> based on her examination of other papers on which Dr. Popovic was an author, Dr. Schaffer discounted his claim that he had been hampered in drafting and editing the Science paper because English was not his native language. She decided that, since the English in the other papers was "pretty good," he was not credible. Tr. at 1529-30. However, she lacked factual information critical to evaluating his skills; she admitted at the hearing that she did not know whether these other papers reflected his personal English skills or instead either were written in his native language and translated into English or were heavily edited by others. Tr. at 1599.[16]

Dr. Martin, another of ORI's expert witnesses, simply cannot be considered disinterested. He acknowledged that he had had a dispute with Dr. Gallo regarding the research involved here, and his testimony evidenced sympathy to the French researchers' claims that Dr. Gallo had failed to give them appropriate credit. Tr. at 1337; 1359-62; 1311-12; 1316; 1328-29. As discussed below, his testimony showed a frustration with what he saw as a lack of detail in the paragraph at issue that derived from what he wanted to know for his particular purposes and what Dr. Gallo had said to him about the Science paper, rather than reflecting an impartial analysis based on reading the paper as a whole. Tr. at 1333-63. For example, Dr. Martin's interpretation seemed to assume that patient donor cells had been cocultivated with the T-cells, rather than that the T-cells had been exposed to cell-free supernatants (fluids) from the patient cultures, as the paper itself describes. See Tr. at 1324.

We found Dr. Sodroski, the only retrovirologist other than Dr. Martin who testified for ORI, to be not only objective, but highly credible and persuasive. When viewed as a whole, however, his testimony supported Dr. Popovic's case more than ORI's case. On direct examination, Dr. Sodroski testified with respect to the

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[16] Dr. Popovic testified that some of these papers were written in his native language and translated and that some were written in English and heavily edited by others. Tr. at 2287-89. Others who knew him in the relevant time period testified about his difficulties with the language, and our observation of him over the two and a half weeks of hearing confirmed that he has continuing difficulties with syntax and the nuances of the English language, even though his basic English is good.

term "concentrated fluids" in the disputed sentence that he believed that the term referred to the "concentrated culture fluids harvested from short-term cultures of T-cells grown with TCGF, or T-cell growth factor, which were obtained from patients with AIDS or pre-AIDS." Tr. at 741. (That is, the concentrated culture fluids referred to in the preceding sentence.) He then testified that the basis for his conclusion was that "the word 'first' suggests that the demonstration of particle-associated RT was associated with the actual short-term cultures of the T-cells themselves." Tr. at 741. This testimony supports our analysis above that, in context, the importance of the sentence is that it establishes an association between RT activity and the patient cultures necessary to show that the retrovirus was transmitted to the cell line from patient cultures.

ORI counsel did ask Dr. Sodroski: "Does that sentence then mean that before the pooling the patient samples were RT positive?" Tr. at 744. He answered: "Yes." Tr. at 744. His responses to subsequent questions, however, indicated that this opinion was based on several assumptions and factors. He assumed the RT testing would have been done on individual patient samples before pooling because pooling samples with no virus would dilute the amount of virus, and because he assumed that RT results for the cultures could have been obtained within 2.5 to 3 hours, so that culture viability would not suffer much from waiting for the results. Tr. at 744-45; 749; 759. We discuss below the question of the "logic" of pooling prior to RT testing. With respect to waiting for RT results, Dr. Sodroski indicated that, if he had to send for results to another laboratory and wait three days to obtain results, this would affect his view of whether culture viability would be affected. Tr. at 759. As our analysis discusses, the evidence shows that Dr. Popovic was sending materials to another laboratory for RT testing, so that culture viability would suffer from waiting for results.

Dr. Sodroski also indicated that he read the term "concentrated culture fluids" to refer to individual patient samples because the word "fluids" is plural. Tr. at 772; 775-76. When informed of the possibility that supernatants from individual patient cultures were first pooled and then concentrated, and that there were three such concentrated culture fluids used for the "repeated

exposure" of the cell line, he acknowledged that the term "concentrated fluids" was ambiguous. Tr. at 789.[17]

Finally, testimony for Dr. Popovic by Dr. Malkovsky, who had the most extensive experience of any of the witnesses in isolating and growing the AIDS virus, also indicated that the sentence was ambiguous, depending on whether the fluids were first pooled and then concentrated or were tested for RT before the pooling. Tr. at 2235-36. He viewed the editorial change which created the "first shown" sentence as not changing the meaning, but as stressing more the fact that the fluids were positive for RT. Tr. at 2235. Contrary to what ORI argued, we do not find that the mere fact that, like Dr. Popovic, Dr. Malkovsky was born in Czechoslovakia indicates that he was biased in Dr. Popovic's favor.

In sum, ORI did not establish through a preponderance of the credible testimony that ORI's reading is the only reasonable reading of the disputed sentence.

3. Dr. Popovic's testimony on what he in fact did is credible.

ORI also suggested that, even if the sentence was intended to mean that pooled concentrated fluids were shown to contain particle-associated RT, we should find the sentence false. ORI argued that there were two reasons why we should not find credible Dr. Popovic's assertions that he had sent such fluids to Dr. Sarngadharan's laboratory in Maryland for RT testing. First, ORI argued, Dr. Prem Sarin, at the LTCB, was capable of doing RT tests and had performed such tests for Dr. Popovic on patient samples. Second, ORI asserted, there is no documentary evidence that Dr. Sarngadharan had tested such concentrated fluids and found them positive.

We find credible Dr. Popovic's testimony that he sent materials to Dr. Sarngadharan for RT testing, rather than relying on Dr. Sarin to perform the tests, for the following reasons:

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[17] Dr. Sodroski testified that it is "not uncommon that there are ambiguities in methodologies recorded in journals like Science that are very pressed for space," so he did not think the ambiguity in the term "concentrated culture fluids" was particularly troublesome. Tr. at 792-93.

- We found Dr. Popovic credible as a witness based on a number of factors, including his demeanor during the hearing, the straightforward way in which he testified, others' testimony about his basic integrity (which was wholly unrebutted), and our review of his past statements.

- ORI's major argument concerning Dr. Popovic's credibility was that that he allegedly lied in a written submission to ORI in stating that seven or eight of the pooled cultures were from patients confirmed to be HIV positive. (HIV is the current designation for AIDS virus variants.) ORI relied on an analysis by Roche Diagnostics of aliquots of the ten pool samples, which found HIV virus in only six of the ten samples. What ORI ignored was that one of the four other samples was identified as being from a patient who "seroconverted between June 1984 and June 1985." Ex. H-79 at 468. Thus, since at least seven patients could reasonably be said to have been confirmed to be HIV positive, Dr. Popovic's statement was not inaccurate.

- Dr. Popovic's contemporaneous notebooks and those of his technician indicate that, during this time period, he was regularly sending materials to Dr. Sarngadharan for RT testing. See, e.g., Ex. H-19 at 29, 33, 44.[18] They also show specifically that he sent some materials to Dr. Sarngadharan for RT testing on the dates of the first and third pool infections. Ex. H-19 at 33, 44.

- Dr. Sarngadharan's testimony before ORI (admitted here by agreement of the parties) corroborates Dr. Popovic's testimony. Ex. H-50 at 15-19; see also Ex. H-52 at 17, 38.

- Dr. Popovic's testimony that he had other evidence of the presence of a retrovirus in the samples (such as multinucleated cells) which led him to question Dr. Sarin's results is consistent with unrebutted

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[18] The notebooks use the name "Sarang" rather than "Sarngadharan", but both parties agreed that these names referred to the same person. While the original protocol for the experiments, dated September 10, 1983, called for RT testing before infection, Dr. Popovic testified that he started sending tests to Dr. Sarngadharan in October or November 1983, and the notebooks support this claim, as does Dr. Sarngadharan's testimony during the investigation. Tr. at 2495; Ex. H-19; Ex. H-50 at 15-19.

> testimony on the kinds of clues on which a researcher in general, and Dr. Popovic in particular, would rely in trying to detect and isolate a retrovirus. Moreover, Dr. Sarngadharan was instrumental in developing the RT test and an expert on it. Ex. H-50 at 7-9.

ORI would have us find against Dr. Popovic on the basis that there is a lack of any primary data showing RT results for the three concentrated culture fluids. There are several reasons why we do not make such a finding here. First, there is some data in the notebooks which may be relevant; the problem is simply in interpreting those data. Codes were used on materials sent to Dr. Sarngadharan so that his testing would be blind. Usually, these codes were just numbers, starting with one, corresponding to samples sent on a particular date. Dr. Sarngadharan would generally call Dr. Popovic with the results. Ex. H-50 at 15-18. Dr. Popovic's notes, showing RT results with numbers and various dates, are difficult to interpret because the code is not always clear. For example, RT results from Dr. Sarngadharan corresponding to the date of the first pool infection, November 15, 1983, include a positive result for code number 3, which is identified only by a notation which looks like a "17" (in contrast to several other code numbers which have identifiers corresponding to individual patient samples mentioned in the notebook). Ex. H-19 at 57.[19] Dr. Popovic has said that this may be the RT result for the first concentrated culture fluid (which was harvested from cultures from the same three patients as the second concentration). While his notes do not specifically identify "17" as the pool, neither do they rule this out as a possibility. It is, moreover, credible that each of the three pooled and concentrated culture fluids would have tested positive for RT activity, since it is undisputed that aliquots from one or more of the patient samples used to create each of the three concentrated culture fluids contained the AIDS virus.

Second, the particular circumstances here such as the passage of time and the manner in which Dr. Popovic and his technician kept notes make inferences which we might otherwise draw from a lack of primary data unreasonable here.

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[19] Dr. Schaffer was apparently under the erroneous assumption that this was an undated entry. Tr. at 1501.

Third, it is not clear that Dr. Popovic, rather than Dr. Sarngadharan, would have had the responsibility, if any, to retain records recording the results of experiments Dr. Sarngadharan performed. ORI did not rebut testimony that the contract between Dr. Sarngadharan's laboratory and the NIH required him to retain records for only three years. More than five years had passed before ORI investigators requested such data, and Dr. Sarngadharan testified as to circumstances in his laboratory which made retention of old records difficult. Ex. H-50 at 34.

Dr. Popovic's testimony that he first pooled and then concentrated the supernatants (fluids) from the patient cultures is also credible, for the following reasons:

- The protocol he wrote for these experiments in September 1983 states: "If not sufficient volume of culture fluids; pool together several samples. Use both (conc.) culture fluids and cells for infection." Ex. H-19 at 16-17; see also Ex. H-45 at 15-21 (12/1/90 preliminary response).

- Dr. Sodroski, in describing what a retrovirologist typically would do, indicated that a researcher would usually concentrate the fluids before testing them for RT activity since it gives a better result. Tr. at 677-78.

- Dr. Sodroski also indicated that concentration would be done in two steps. Tr. at 678. In light of this, it simply would make more sense first to pool the culture fluids and then to concentrate them since this would require fewer steps of concentration than if each individual culture fluid were first concentrated.

- Dr. Sarngadharan explained that the fluids would have been first pooled and then concentrated, with part used for infection and part sent for RT testing, and that it would have been contrary to the purpose of pooling (to save scarce patient material) to have first sent parts of the individual patient cultures for RT testing. Ex. H-52 at 34-35.

Finally, we find credible Dr. Popovic's testimony that, if there was some imprecision in the sentence, he was not aware of it at the time.[20] As we discuss next, ORI did

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[20] In addition to the other factors we discuss below, Dr. Popovic's credibility on this point is also enhanced by testimony by Dr. Sarngadharan, who was (continued...)

not prove by a preponderance of the evidence either that Dr. Popovic drafted the sentence or had his attention directed to it during the editing process. Even more important, ORI did not prove by a preponderance of the evidence that Dr. Popovic had a motive to falsify the sentence.

4. ORI did not prove either that Dr. Popovic drafted the sentence or that he became aware of any imprecision in the sentence during the editing process.

During the course of the investigation, Dr. Popovic provided copies of eight of the drafts of the Science paper at issue, including his handwritten draft and later typed or xeroxed versions which show corrections in other persons' handwriting. These drafts were referred to by number at the hearing as though they were consecutive drafts, but there possibly was at least one intervening draft, which is missing.[21] We nonetheless use the draft numbers used by the parties.

The unrebutted testimony shows that, after preparing a rough handwritten draft of the paper and having it typed, Dr. Popovic traveled to a conference in Utah on or about March 18, 1984 to present a paper. While at the conference, he received a phone call from Dr. Gallo asking him to return. Meanwhile, Dr. Gallo began editing the draft and it went through several versions before Dr. Popovic returned to the Laboratory of Tumor Cell Biology on March 27, 1984. Dr. Gallo told Dr. Popovic upon his return that if he was not able to complete editing of the paper within a very short period of time, it might not be published with the other three papers. Over the next few days, several others (including Dr. Gallo, Dr. Sarngadharan, and Anna Mazzuca, who acted as an editorial assistant at the LTCB) assisted Dr. Popovic

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[20] (...continued)
involved in editing this paper. He testified that "first shown" meant that the concentrated culture fluids were shown positive before the infection. He interpreted this, however, as consistent with what actually occurred since, even if the result is found later than the infection, "what you find out is on a result of a sample before going on to the cell . . . ." Thus, he said, "That positive first only means that the sample was positive prior to going on to these cells." Ex. H-52 at 33-38.

[21] Alternatively, some changes could have been made directly by whoever typed the drafts.

in editing the paper. The paper was submitted to Science on the morning of March 30, 1984.

Neither the paragraph nor the specific sentence at issue here appear in Dr. Popovic's handwritten draft. Draft seven contains the sentence quoted above, which appears on draft eight as two sentences (including the "first shown" sentence). Since there is no marking on draft seven indicating such a change, and no one has produced any intervening draft, it is impossible to determine who made the change.

ORI would have us infer that Dr. Popovic made the change because the unedited sentence in draft seven was added in response to a direction by Dr. Gallo in draft five to "give method" and Dr. Popovic was the person responsible for the method. See Ex. H-10 at 6. It is equally reasonable, however, to infer that the change which created the "first shown" sentence was made by someone else as an editorial change. The clause in draft seven beginning "which was harvested from short-term cultured T-cells" is a misplaced modifier which could mistakenly be read as modifying "RT" (the antecedent noun), rather than as modifying "concentrated culture fluids." Moreover, this clause had a singular verb form "was," but clearly was intended to relate back to the plural noun "fluids." In our view, this makes it just as likely that the change in draft eight adding the "first shown" sentence was made by someone skilled in English, as that it was made by Dr. Popovic.

ORI presented no evidence that the "first shown" sentence was specifically brought to Dr. Popovic's attention, either before the paper was submitted to Science or when he read the galley. Editing of the galleys was done under unusual circumstances, due to the nature of the four papers, and Dr. Popovic's participation was limited to reviewing the galleys at the house of a Science editor on a weekend day. In a period of about an hour, he not only reviewed the galleys of his paper, but also briefly reviewed the galleys of two of the other papers on which he was an author. Tr. at 2301; see also Tr. at 1717-19 (Kulstad).

While Dr. Popovic himself admitted that he would have liked more time to review the galleys, ORI did not establish that Dr. Popovic had any meaningful control over the editorial process, other than potentially withdrawing his name from the paper. One of ORI's own witnesses acknowledged that this would be "inconceivable," given the nature of the papers and Dr. Popovic's contribution. Tr. at 465 (Richards). We

agree. The editorial process was clearly adequate; none of the allegations here calls into question the major conclusions of the paper. We doubt that any paper could withstand entirely the scrutiny this paper has received. ORI sought to establish that the pressures to publish were created or fabricated by Dr. Gallo and did not justify any failure to ensure precision in every aspect of the paper. We found persuasive, however, Dr. Popovic's testimony that, as a physician, the primary pressure he felt was that publishing the papers could save lives.

Under the circumstances, including the subtle nature of any imprecision in the "first shown" sentence and the fact that English is not Dr. Popovic's native language, we find credible Dr. Popovic's assertion that he did not recognize any inaccuracy in the sentence.[22]

Thus, even if we viewed the sentence as inaccurate, rather than merely ambiguous, we would not find that it was falsified by Dr. Popovic.

5. ORI did not show that Dr. Popovic had a motive to falsify the sentence.

ORI took the position that Dr. Popovic had a motive to falsify the sentence because it would make the methodology of the reported experiment appear more rigorous if the RT tests had been performed on each of the individual patient samples before they were pooled. ORI relied on testimony that it would be more logical to test for RT activity in patient samples before pooling them because adding samples with no virus in them to the

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[22] ORI argued that we should find Dr. Popovic responsible for any inaccuracy in the disputed sentence because it was repeated in a patent application filed around the time the paper was published and because Dr. Popovic, by signing the application, had certified that it was not false. Unrebutted testimony, however, shows that Dr. Popovic did not actually review the application before signing it but relied on others, including lawyers for NIH, to accurately reflect the paper in the application. Tr. at 2325-27; 2487-90. Since ORI did not prove that Dr. Popovic was aware of the inaccuracy in the paper, or that he reviewed the patent application, the fact that he certified the application does not help ORI's case here. Moreover, ORI's implication that he had a motive to falsify the application is unwarranted, since at that time researchers could not share in the patent proceeds.

pool would "dilute" the pool and reduce the chances of infecting the cell line with the virus.

We reject this analysis for two reasons. First, ORI's position would require a finding that Dr. Popovic viewed the "first shown" sentence as a part of the methodology reported in the paper and viewed RT testing as an integral part of his methodology. Second, ORI's position would require a finding that Dr. Popovic thought that what he did was illogical, so that he should misrepresent it to make it appear more logical and therefore more rigorous. The record does not support such findings.

In our view, characterizing the paragraph in question as the key methodology section in the paper takes that paragraph out of context. As discussed above, the paper's focus was on the development of a cell system to permanently grow and continuously produce large amounts of virus in spite of the cytopathic effects of the virus. The most important contribution of this paper was identification of the appropriate target cells, and identification of the most permissive clones of that cell line. Dr. Sodroski testified that --

> the key to success I think here was that the fact that the cells, the right target cells for the virus could be propagated in the culture, allowing the virus to replicate . . . to a level that was detectable . . . .

Tr. at 674; see also Tr. at 1982-83, 2002 (Dr. Blattner). He stated that the importance of establishing continuous production of the virus was that it could be used to further characterize the virus, as well as to provide a reagent for the purpose of establishing diagnostics. Tr. at 780-81.

The testimony established that there were certain standard methods for infecting a cell line with a virus: cell free transmission (or exposure) and cocultivation. Cocultivation is mentioned several paragraphs before the one in question and a reference is given.[23] Both cell free transmission and cocultivation are referred to and described in somewhat greater detail in the legend to Table 2 in the paper. Thus, the key contribution to "methodology" in the paper was the identification of the right target cells to obtain continuous production of the

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[23] Even Dr. Martin, who faulted the paper for lack of detail, testified that, when the paper came out, use of the process of cocultivation in isolating viruses had "long been appreciated." Tr. at 1324.

virus, not the particulars of how to infect a cell line with a virus.

Moreover, contrary to what ORI suggested, there is no apparent reason why Dr. Popovic would have thought it important to the paper's conclusions to go into the details of how he pooled viruses together when infecting the parental T-cell line.[24] Indeed, the contemporaneous evidence (the various drafts of the papers) indicates that he did not originally include this paragraph. He added it after a decision had been made that the isolate later called HTLV-IIIB would be used for the AIDS test. This decision ultimately gave the infection of the parental cell line an importance it would not otherwise have had. With respect to how Dr. Popovic would have likely viewed the paragraph at the time in light of the conclusions in the paper, however, the evidence shows that ORI overrated the importance of the paragraph.

An examination of the paper itself reveals that the infection described in this paragraph is not the only one described in the paper. When commenting on this paragraph, Dr. Sodroski noted the examples in the paper of infection of sub-clones of the HT cell line with primary patient isolates that were not pooled. Thus, he said, "there are other examples in the paper of a successful propagation of an HIV isolate on a permanent T-cell line . . . that, apart from the paragraph in question, would support the major claims of the paper." Tr. at 779-80. Indeed, he considered the paper a "tour de force" of science because "not only do you see multiple examples of virus isolations, you also see that the virus is established in a stable cell line, which allows for diagnosis." Tr. at 734. He stated that this evidence, together with the serological data in the paper and the accompanying papers, was convincing evidence that a retrovirus was the etiologic agent of AIDS, rather than an opportunistic infection, which could have been the interpretation when you only have sporadic examples of virus isolation, as had been published by French researchers. Tr. at 734-36.

As a result of the allegations regarding misappropriation of the French isolate, the paragraph took on inordinate importance to the investigators. The evidence does not show that this paragraph would have had importance to

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[24] Dr. Svoboda testified that pooling (the aspect of the experiments on which ORI focused) "is not a real technique. It's a procedure used in cases when you don't have enough virus." Tr. at 1949-50.

other retrovirologists generally or to Dr. Popovic in particular, at the time it was written. Dr. Sodroski noted that, in light of the overall evidence supporting the paper's major conclusions, the paragraph in question would be less important to "perhaps 99 percent of investigators or more." Tr. at 781. ORI relied on testimony that the methodology might be important to investigators attempting to isolate viruses from other patients. Dr. Sodroski recognized this, but noted that "the paper does give examples of those types of isolations, and passaging virus onto permanent T-cell lines, in which pooling does not appear to have been done." Tr. at 781. Thus, he said, "I don't know that the specific details that we're focusing on in this paragraph really had much practical import, in terms of the actual advance of science, or the advance of diagnostics in the AIDS field." Tr. at 781.

Thus, we conclude that, in describing this paragraph as a methodology section of the paper, ORI overrates its significance and exaggerates Dr. Popovic's possible motivation for falsifying it.

We further conclude that, even if the paragraph is properly viewed as intended to set out a methodology so that the experiment described could be reproduced, ORI did not show that the "first shown" sentence should be considered as intended to represent part of that methodology and to misrepresent the "rigorousness" of the methodology.

For its position that RT testing was an integral part of the methodology presented in the paper, ORI relied on the fact that in a 1990 textbook chapter describing how to propagate the AIDS virus in a neoplastic T-cell line, co-authored by Dr. Popovic, the following statement appears:

> Culture fluids to be concentrated for use as inocula should contain at least 100,000 cpm RT activity/ml (before concentration).

Ex. H-89 at 18.[25]

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[25] In its post-hearing brief, ORI misquotes this as stating that one "must show a finite amount of reverse transcriptase activity (100,000 cpm) before concentration." ORI post-hearing br. at 71. This appears to be a particularly egregious example of ORI substituting its paraphrase for an exact quotation. ORI's substitution of the word "must" for the word "should" changes the meaning.

When questioned about the textbook and whether it was saying one must have positive RT activity before using a patient sample to infect a cell line, Dr. Sodroski said that he would interpret it that "to make the assay optimal" one would want the specified level of RT activity. Tr. at 754. On cross-examination, he said that the impression the book chapter gave was that "a certain level of virus in the samples used to infect the cells would increase the efficiency of success in the experiment." Tr. at 765. He explained that an RT test "doesn't really tell you what the infectivity of a particular virus preparation is . . . So I find setting those kinds of thresholds to be relatively arbitrary anyway, because one can have a very high reverse transcriptase and have a very low infectivity, . . . virus that's sitting around for a long period of time can lose its infectivity without necessarily losing ability to detect reverse transcriptase from the culture." Tr. 765-66; see also 782-83 (Sodroski); 2241-42 (Malkovsky).[26]

Dr. Sodroski also acknowledged that it would be fair to say that the understanding of methods for culturing and propagating HIV has improved between 1983 and 1990, and that the value in the textbook was perhaps based on practical experience between 1983 and 1990. Tr. at 767. The issue here is how in 1983-1984 Dr. Popovic viewed the importance of RT testing before using patient samples to infect a cell line. ORI's position that Dr. Popovic considered this paragraph an important part of the methodology presented in the paper is not supported by the record. Indeed, since Dr. Popovic did not indicate in the paper that RT was first shown for the individual patient isolates described there, the contemporaneous evidence suggests that he did not ascribe particular importance to testing for RT before infection.[27]

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[26] ORI also relied on Dr. Martin's testimony describing RT testing as a "go, no go test". Tr. at 1330, 1337-38. The first time he used this description, however, Dr. Martin simply said "I imagine" that's "sort of a go, no-go kind of test." Tr. at 1330. Dr. Malkovsky testified that his laboratory sometimes performed RT testing before pooling and sometimes did not. Tr. at 2240. We give more weight to what is in fact done in laboratories, than to what someone "imagines" would be done.

[27] See, e.g., Ex. H-5 at 499 (legend to Table 2, referring to experiments exposing cells of H9 clones to

(continued...)

To show that Dr. Popovic had a motive to falsify the statement, however, ORI relied on testimony that it would be more logical to test for RT activity prior to pooling patient samples because adding samples with no virus in them would "dilute" the virus in the pool. For example, Dr. Sodroski testified that testing for RT activity before pooling --

> does provide a more rational appearance to the pooling. It would not make sense to pool samples that didn't contain virus, or for which there was no evidence of virus. Adding those to the pool would only dilute out the virus preparation. So it would make more sense to have first shown that there was evidence of virus in any sample added to a pool.

Tr. at 744-45. However, when asked whether it would change scientists' opinion of the rigorousness of the experiment, Dr. Sodroski indicated that pooling was simply not very rigorous to begin with because it could never be reproduced in all of its details again because each isolate is unique at that time. Tr. 745-46. Yet, the relevant paragraph in the paper does not hide the fact that more than one patient sample was used to infect the parental cell line; the paragraph states that the "concentrated culture fluids" used for "repeated exposure" were "harvested from . . . cultures . . . obtained from patients with AIDS or pre-AIDS." Ex. H-5 at 499. We do not find it credible that Dr. Popovic would honestly reveal in the paper the lack of rigorousness inherent in using more than one patient culture, yet risk his career by deliberately falsifying the timing of obtaining RT results.

Dr. Popovic acknowledged that it would have been preferable to have established RT activity in each of the individual cultures before pooling them, but provided a reasonable explanation for why he did not, which is consistent with testimony by others. First, he said that pooling would increase the multiplicity of infection. ORI argued that we should reject this reasoning, citing testimony by Dr. Sodroski. Dr. Sodroski said that it was not credible that Dr. Popovic would pool to increase the multiciplicity of infection because: "To me, knowing that there were a certain number of samples that . . . didn't contain at least high amounts of HIV, that those samples were added to virus-positive samples, certainly

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[27] (...continued)
"concentrated culture fluids positive for particulate RT activity").

one would not expect the multiplicity of infection to increase." Tr. at 748. This testimony is based on the assumption that Dr. Popovic knew he was adding samples that did not contain high amounts of HIV.[28] When he conducted these experiments, however, he did not even know for sure what he was looking for. He testified that he had information from clinical physicians and morphological evidence (such as giant multinucleated cells) that led him to believe the patient samples contained a retrovirus. See, e.g., Tr. at 2303, 2415-19; see also Tr. at 2163 (Read-Connole). Moreover, he testified persuasively and without rebuttal that it is well established in retrovirology that concentration can increase multiciplicity of infection by twenty to fifty fold. He gave the example that if, under standard conditions, the increase would be thirty fold, pooling and concentrating samples could potentially increase the multiplicity of infection fifteen fold, even if only half of the samples contained the virus. Tr. at 2495-98.

Dr. Popovic also explained that, based on past studies, he knew that retroviruses were heterogeneous and that some strains might be more apt to infect a T-cell line than others. Thus, by increasing the variety of strains to which he exposed the cell line, he could increase his chances of success. Ex. H-153. Dr. Sodroski testified that, even if some pooled samples did not contain high amounts of HIV, "you could potentially add very low levels of minor virus variance to the pool" which would increase "virus diversity." Tr. at 748-49. Dr. Sodroski also testified that it is now known that some strains of HIV grow better in T-cell lines than others. Tr. at 715-17. Thus, Dr. Sodroski's testimony supported Dr. Popovic's on the diversity question; ORI presented no testimony that rebutted Dr. Popovic's on this point.

Finally, unrebutted testimony established that Dr. Popovic would have used pooling when working under his mentor, Dr. Svoboda (Tr. at 1949-51), and that Dr. Popovic is the type of intuitive scientist who, while

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[28] Dr. Malkovsky testified that his laboratory had pooled samples, sometimes without testing for RT first. He said that if the concentration of virus in some of the fluids were high, diluting them with non-virus containing fluids would not make any difference in the final effect. He also said that "it is very difficult by any other methods [with] the exception of co-culture, to decide that the virus is not present" and that measuring RT activity was sometimes impossible, even when a retrovirus is present. Tr. at 2239-42; see also Tr. at 2244, 2248.

engaged in hunting for a novel retrovirus, would likely try experiments which others (with hindsight) might view as illogical (see, e.g., Tr. at 1985-86). In our opinion, these factors make it unlikely that Dr. Popovic would have viewed what he did as illogical when he wrote the paper and would have felt a need to misrepresent his method to make it appear more "rigorous" to others.

In sum, ORI did not prove by a preponderance of the evidence that the disputed sentence was intentionally falsified or even that it was untrue.

B. ND ENTRIES IN TABLES 1 AND 2

Table 1 of the Science paper reports on the response of cloned T-cell populations to infection with HTLV-III. Results for eight different clones at 6 and 14 days after infection are shown for the following: total cell number; percent of multinucleated cells; percent of positive cells as shown by immunofluorescence assay (IFA)[29] against both rabbit antiserum to HTLV-III (diluted 1:2000) and patient serum (from patient E.T.); and reverse transcriptase (RT) activity. Table 2 of the paper reports on isolation of HTLV-III from patients with AIDS and pre-AIDS. Information is given for five patient isolates regarding the patient diagnosis and origin of the sample. Virus expression is reported through RT activity; percent positive cells in IFAs against rabbit antiserum and serum from patient E.T.; and electron microscopy. See Appendix A, the Science paper, for these tables.

At issue here is the use of "ND" in Table 1 for four data points reporting 6-day IFA results for four different clones against patient serum E.T., and the use of "ND" in

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[29] Immunofluorescence Assays (IFAs) can detect the presence of a specific viral protein in cell cultures or primary patient cells by using fluorescent dye molecules that link directly or indirectly to antibodies to that viral protein. Tr. at 1807-18 (Gartner). Ms. Read-Connole indicated that she performed IFA assays using eight-well slides, placing a concentration of cells in each well and then adding the antibody and fluorescence after certain preparatory steps. IFA slides are read under a fluorescent microscope to determine what proportion, if any, of the cells counted react. IFA slides have a positive reaction when the cells light up, or fluoresce, bright yellow green. Tr. at 2155-58 (Read Connole); Tr. at 1830 (Gartner).

Table 2 for two data points for patient isolate S.N.: the IFA against E.T. serum and the electron microscopy result. The question of scientific misconduct here centers around the definition "ND, not done." Ex. H-5 at 498. This definition appears in fine print in the middle of the lengthy legend to Table 1, but does not appear in the legend to Table 2.

ORI argued that the ND entries are false based on its conclusion that the phrase "not done" means that an experiment was "not performed" and that the laboratory notebooks demonstrate that these experiments were, in fact, performed. See, e.g., ORI post-hearing br. at 73, 83. ORI argued that, instead of recording in the tables the actual results of the experiments, Dr. Popovic deliberately concealed the actual results by listing the data entries as "not done." ORI post-hearing br. at 77, 88.

The parties' presentations on this issue represented a battle of experts concerning the meaning and use of "ND" and "ND, not done" in scientific papers -- a battle in which much of ORI's own experts' testimony did not support its position. While there may be an immediate, commonsense reaction that "not done" means that you did not do it (what ever "it" is), even a commonsense reaction is ambiguous in this context -- what did you not do, any experiment at all or any quantification of its results. After extensive expert testimony, we found that "ND" and "ND, not done" might mean something different from what a commonsense reaction might tell one and in fact mean various things when used in scientific papers (but in general convey that there is no meaningful data to report).

Dr. Popovic has consistently stated that, at the time he drafted the tables, and put in the "NDs," he intended to convey the meaning that the data was inconclusive, unquantifiable, or not determinable. See, e.g., Tr. at 2310-19; 2447-49; 2451-54; and 2471-77; Ex. H-157 at 19-22. He said he could not recall putting the definition "ND, not done" in the legend, but argued that, in any event, it was not inaccurate to state that the experiments were "not done," given the various possible meanings of that phrase. Tr. at 2309; 2352-53.
Dr. Popovic produced drafts of the paper which show that the definition was not in his original handwritten draft, but appeared first in draft seven. Compare Exs. H-6 and H-12. Unrebutted testimony shows that a number of other individuals were involved in editing the drafts by that point.

ORI presented evidence which it said showed that Dr. Popovic most likely drafted the legend, including the definition, and that, in any event, he was responsible for it. We do not need to decide here whether Dr. Popovic in fact drafted the definition in the legend, in light of our conclusions on the threshold issue of whether the ND entries were false.

On the basis of the record before us, we conclude that ORI did not show by a preponderance of the evidence that the ND entries in Table 1 and 2 were inaccurate or misleading, much less that they were intentional falsification. We conclude instead that any dispute over the validity of the ND entries is based on honest differences in interpretation or judgment of data.

We reach our conclusions about the ND entries for the following reasons:

- ORI's finding depends on a reading of "not done" as "not performed," but the weight of the evidence does not support ORI's contention that it is commonly accepted within the scientific community that the phrase "not done" means "not performed."

- Dr. Popovic's testimony was credible that he did not use ND to mean "not performed," but instead meant to convey that the data was inconclusive, unquantifiable, or not determinable. He has consistently asserted that he used the ND in that sense, and what he did in this paper was not inconsistent with what he did in other papers, contrary to what ORI argued.

- Dr. Popovic satisfactorily explained that the use of ND here represented a reasonable judgment because it would have been misleading to the reader to report exactly what appeared in the laboratory notebooks. Dr. Popovic's testimony was supported by persuasive expert testimony.

- The expert testimony on which ORI relied to interpret the results in the laboratory notebooks indicates that these experts' opinions were not based on accurate facts; the testimony indicated that the ORI experts had failed to take into account the entire parameters of the experiments performed; failed to consider the subjective nature of the IFAs or the imprecise nature of an EM and to read the results in light of the results of parallel experiments showing virus expression; and, in many instances, misconstrued what certain entries in the laboratory notebooks meant.

- o ORI did not establish that Dr. Popovic had any motive to misrepresent or falsify the data, and the expert testimony indicates he would not have had a motive. In the opinion of experienced retrovirologists, the use of the NDs rather than the precise notebook entries did not add anything to the paper nor affect the overall conclusions.

1. ORI's construction of "not done" as meaning "not performed" is not supported by the record.

ORI's basis for arguing that Dr. Popovic falsified the ND entries on Tables 1 and 2 of the Science paper is its construction of the definition, "ND, not done", in the legend to Table 1. ORI reads "not done" as unequivocally meaning "not performed" (by which ORI means not even attempted). ORI determined that the ND entries were falsifications because they were represented in the tables as "ND, not done," yet the experiments were performed. ORI concurred with previous investigatory findings rejecting Dr. Popovic's explanation that by "ND" he meant "not determinable" or "not done properly," although ORI also stated that it did not believe that "the 'ND' entries served to enhance substantially either the methodological rigor or the robustness of the findings of the paper." ORI Final Report at 9-10, 55.

Therefore, ORI's position is dependent on reading "ND, not done" a particular way. However, the testimony and evidence shows that ORI's reading is not the only reasonable reading of this term.

First, Dr. Popovic pointed to dictionary definitions of the term "done" which indicate that "not performed" is not the only meaning and that one possible meaning is "not completed." ORI did not offer any dictionary definition which would indicate that "not performed" is the only meaning, or even that it is a preferred meaning, of "not done."[30] Nor did ORI specifically find that, if "not done" were used to mean "not completed", the ND entries would be false. Thus, at the very least, ORI had to establish that the commonly accepted usage of "not done" in the scientific community at the time of the conduct was different from the ordinary meaning, and, in fact, was the meaning ORI advanced here. In addition, to show that Dr. Popovic intentionally falsified the

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[30] We find some merit to Dr. Popovic's claim that, as a non-native English speaker, he would not be as familiar as a native with subtle nuances of the language and might be more apt to rely on dictionary definitions.

results, ORI would have to show that Dr. Popovic was aware of that special usage.

For its position that "ND, not done" meant "not performed," ORI relied on testimony from five witnesses (Dr. Richards, Dr. Hadley, Dr. Martin, Dr. Watkins, and Dr. Gartner).[31] For the following reasons, we find that ORI's reliance on this testimony is misplaced:

- Dr. Richards was one of a group of scientists who advised NIH during the investigation. The advisors did not themselves undertake to investigate and ascertain whether the statements in issue were false. Tr. at 513-15. Dr. Richards testified that the advisors had concluded that the ND data points appeared to be falsified because ND is defined in the footnote to the paper as meaning not done, which is a term of art meaning the experiments were not performed. Tr. at 438, 514. We give little weight to his testimony for two reasons. First, his opinions were developed based on selected information given to him by ORI. See also Tr. at 421, 467-70; 492; 510; 512-13. Second, Dr. Richards readily acknowledged that he did not have a background in cell biology, virology, or retrovirology. Tr. at 479-81; 503-04; 506-07. We find, therefore, that he could not reliably comment on whether "not done" had a particular meaning in these disciplines.[32] We also note that Dr. Richards stated that there are no generally accepted standard symbols to use when you might have ambiguous results or a problem with a particular experiment. Tr. at 520.

- Dr. Hadley (a psychologist) led the initial investigation. She was not accepted as an expert

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[31] Several of ORI's record citations in support of its proposition are to unrelated testimony which does not even mention the issue presented. See ORI post-hearing br. at 74, citing Tr. at 610, 937, and 1845.

[32] Some of his conclusions were apparently based on discussions with his colleagues, but those colleagues were not even identified, and we have no way of evaluating their qualifications and credibility. Moreover, Dr. Richards seemed to hold Dr. Popovic to his own standard of explaining in footnotes why there is no data entry for a table. See, e.g., Tr. at 520. Yet, it was undisputed that Science is a journal with strict space limitations, and the legend here is already very detailed and lengthy.

witness for purposes of this proceeding. Dr. Hadley's testimony does not establish a community standard.

She was asked:

> Q: On the basis of the investigation conducted at ORI, what is your understanding of the term not done to mean?

She testified as follows:

> A: It means the experiment was not done. It was not attempted. It was not performed.

Tr. at 936.[33] This testimony merely states an ultimate conclusion and does not provide us with any clear basis for Dr. Hadley's "understanding." In the absence of any such information, this testimony has little utility in establishing that there was in fact a community standard that "not done" only meant "not performed" at the time used in the Science paper.

- Dr. Martin (who was qualified as an expert retrovirologist) testified, when first questioned on the NDs, that every time he sees an ND "it can either mean not done or not detected. It could be either one." Tr. at 1344. He further stated that it meant "that particular experimental part of the table, for some reason, it's usually a technical reason, contamination with mold, for example, the bane of virologists, or some problem akin to that, just wiped out that particular experimental result, or the experiment just wasn't -- was overlooked. We all make mistakes, and it just wasn't --" Tr. at 1344. It was only after he was specifically asked whether he meant it was "not performed" that he answered, "It was not performed. Correct." Tr. at 1344. Since Dr. Martin did not state that "not done" meant "not performed" until prompted to do so by counsel (and since, as discussed above, Dr. Martin may not have been disinterested), we give more credence to his first reaction about the meaning of the NDs in the tables. That testimony supports Dr. Popovic's position that ND, regardless of how it is defined, can be used not only where an experiment is not even attempted, but

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[33] ORI cited to Dr. Hadley's testimony on page 937 of the transcript. That page, however, does not actually refer to statements about the meaning of the term "not done."

also where there are technical difficulties which prevent it from being properly completed.

- Dr. Watkins, an ORI investigator, testified that "[t]he tradition in science, the use of not done means that an experiment was not done, not that it was done, but not interpretable, or not finished, or something of that nature." Tr. at 1414. Dr. Watkins did not testify about his basis for reaching this conclusion. Since he was not qualified in these proceedings as an expert (in any relevant discipline) and did not explain the basis for his conclusion, we give little, if any, weight to his opinion.

- ORI further relied on testimony of Dr. Gartner, an expert retrovirologist, as establishing that it was commonly accepted within the scientific community that "not done" means "not performed." The transcript page ORI cited (1845) does not contain any remarks by Dr. Gartner on this particular subject. The only reference to "not done" is in a question to Dr. Gartner asking her to assume that for a particular patient sample no IFA was done. In response, Dr. Gartner asks, "What do you mean by not done?" and counsel answers, "[t]he test was not performed." Tr. at 1846. Dr. Gartner then indicates that to her "that's a significant difference." Tr. at 1846. Obviously if Dr. Gartner thought that "not done" commonly meant "not performed," she would not have asked ORI counsel what he meant by "not done" and would not have stated that there is a significant difference between the two terms. Other testimony by Dr. Gartner more directly supported Dr. Popovic. She testified that she had used ND to mean "not done, not determined meaning I couldn't come to a definitive conclusion." Tr. at 1883. While she stated that she would feel obliged to explain to the reader where there was an "ambiguity" or some technical problem, she also indicated that the journals sometimes treat that type of explanation as "irrelevant." Tr. at 1883-84. Finally, she testified that the scientific community had different ways of explaining that they do not have a data point, and that whichever definition of "ND" was used "[m]ost of us realize that what that means is that there was . . . no meaningful data generated, at least that's what it means to me. . . ." Tr. at 1887-88.

Thus, ORI's reliance on these witnesses' testimony is misplaced; either that testimony, considered as a whole, supports Dr. Popovic more than ORI, or that testimony is conclusory opinions by individuals who did not have

relevant expertise and who did not clearly articulate any basis for their conclusions.

Testimony from other expert witnesses presented at the hearing supports Dr. Popovic's position and establishes that both ND and "not done" have many meanings other than the narrow meaning relied on by ORI.

- Dr. Huth, ORI's expert witness in the publication of scientific papers and the standards in the scientific community with respect to editing and publication of scientific papers, stated that "there can be a lot of ambiguity about [ND]. This new style manual that I'm working on with the Council for Biology Editors . . . has an array of possible meanings, not determined, not done." Tr. at 1200. While he testified that he felt that an author using ND has the obligation to inform the reader of the usage of ND, nevertheless his testimony indicates that he did not ascribe the limited meaning to ND that ORI did -- that an experiment was not even attempted. Dr. Huth's testimony indicates that ND and "not done" were ambiguous. Tr. 1200-01; 1228-29; 1239-40.

- Dr. Schachman, an expert in accepted practices for conducting and reporting biological research, testified that he was familiar with the use of the abbreviation "ND" and that it usually means "not determined," which he interprets "as not determinable, so that an experiment is done, and one doesn't know how to handle the data" because one could not quantify the sample, "the number didn't make sense, or you couldn't do the experiment sufficiently precisely to warrant a number." Tr. at 1274-75. He also testified that he usually took for granted the definition of ND. Tr. at 1275.

- Ruth Kulstad, an editor of scientific journals for almost 30 years, and the editor of the Science paper here, testified that the abbreviation ND had no standard meaning and that "it means all sorts of different things to different people." Tr. at 1723. She testified that she quite often found that abbreviation used without a definition. She further stated that she did not think anyone (particularly scientists) really cared how the term was defined. Tr. at 1723, 1742-43.

- Dr. Malkovsky, an expert retrovirologist, testified that his understanding of the meaning of ND both generally and within the specific context of Table 1, was that either the experiment could not be performed

for various technical reasons or, if it was performed, it provided inconclusive data which was impossible to interpret. Tr. at 2228; see also Tr. at 2249-51. He stated "[i]t simply means I don't know, so it conveys sort of zero information." Tr. at 2228. He further explained that, while a scientist may have an obligation to report what is meant by ND, "ND, not done" has many different interpretations. Tr. at 2253. Dr. Malkovsky also testified that "if you don't get [a] technically satisfactory result, some people would say not done, some people would say not determined, some people would basically not comment on it at all." Tr. at 2251.

- Dr. Berns, one of ORI's expert witnesses and scientific advisors, testified that there was no distinction, in his understanding between "not done" and "not determined." Tr. at 1049, 1096. Moreover, his testimony showed that he was senior author on a paper which reported experiments as "ND, not done" in a table while at the same time describing those experiments in the discussion section of the paper as though they had been performed. Tr. at 1101-03; see Ex. D-18. Thus, on its face, this paper would support a conclusion that "not done" is used not only to mean "not performed."[34]

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[34] When it was brought to his attention that experiments were reported as "not done" in the table but the body of the paper described the experiments as having been performed, Dr. Berns called this a mistake which he would characterize as an "honest error." Tr. at 1102. Dr. Berns' testimony did not establish, however, that usage of the term in the paper was a mistake, since he admitted he simply could not recall whether or not the experiment was in fact performed. Tr. at 1102. ORI tried to distinguish his paper from the one at issue here by saying that the reader would not be misled since the contradiction was apparent on the face of the paper. ORI post-hearing reply at 65. We note, however, that the legend to Table 1 in the Science paper describes the preparation of the IFA slides in such a way as to suggest that they were prepared for each of the clones at both 6 and 14 days. Thus, we do not see how the NDs in Table 1 are any more misleading than the NDs in Dr. Berns' paper. In fact, Dr. Richards testified, when asked about the legend to Table 1, that "in this kind of a table, where you have a whole series of cells, it is almost inconceivable that the protocol would be set up to omit certain of the samples, that doesn't make any sense,

(continued...)

Finally, while ORI submitted several exhibits that suggested the scientific community may have tried to establish standard abbreviations or standard meanings for the abbreviations, this evidence does not show that the scientific community had, during the time period in question, established a standard meaning for the use of the abbreviation ND or the term "not done" to mean "not performed." See Exs. H-102, H-109, H-110.

In sum, ORI did not establish by a preponderance of the evidence that "not done" meant only "not performed" (not even attempted). Instead, the evidence shows that both ND and "not done" had a variety of meanings.

2. Dr. Popovic's testimony about what he meant in the paper is credible.

There are a number of reasons why we find credible Dr. Popovic's testimony that he did not use the NDs as meaning "not performed" and was not aware that the definition used in the paper might have suggested that meaning to some scientists. As discussed above, we found Dr. Popovic in general to be credible, based on our observation of him at the hearing and unrebutted testimony about his integrity. Moreover, he provided a persuasive explanation of why he put the NDs, rather than the exact entries in the laboratory notebooks, and ORI did not establish any motive for him to falsify the results. In this section, we discuss two additional reasons why we found him credible on this issue: first, he has been consistent in explaining what he meant by the NDs (even in a statement made before this investigation began), and second, ORI did not establish that he had knowingly used ND to mean "not performed" in other papers.

Our review of the record indicates that Dr. Popovic has consistently maintained that he meant to convey a different meaning than that the experiments were not performed. Ex. H-48 at 43-48; Ex. H-157 at 19-22; Ex. 49 at 5-7; Tr. at 2308; 2471-75. In the first written response to ORI in our record that specifically deals with the subject of the use of "ND, not done" in the paper, Dr. Popovic asserted that he had explained from the beginning that, at the time the paper was written, "ND" "was equal to 'not done,' 'undeterminable,' or 'not detected,'" in his mind and that he did not "understand

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[34](...continued)
because that isn't the way those things are done." Tr. at 515-16.

that 'ND' could have at least three different meanings when [he] prepared the original manuscript tables [since he] did not fully appreciate the distinction among 'not detected,' 'not determined,' and 'not done'." Ex. H-48 at 43.

Dr. Popovic's explanation is corroborated by other evidence in the record. We find particularly persuasive that in a memorandum to Dr. Gallo, dated March 25, 1986, Dr. Popovic stated that the EM data for isolate S.N. in the Science paper "were not done properly." Ex. H-61. This evidence predates the investigation into this matter and was prepared outside of the confines of this dispute. This memorandum indicates that Dr. Popovic did not intend to suggest that the experiments were not performed at all.

Also, we reviewed the use of ND by Dr. Popovic in papers (other that the Science paper in dispute here) on which he was first author that were submitted into the record.[35] Ex. P-42, P-43, P-50, P-51. Dr. Popovic did not use the term "ND, not done" in any paper in the record for which he was listed as first author, other than the paper at issue. He used the term "ND-not determined" in Exhibit P-50, and "ND-none detected" in Exhibit P-51; however, this paper was issued after the paper in question. Ex. P-51; Tr. at 2346-47 (Popovic). In the other two papers on which Dr. Popovic was first author, he used the term "NT-not tested" to reflect when experiments were not performed.[36] If Dr. Popovic had truly intended to mislead the reader into thinking that the experiments in question here had not been even attempted, we think it more likely that he would have used "NT-not tested," rather than the more ambiguous "ND, not done."

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[35] We reviewed only those papers on which Dr. Popovic was first author because ORI did not establish that, for any of the papers where Dr. Popovic was not the first author, he would have actually performed the experiments where ND was used or that he was responsible for drafting the legend.

[36] Dr. Popovic had initially pointed out that there were several papers in which he had used the term "ND, not done" as meaning either not determinable or that the experiment was not finished because the results were inconclusive, yet ORI here did not specifically rebut those statements here. Ex. H-48 at 46-47.

ORI determined that Dr. Popovic had used the terms NT and ND interchangeably to mean "not performed." ORI post-hearing brief at 80. This determination was based on an analysis of two of Dr. Popovic's papers that used ND as "not done." Ex. H-84 at 94. One of these papers was published in the journal Neoplasma in 1970, and one was published in the International Journal of Cancer in 1969. We do not find this analysis persuasive, for several reasons. First, ORI deduced that the experiments in the papers were not in fact performed based solely on its analysis of what the paper said. Ex. H-84 at 93-94. ORI did not apparently have, and did not present to us, any independent evidence of whether the experiments were in fact performed. Second, unrebutted testimony by Dr. Popovic establishes that his articles in Neoplasma were written in his native language and then translated into English by language experts, as were many of his early articles that appeared in other journals. Tr. at 2287-88. Also, he does not appear as either the first or the senior author on the article in the International Journal of Cancer. Ex. P-48 at 46. Absent evidence that the translators or other authors discussed with him how they were defining ND in these papers, we cannot reasonably infer that Dr. Popovic intended to use ND to mean "not tested" in these papers. Finally, in deciding what Dr. Popovic's practice would have been in 1984, we find articles published closer to 1984 to be more relevant than these papers published more than a dozen years before.

In sum, we found credible Dr. Popovic's testimony to the effect that he did not mean to convey to the reader the erroneous impression that none of the experiments reported as ND were even attempted.

3. The ND entries represented a reasonable judgment by Dr. Popovic as to how to report the actual experimental results.

Among other data, Table 1 contains the percentage of immunofluorescence positive cells for eight clones against rabbit and patient antisera at 6 and 14 days after infection. Dr. Popovic reported as ND the IFA results for clones H9, H17, H31, and H35 for patient serum E.T. at 6 days after infection. Ms. Read-Connole was the technician who prepared and first read the IFA slides. Her laboratory notes record her readings of IFA slides against eight antisera for 17 different cell cultures; most of them were T cell-clones (either infected or uninfected) or patient samples. She recorded results for: three different dilutions of rabbit antisera; normal rabbit serum; sera from AIDS patients;

serum from Dr. Popovic (MIKA); and one control positive serum against HTLV-I virus. See Appendix for Table 1 and for Ms. Read-Connole's laboratory notebook page 30. While generally positive results were reported as a percentage, no percentages were recorded for clones H9, H17, H31, and H35 at 6 days. For clone H9, Ms. Read Connole recorded "+"; for clones H17 and H31, she recorded "-". The record is unclear whether clone H35 was not tested against the patient antisera or simply not evaluated (although it is clear that there was a slide prepared for clone H35). Ex. H-63; Tr. at 2168-69 (Read-Connole); Tr. at 1546 (Schaffer); and Tr. at 2315-16 (Popovic).

To explain why his assessment of the 6-day results for these four clones was unquantifiable or not determinable, Dr. Popovic testified that in light of the other data reported in Table 1 for these clones, i.e., the relatively low number of total cells, the presence of multinucleated cells, the reaction against the rabbit antisera, and the reverse transcriptase activity, he knew that the clones were positive for virus production. Tr. at 2310-16.

For clone H9 he explained that due to the cytopathic effect of the virus, the cells were damaged and the slide was of "low quality," but he stated that he knew from other data that the virus infected the clone. Tr. at 2310-12. Dr. Popovic gave a similar assessment of the quality of the preparation for clone H17 and noted that it was recorded as "-" because it was not possible to determine viral activity from the IFA assay although all other "parameters clearly indicate that there was a virus production." Tr. at 2313. Dr. Popovic stated that, with respect to the patient sera IFA, the inability to detect viral activity in clone H17 was artifactual data which was misleading. With regard to clone H31 Dr. Popovic testified that --

> The phenomenon was precisely the same as for H9, H17, the quality of the slides were low and it wasn't possible to quantify. And for that reason, I put ND. However, all other data . . . clearly showed that there is a virus production.

Tr. at 2314-15.[37]

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[37] Unreported 6-day data for other patient serum showed a positive reaction for clones H9 and H31, and was recorded as a minus for H17. Dr. Popovic testified that

(continued...)