referring to a positive result in the Leucomalachite Green test; a presumptive test for blood relying on a reaction with haemoglobin. It is not specific for human blood.

The main handwritten note is initialled (not clear by whom) on 22nd April 1992.

Bloodstain Grouping Request and Results

This form is dated 29th April 1992.

Only MSN14 appears to have been examined. It showed a positive test for Human antigens.

It is a little surprising that the control sample (MSN15) was not subjected to this test; that is the purpose of the control.

It is common, and good practice, to include reagent blanks or negative controls in tests such as this. ~~Essentially this is to check that the system itself is not producing the positive results~~

The test is performed with everything but the test material (blood), but with a proxy such as saline.

Movement of Items Record

This document has only one entry, dated 28th April 1992, purporting to record the move of MSN14, MSN15, MJD28, and WL19 to 'Freezer Rm', presumably freezer room. A record of the contents of each freezer may/should exist.

The items appear to have remained in the freezer until late 1994.

JH1 + JH2 removed → 8/m
July 92 - until
1994!
By Kerr!

Additional statement of Wilfrid Anthony Basley (6/10/95) and Case Transfer Form

The above four items, plus tubes containing material extracted from them, were packaged by Mr Basley on 22nd December 1994. They were sent for further DNA testing (STR) by commercial carrier to FSS Wetherby on 29th December, arriving on 30th December 1994.

The Statement records the bag numbers as 212959 and 212960.

Kerr had JH1 & 2 removed from F.S.S in July 92 (before trial) - denied existence until '94! Found in his locker.



The Case Transfer Form completed by C Thitchener lists the tag numbers as 1047286 and 1047285.

Only 1 item in 1 sack is listed ("A sealed box containing items listed on STR Submission Form"). The blood sample from Hilda Marchbank and the evidential items are presumably together in this single 'sack', although in separate bags?

STR Submission Form

This form was apparently completed at FSS Wetherby by L. Old on 30th December 1994 confirming receipt of bag numbers 212959 and 212960 by courier.

General Examination Record (2/3/95)

Completed by TMC (Dr Tim Clayton?) and describes the contents of a bag (212959) containing MSN14, MSN15, and MJD28.

The flakes are in an, "A4 lined paper packet". There is no mention of the folded paper described by Mr Basely in his Examination Record on 22nd April 1992.

On MSN15 (Control) and MJD28 it is noted, "Nothing visible", whilst on MSN14, "Can't see anything to test". These remarks presumably referring to bloodstaining.

In the same bag were two packets containing individually labelled small test-tubes. It was not clear to Dr Clayton what these actually were. He notes that they, "looked like", actual extracts (the products of the first part of the DNA profiling procedure) and Chelex pellets (a later stage).

They were stored at -20°C (TMC statement 20/11/95).

Statement of Dr Tim Clayton (31/8/95)

Describes his visit to Professor Brinkmann's laboratory in Germany.

The report refers to work on items MSN14, MSN15, JH1, JH2, and WL19. JH1 and JH2 are the items from the part of the wall containing the fingerprint attributed to Susan May.

He notes that the container with the blood sample from Hilda Marchbank, "leaked rather badly".

An analytical procedure is described to make best use of the limited samples by selecting the most probative DNA areas (loci) to test.

JH1, although having visible red/brown staining, was negative when tested for blood. JH2 showed visible red/brown staining and a slow, but positive reaction in the test for blood. The

JH1 is mark with my print in?



type of presumptive test is not recorded in the report (It is identified as a KM test in a subsequent statement – 6/11/95).

On the basis of these tests it was decided to do no further work on JH1. This seems to me a curious strategy. The test for blood is likely to be less sensitive than the DNA analysis, and it operates on a completely different parameter; one is measuring the effect of a protein, the other measures DNA qualitatively and quantitatively. If the red/brown staining is blood then it contains DNA of evidential value. The issue is that, with a negative test for blood, and a DNA profile, it would not be possible to say scientifically that the DNA originated from blood even though the red/brown staining was present. Strictly speaking, JH1 would be the reagent blank to show whether the red/brown staining was blood. In the same strict sense, a comparison of the results from JH1 and JH2 show that the red/brown staining is not blood because JH1, having staining, was negative in the test for blood. Of course there are other reasons why these results may occur. Dr Clayton acknowledges the possibility, and some reasons, of so-called 'false-positives' in his Statement of 6/11/95. His final reason is, "the stain was not blood". The possible reasons were unable to be tested.

If DNA was found in JH1 that came from a source other than blood then that could also be the source for any DNA in JH2. This would be helpful for the defence position, but not the prosecution.

The difficulty in interpretation can be illustrated by considering the hypothesis that Hilda Marchbanks' DNA is present on the wall.

In this case, all samples would show her DNA profile. Without testing the controls and all of the available material (including MSN15 and JH1) it is not possible to be sure about the source of DNA.

Curiously, although MSN15 is mentioned several times in the report, it is missing from the Results and Conclusions. A negative result for MSN15 is an important requirement. (This is reported in Prof. Brinkman's results though.)

Michael Davie Statement 6/7/92 (Document S95)

He states that a number of stains on the bedroom wall, to the right on entering, tested positive for blood on 12th March when he attended the scene. He states that on a subsequent visit on 17th March other stains, position unidentified, gave negative results on presumptive tests for blood. On a third visit on 20th March, a number of other stains in the kitchen were tested



14/02/8
and only one of these gave a positive test for blood. This was a stain behind a radiator in the kitchen.

The reason given for this stain only being identified 14 days later was that there were towels over the radiator which had obscured sight of the stain on a previous visit. However, DC Snitynski's statement (below) refers to the towels being removed on 17th March, only 5 days later than the murder and 9 days before Davie's visit. Mr Davie goes on to say, "If these towels had been there prior to the murder then I can see no way in which this bloodstain could be connected with that crime."

* The reasons for ignoring ~~this staining behind the radiator~~, which clearly shows that a substance similar to the ones being used as evidence against Susan May, have never been expounded. Identification of the source of this blood would be useful. It would also be helpful to elicit the logic behind the assumption that this stain is not connected with the others (JH1 and JH2).

Mr Davie received items MSN14 & 15 ("Blood on paint from bedroom wall and control"), and JH1 & 2 ("Blood on paint from bedroom wall"). He was specifically asked to examine evidence regarding Susan May's involvement in the murder and started his examination after she had been charged.

51/02 I note that the tests on the bloodstains to confirm that they were of human origin were reported as giving, "no results". An alternative, and also perhaps more accurate depending on how the testing was done, is to report that the tests were negative. This illustrates a, probably unconscious, bias in the reporting.

Mr Davie's section, "Interpretation" is obscure in its logic and flawed in its use of acceptable practice.

To say, "Apart from the presence of Susan May's fingerprints on the bedroom wall I have found no evidence to support the allegation that she murdered Hilda Marchbank" is surprising, as he is not a fingerprint expert. He then goes on to say that, "In reaching conclusions with respect to this evidence", without clarifying the specific evidence, and then considers two hypotheses.

* The two hypotheses that Mr Davie used to reach his conclusions are simply unacceptable.

* They address the ultimate issue and should not have been considered. The development of the so-called Bayesian approach to evidence evaluation requires that the scientist considers



alternative explanations for the evidence. The form of the argument is; *given* the evidence, what is the probability of each of the hypothesis.

He explicitly compares the two hypotheses, "Susan May committed the murder ...", and, "Susan May did not murder Hilda Marchbanks ...". This is not good practice and, I would have thought, legally questionable.

The only hypotheses that he could compare on the basis of his own expertise (he cannot verify the fingerprints) and examinations were

1. The marks on the wall are human blood, and
2. The marks on the wall are not human blood.

In comparing these, he should consider all of the test results without bias or attempting to explain away results that do not fit the hypothesis. Each test has a false positive and false negative possibility. Given properly conducted tests, the test results are; a positive presumptive test for blood and a negative human species test.

Given this evidence, the first hypothesis is less likely than the second.

It is still possible that the species test failed because of a poor sample, but there is no support for this hypothesis in Davie's statement other than his *ipse dixit*.

Despite his initial assertion that, "Apart from the presence of Susan May's fingerprints on the bedroom wall I have found no evidence ...", he then uses the presence of three small bloodstains, and opinion about blood drying times, to support his conclusion that, "the scientific findings tend to support the first hypothesis and therefore the allegation".

Excessive weight has been attached to the preliminary test for blood, compounded by insufficient weight being accorded the negative test for human body fluid.

I prepared a previous report for Mr Campbell Malone, solicitor, on the topic of the testing for blood. It is attached as Appendix 1.

As regards continuity. There is no record in Mr Davie's report as to the specific storage and handling procedures to which the exhibits were subjected.

Blood on other bedsheet?

Witness Statement of Jonathan Whitaker 22nd September 2004

JH1 and JH2 contained a mixture of apparently stained and unstained paint flakes. The stain was taken to be blood on the basis of the previous presumptive testing.

The stated purpose of the examination was to ascertain if "DNA/blood from Hilda Marchbank, Susan May or any other person is present on the paint flakes JH1 and JH2".



The scope of work and comment goes beyond this remit.

The stained and unstained fragments within each exhibit were separated to test whether any DNA could have originated from the wall. This, to some extent represents a failure in the initial evidence collection by **failing to collect control samples**. The requirement for controls was known as MSN15 was collected as the control for MSN14.

Dr Whitakers's statement on page 4 regarding the reason for the failure to produce a full profile from the blood sample of Hilda Marchbank ("insufficient amount of good quality DNA") contrasts with his later statement, which he uses as a factor in assessing the propositions, "bloodstains are a relatively good source of DNA ... even if it were mixed with some other undetected body fluid ... even on old and chemically treated bloodstains".

I believe the experimental approach is fundamentally flawed and will therefore not comment further on the results. Because, if I propose that each set of flakes (JH1 and JH2) had been transported together and that there had been a consequent transfer of DNA from the stained to the unstained section, this is compatible with the observed results and therefore

undermines any other conclusion. The continued use of only two alternative hypotheses by the FSS when considering results is scientifically questionable and potentially misleading. If more work is required to examine the use of LCN and the statement of Dr Whitaker dated 15/2/05 then this can be done, but will require further instruction from the CCRC. I can provide a strategy and a statement of expected costs if required.

As an example, it is not at all obvious how a 'more complete' profile obtained from JH2, without a reference sample, could be considered to belong to Hilda Marchbank. The verification of the LCN results by examination of the laboratory records will also enable an assessment of their reliability. However, the objection to this approach remains as above.



APPENDIX 1 Comments on TAB test



PLEASE NOTE THAT ALL OF THE STATEMENTS CONTAINED HEREIN ARE BASED ON THE INFORMATION I HAVE BEEN GIVEN AND MAY BE ALTERED IF THAT INFORMATION IS AMENDED OR APPENDED.

The key prosecution evidence was that a stain made from the victim's blood contained a fingerprint belonging to Susan May; the implication being that this could only have happened after the murder.

Three facts have to be proven to sustain this evidence;

1. It was blood
2. It was the victim's blood (and no other tissue)
3. The fingerprint belonged to Susan May

It is to the first of these that I have addressed most attention.

Traditionally, forensic scientists use presumptive tests as an easy way to eliminate possibilities. This avoids unnecessary testing of for example, powders for drugs or blood for blood group substances or DNA profiling. A positive presumptive test is not regarded as reliable proof that the substance is what it has been tested for. This is particularly important when used in the legal domain where presumption is "an inference of the truth of a fact from other facts proved". This is NOT the scientific use of the word.

Therefore, no matter what presumptive test was used, it would normally be regarded as a preliminary test before further testing to identify the material. For blood, these further tests would include the identification of the source of the blood by blood grouping or DNA profiling. The least informative data is that it is blood, the next the species, blood group, and DNA profile in increasing order of discriminatory power in establishing a source.

In this case the TAB technique was used, ostensibly to identify the material as blood.

In considering how good any scientific test is at separating and identifying the component under test (the analyte) the term 'specificity' is used. A measure of how little material the test can reliably detect the term 'sensitivity' is used. This latter helps the investigator to know the minimum amount of material that was there if they detect any.

The specificity of a test will therefore depend on other things that are detected by the test – or show 'positive'. For example, if our test for cars was simply to test for four wheels then we would see many 'false positives' because vans and tractors would also be 'positive' in our test, and there would be 'false negatives' in that there are a number of three-wheeled vehicles that are cars but do not show positive in our test.



In forensic science it is vital that the specificity of the tests used are known. Clearly, the more materials that show positive for our test when they are not (the false positive rate) or negative when they are actually what we are looking for (false negatives) the poorer the test is as a reliable indicator for the material.

In addition to those materials identified above, TAB is a 'nuclear stain' used in histochemistry to stain the nucleus of cells. The relevance of this is that almost every cell in every plant or animal has a nucleus. **Almost any biological material, including blood, would show positive by this method.** This would not normally be a major problem for investigators when it is used as a preliminary test or just to show fingerprints, they would expect to do more tests to establish the material as blood.

However, **it cannot be regarded as specific for blood** and therefore it has not been established by this test that the marks were blood.

Hussain's evidence specifically says that TAB reacts with haemoglobin with the implication that it will react with almost nothing else. However, Gettler and Kaye report, "One of three tests is used frequently by clinical laboratories for the detection of occult blood in feces, urine, spinal fluid and gastric contents, namely the guaiac, benzidine and orthotolidin test. *These tests are not specific for hemoglobin (blood)* since many other substances, as indicated in the table, give a similar color reaction." (The Phenolphthalin Test For The Detection Of "Occult" Blood Alexander O. Gettler & Sidney Kaye, The American Journal of Clinical Pathology, Vol. 13, No. 9, September, 1943).

Haemoglobin is contained in the red blood cells. Red blood cells are the one cell type in the body that have NO nucleus and would not therefore be expected to stain positive with TAB. There is no haemoglobin in the nucleus of cells, therefore TAB clearly reacts with other biological materials. This does not rule out TAB reacting with haemoglobin, but leaves two possibilities open;

1. TAB reacts with a range of materials, including Hb and nuclei.
2. TAB does not react with Hb, but some other component in blood that makes it a 'test' for blood.

I have not been able to consult the original reference (Sahs, P., "DAB: An Advancement in Blood Print Detection", J. Forensic. Ident., Vol. 42., No. 5,(1992), pg 412.)



I quote from a fingerprint website "D.A.B. is a protein stain that is *not specific for blood*. Dye will also absorb to palmar sweat." N.B. DAB = TAB as explained above, 'palmar' = from the palm of the hand.

(<http://www.cbdiai.org/Reagents/dab.html#ttops>)

I consider it misleading to say, as Hussain did, that "the material behaved exactly as I would have expected had it been blood" because there would appear to be many materials that would behave in the same way.

While it may be true that he "can think of no other material which would have behaved in that way" it is clearly not a true statement of the facts as demonstrated above; simply that he does not have sufficient knowledge of the tests he was using. Again, I consider this clearly misleading.

All of this was compounded and summarised in his response to defence Counsel, "I am **certain** in my opinion that the material there was blood". That may be, but his opinion is clearly and demonstrably flawed.

It is wrong, and misleading, to say that only food containing haemoglobin would produce a positive result with TAB. Wrong for reasons already explained, and misleading because it attempts to limit the positive result to only blood.

(Even the judge seems to be confused about haemoglobin, asking if it might be in food for human consumption – it is ubiquitous in meat, it is what gives blood its red colour!)

TAB has been tested for use after ninhydrin, but there is no published work reporting its use after iodine treatment.

The question remains why Hussain thought it necessary to use ninhydrin after achieving results with iodine.

In response to prosecution Counsel's question on the appearance of the marks and their reactions, Hussain said, "I can think of no other material which would have behaved in that way". I quote from the Australian National Institute of Forensic Science website, "A number of substances such as fruit-stains or dye-stuff may soil clothing and take on the appearance of bloodstains. The benzidine test - used for many years to confirm the presence of blood - has been discontinued because the reagent is carcinogenic. It has largely been replaced by the Kastle-Meyer test, using a solution of phenolphthalein which turns pink in contact with even small traces of blood. The test works by detecting the presence of the enzyme peroxides in the blood. However, as *this substance is also present in other*



biological materials, the Kastle-Meyer test is regarded as a screening procedure. It is highly sensitive, and positive reaction is judged presumptive of blood, and further confirmatory tests are carried out. These are usually chemical and microscopically procedures to identify blood by its pigments and cellular structures"

<http://www.nifs.com.au/FactFiles/serology/how.asp?page=how>

Meat, fruit, and 'other biological materials' may therefore all react positively with TAB. I have been unable to examine this other reference, but it is clearly relevant; Pascual, F.A. Verdú and M.S. Gisbert Grifo, "Investigation of bloodstains: false negative results of the benzidine test", *Forensic Science International*, 71 (1995) 85-86.

SUMMARY

Despite the confusion on the naming of the test used to establish that the material on the wall was blood, it has been demonstrated here that neither the appearance of the stains, the KM test (which was set aside as evidence), nor the TAB test were sufficient to establish any material scientifically as blood.

Of course this does not rule out the possibility that the material was indeed blood. But, the scientifically justifiable conclusion is that blood is one of an unknown number of materials that would have tested positive and furthermore have a reasonable chance of being present in a house.

The lack of appreciation of the possibility for false positive results was compounded by the scientist giving evidence to the court that he was 'certain' of the nature of the material as blood. This would have misled any reasonable person as to the weight of evidence regarding the nature of the material.

The 'TAB' test.

It is first necessary to explain the difficulties with the naming of organic (carbon-containing) chemicals:

In evidence, the term TAB test was used, using a chemical called tetra amino biphenyl.

However, this chemical has another, more common, name, DAB or di-amino benzidine.

Benzidine is also the basis of the eponymous test for blood used for many years. The molecules are similar (TAB and DAB are identical) and react in practically the same way to



blood. Researching the difficulties of the TAB test is confounded by the different naming conventions and for this reason the source of this possible confusion is explained here.

Carbon atoms can be strung together in chains that may be branched or circular. Other atoms or groups of atoms can be attached to these chains at almost any particular carbon atom and the position of these groups can affect the chemical behaviour of the molecule. Sometimes the chemical was discovered before the actual structure was known. For example, what we know historically as alcohol, was labelled by the first scientists as ethanol. We now know that ethanol is simply one of a large family of alcohols that differ only in adding a carbon atom to the chain (each carbon atom also has a couple of hydrogen atoms attached). Ethanol has only two carbon atoms and therefore it really doesn't matter which carbon atom you attach the so-called alcohol (-OH, a hydrogen atom and an oxygen atom) group to, the molecule looks the same.

To identify where things are attached to various naming systems were developed, including IUPAC and SI systems. These could still give different names to the same chemical, but a scientist knowing the systems could easily work out the chemical structure; and that was the important feature.

Adding another carbon atom to the chain of ethanol to give three now means that you can attach the -OH group to one of the end carbons or to the one in the middle; this produces a different chemical, propanol (propanol differs from propane gas only in having the -OH group). Propanol with the -OH attached to the end can be called propan-1-ol (the 1 signifying attachment to the number 1 carbon atom) or simply propanol, and when the -OH is attached to the middle carbon, it is called propan-2-ol (-OH on the number 2 carbon) or t-propanol (the rough shape of the molecule).

Looking at TAB, tetra-amino-biphenyl. Phenyl is a carbon ring with 6 carbon atoms, like a hexagon. Five of the carbon atoms are 'full', having all their bonding capacity taken up by either the adjacent carbons or attached hydrogen atoms. But one of them is free to attach to something else.

In bi-phenyl, this something else is another phenyl molecule, hence BI phenyl. So biphenyl is simply two phenyl molecules stuck together.

We can now replace some of the hydrogens around the hexagons with other groups of atoms. One of these groups has one nitrogen atom and two hydrogen atoms (-NH₂) and is called an AMINO group.

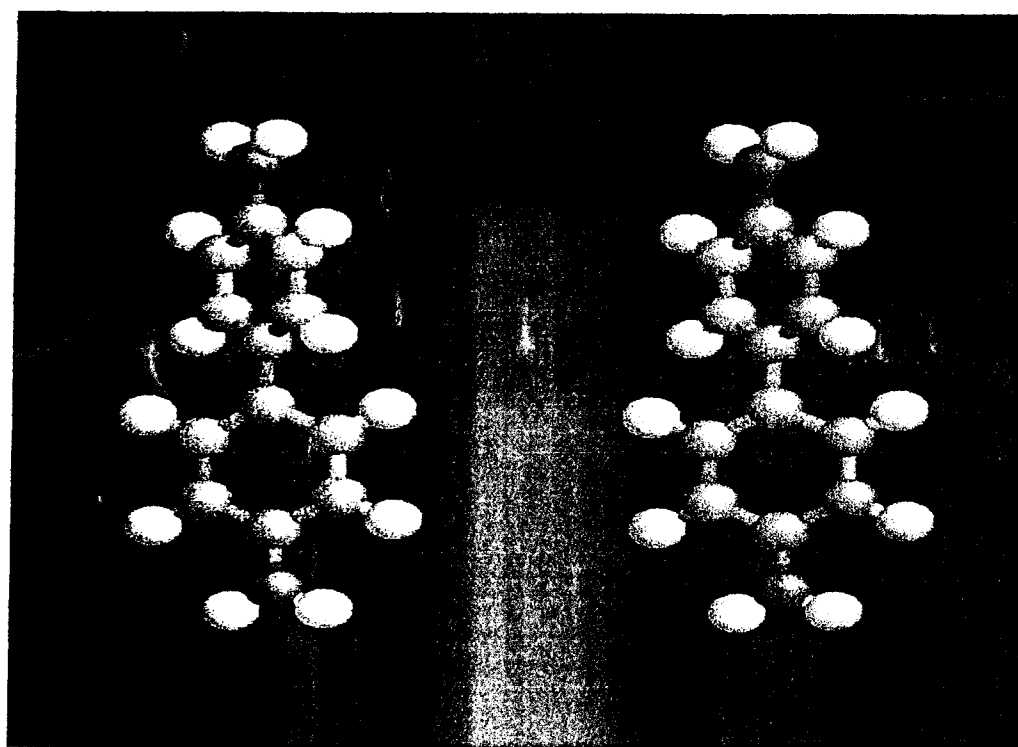


Attaching FOUR of these to biphenyl gives us TETRA amino biphenyl or TAB, the nomenclature used by Hussain. This name does not tell us where the amino groups are attached.

Another naming convention can start with a base molecule and note the additions.

There is a molecule called benzidine which, if you like, could also be called BI amino biphenyl if you used the system above. Of course these names would not suggest to a lay person that the molecules were actually identical.

Here is a model of benzidine showing two slightly different views of the molecule.



You can see two 6-Carbon-atom rings joined to each other. The white balls are hydrogen atoms, the blue balls are nitrogen. You can see the amino (-NH_2) groups at the top and bottom of the structures.

A more precise way of naming would be to label the C atoms at the junction of the two rings as 1. Going round the rings will give C 1-6. To differentiate one ring from the other we add an apostrophe to the numbers on one ring giving C1'-6'.

This is 3,3', bi-amino bi-phenyl, also known as benzidine.



If we add another two amino groups to the No.4 carbons on each ring, we will have 3,3',4,4', tetra-amino bi-phenyl (TAB), also known as di-amino benzidine (DAB)!

Benzidine has also been used as a presumptive test for blood. This quote, from the Forensic Medical Institute, expresses due concern about its interpretation,

"In the case of Benzidine being used on a human body to demonstrate reactions to blood, the possibility of having fake positive reactions must be taken into account. Not only paint, rust, fresh vegetable, bacteria, animal blood etc. remaining on the body of the tested person can give a positive reaction but also the remains of old blood no longer visible or any minor wound on the surface of the skin can give a reaction. Principally, *the above use of it cannot provide enough evidence.*

Following a Benzidine-test, the blood sample becomes unsuitable for further tests". (Source: <http://www.alarmix.net/neki/esetek/benzidine2.htm>)

The key issue here is that a material may be one of many possible species. A presumptive test merely reduces the number of possibilities by excluding some, but a great number of possibilities may remain after a positive presumptive test.