Investigation Report
Research Misconduct Case # 2014-01
March 13, 2015

I. NAMES AND TITLES OF INVESTIGATION COMMITTEE MEMBERS

Alan Genz, Professor, Department of Mathematics
Cornelius Ivory, Professor, School of Chemical Engineering and Bioengineering
Thomas Jobson, Professor, Department of Civil and Environmental Engineering

II. SUMMARY

The Committee found, based on a preponderance of the evidence, Dr. Craig Frear (Respondent), Assistant Professor in the Department of Biological Systems Engineering, committed research misconduct with respect to (1) fabricating experimental data and (2) knowingly and intentionally falsifying data that formed [redacted], a peer-reviewed journal article and a chapter in an annual report published by Washington State University's Center for Sustainable Agriculture and Natural Resources. In addition, he failed to declare an existing commercial conflict of interest when he submitted the peer-reviewed journal article.

III. BACKGROUND AND STATEMENT OF ISSUE/ALLEGATIONS

At the request of Dr. Christopher J. Keane, Vice President for Research at Washington State University (WSU), this committee was formed to review the research misconduct allegation of falsification of data represented in publications authored by the Respondent:

[redacted]

B. Report chapter, Chapter 3: "Baseline Performance Monitoring of Commercial Dairy Anaerobic Digester" in CSANR Research Report 2010-001, and
C. Paper entitled "Evaluation of Co-Digestion at a Commercial Dairy Anaerobic Digester" in *CLEAN—Soil, Air, Water, 39*(7) 697-704 (2011).
D. Does a preponderance of the evidence prove that Respondent committed falsification of data as defined by Executive Policy #33?
E. If so, does a preponderance of the evidence prove the falsification of data constituted a significant departure from accepted practices of the relevant research community?
F. If so, does a preponderance of the evidence prove the falsification of data was committed intentionally, knowingly, or recklessly, and not merely carelessly? If you conclude that falsification of data was committed carelessly, please address how this could happen.
G. If you find a preponderance of evidence that Respondent committed falsification of data, did that have a significant impact on the research record, research subjects, other researchers, institutions, or the public welfare?
H. Did Respondent receive or participate in any responsible conduct of research training?

IV. FEDERAL RESEARCH SPONSOR SUPPORT

No federal sponsor.

V. APPLICABLE POLICIES AND PROCEDURES

This investigation was conducted pursuant to the Washington State University Executive Manual Policy 33, *Responding to Allegations of Research Misconduct* (**Exhibit 1**). The policy defines research misconduct as follows:

> misconduct in research and scholarship fabrication or falsification of data, plagiarism, or other serious deviations from accepted practice in proposing, implementing, or reporting on research. Research misconduct does not include honest error or honest differences in interpretations or judgments of data.

VI. SUMMARY OF INVESTIGATION PROCESS

A. On October 27, 2014, Dr. Daniel J. Bernardo, WSU Provost and Executive Vice President, and Deciding Official (DO), after reviewing the inquiry report, determined that sufficient evidence of research misconduct existed to warrant a research misconduct investigation (**Exhibit 2**).
B. On November 3, 2014, Dr. Christopher J. Keane, WSU Vice President for Research and Research Integrity Officer (RIO) notified the Respondent of the research misconduct investigation (**Exhibit 3**).
C. On December 17, 2014, Dr. Keane delivered the charge to this Committee. All Committee members attended the charging meeting. Ms. Sherry Gordon, Senior Counsel, Office of the Attorney General, providing legal advice to the Committee, and Ms. Alicia Foth, the Research Misconduct Coordinator, were also present (**Exhibit 4**).
D. Committee members met to conduct the investigation, write the report, and discuss their impressions on dates: December 17, 2014 (date of charge by RIO), January 12, 2015, January 21, 2015, January 30, 2015, February 6, 2015, February 11, 2015, February 13, 2015, February 16, 2015, February 18, 2015, February 25, 2015, March 2, 2015, March 3, 2015, March 4, 2015, and March 6, 2015.
E. The committee interviewed ten witnesses regarding the misconduct allegations:
    i. Simon Smith, January 22, 2015 (**Exhibit 5**)
    ii. Sita Pappu, January 30, 2015 (**Exhibit 6**)
    iii. Jonathan Lomber, January 30, 2015 (**Exhibit 7**)
    iv. Scott Economu, February 6, 2015 (**Exhibit 8**)
    v. Claudio Stöckle, February 6, 2015 (**Exhibit 9**)
    vi. Craig Frear, February 13, 2015 (**Exhibit 10**)
    vii. Shulin Chen, February 16, 2015 (**Exhibit 11**)
    viii. Bryan Van Loo, February 18, 2015 (**Exhibit 12**)
    ix. Katrina Mealey, February 18, 2015 (**Exhibit 13**)
    x. Stephen Dvorak, February 18, 2015 (**Exhibit 14**)

Interviews were recorded.

VII. RECORDS REVIEWED

The records determined to be relevant to this determination were made exhibits to this report.

VIII. SUMMARIES OF INTERVIEWS

A. Simon Smith (Complainant), January 23, 2015
Scientific Misconduct Investigation Briefing - January 23, 2015 Prepared by Simon A. Smith, Ph.D. (**Exhibits 5, 15**).

Timeline: [redacted]. Since then, he has worked independently at his own company. In 2013, while preparing a study of H_2S evolution in anaerobic digesters, Dr. Smith requested data from the Vander Haak digester from Dr. Frear.

On Dr. Smith's request to Dr. Frear for anaerobic digester data, Dr. Frear sent Dr. Smith an Excel file entitled "GHD Manure Digester Data.xls" which contains a tab "VDH Codigestion Data" summarizing analyses done on samples from the Vander Haak digester (**Exhibit 16, Attachment C**). Dr. Smith found some minor inconsistencies with the data entries in the "GHD Manure Digester Data.xls" file but, upon visiting the lab, Dr. Smith was able to obtain the original data analyses prepared by undergraduate interns under the supervision of Jonathan Lomber on the fate of solids in the Vander Haak Dairy anaerobic digester. These original data files are named "Vanderhaak 0nnn06B.xls," where 0nnn06 represents the 2-digit month|day|year that the samples were taken; these Excel files were prepared under the supervision of Scott Economu (**Exhibit 17**).

Using the original data files, "Vanderhaak 0nnn06B.xls," Dr. Smith prepared a new spreadsheet, "AllData01.xlsx," which performed the same type of TS/VS/FS=(**T**otal **S**olids)/(**V**olatile **S**olids)/(**F**ixed **S**olids) analysis as in Dr. Frear's "GHD Manure Digester Data.xls" but Dr. Smith could not reproduce Dr. Frear's results from [redacted] (2) the Center for Sustaining Agriculture and Natural Resources (CSANR) report chapter 3, and (3) the *CLEAN* paper (**Exhibits 18, 19, 20, 21**).

Furthermore, he found that most of the original VS data had been changed by adding 10, 20, or 30 to the number recorded to two decimal places. For example, VS data from 5/2/2006 is changed from 51.37 to 61.37. The net result of these changes is that the average VS result is increased by 19% and the standard deviation of the VS data is decreased from ±20.12 to ±3.93, by more than a factor of 5. The increase in the average implies that more methane, a marketable side-product, is produced by the digester; the decrease in the standard deviation implies that fluctuations in digester performance are reduced by about 5×.

On July 6, 2013, Dr. Smith informed Dr. Pius Ndegwa, Associate Professor in the Department of Biological Systems Engineering, of possible scientific misconduct. On July 15, 2013, he contacted Sandy Watson, Assistant to the Vice President for Research in the WSU Office of Research with a formal allegation of research misconduct against Dr. Frear.

On January 24, 2014, frustrated by the slow pace of the misconduct investigation, Dr. Smith contacted the editor of the journal *CLEAN – Soil, Air, Water*, Dr. Ali Müfit Bahadir, where Dr. Frear has published "Evaluation of Co-Digestion at a Commercial Dairy Anaerobic Digester." Dr. Smith pointed out the discrepancies between the results from the original data and the published results of the TS/VS analysis. After pointing out a possible conflict of interest arising from Dr. Frear's stake and position in BEST, LLC (BEST), Dr. Smith asked that the editor withdraw the *CLEAN* paper.

Taking this matter seriously, Dr. Bahadir contacted Dr. Frear with these allegations and, in response, Dr. Frear provided eight scanned pages of raw data from a laboratory notebook along with an explanation as to why and how the samples, which had been frozen, were re-analyzed to produce this data (**Exhibits 22, 23**). The editor then emailed these eight scanned pages to Dr. Smith in which he invited Dr. Smith to write a "short rebuttal" of the *CLEAN* paper (**Exhibits 23, 24**). Dr. Smith declined this opportunity to rebut Dr. Frear's paper; the editor declined to withdraw the paper from publication.

Dr. Smith worked through an analysis of the data from the scanned laboratory notebook and discovered that this set produced different VS numbers from both the original student data and the first data set that Dr. Frear had given him. Although the new data in the *CLEAN* paper produced different VS numbers from those used in [redacted] the CSANR report, the VS data have the same average and standard deviation, to four decimal places, as [redacted] and the CSANR report (**Exhibits 19, 23, 20**).

<u>B. Jonathan Lomber, January 30, 2015</u> (**Exhibit 7**)
Scientific Laboratory Manager, Department of Biological Systems Engineering, Washington State University

Jonathan Lomber was employed in the Water Quality Laboratory (WQL) during the time the samples were taken and analyzed. Mr. Lomber explained that the samples were taken at the Vander Haak Dairy in Lynden, Washington and sent (overnight, chilled) to the WQL, and usually were received by him. The samples were typically analyzed by students under the supervision of Mr. Lomber and Mr. Scott Economu, with results recorded on laboratory datasheets and entered into a computer file. Handwritten forms containing this data were kept in a "cupboard" in the laboratory until about 2013, when Mr. Lomber gave all the paperwork to Dr. Frear (**Exhibit 25**).

There was some difficulty with the analysis of the samples because of the novelty of the sample material and this often required discussion with the students, in which Dr. Frear also participated. One problem that was discovered concerned errors in biogas measurements at the farm which would have affected VS results. Mr. Lomber remembers [redacted] but could not say whether Dr. Frear reanalyzed the Vander Haak samples at that time. (Dr. Frear stated that he reanalyzed the Vander Haak samples for TS/VS/FS in 2008.) Mr. Lomber recalled that Dr. Frear recorded the test results in his laboratory notebook and probably also entered them in Dr. Frear's computer. Mr. Lomber did not recall any discussion with Dr. Frear about the results of the reanalysis. The results from the

original analysis were saved on the server and subsequently shared with Dr. Smith. Mr. Lomber had discussed the allegations with Dr. Smith (several times), Dr. Frear, and Dr. Frear's attorney (extensively), and he was aware of conflict of interest and data falsification allegations, including allegations that the anaerobic digesters were not working properly. Mr. Lomber did not believe there was any evidence that showed that anaerobic digesters were not functioning properly. Mr. Lomber reported that he initially was a partner in BEST, but left after a short time.

C. Sita Pappu, January 30, 2015 **(Exhibit 6)**
Director, Office of Commercialization, Washington State University

This interview was conducted to discover facts that were pertinent to the allegation that misconduct occurred to benefit Dr. Frear financially through the BEST commercial relationship with DVO, which is a company in the business of designing anaerobic digesters. BEST is led by Dr. Frear, who serves as CEO, and with Shulin Chen as majority owner. BEST has 3-4 patented technologies related to nutrient recovery from anaerobic digesters. The first patent filing was in 2008, with a provisional filing around 2006. BEST still owes WSU $3,000 for costs on patent filings. The investigating committee believes that the nutrient recovery patents are not related to the contested data on anaerobic digester performance that was published by Dr. Frear in the *CLEAN* paper.

BEST has a collaborative agreement with DVO and ANDGAR (the company which builds and maintains the Vander Haak anaerobic digester) that was signed in 2012. WSU licensed this technology to BEST in July 2011. When asked how long does it take to work out a collaborative agreement, Dr. Pappu thought that a one year timeframe would be typical, and elaborated that WSU/BEST were likely in conversations well before July 2011 on their licensing agreement and that BEST was likely also talking to DVO at the same time.

No income on BEST licensed technologies has been reported to date. The nutrient recovery system that is being co-developed by BEST/DVO/ANDGAR has to be made more efficient before it is commercially viable. Current efficiency at the time of the agreement was 60% and a 90% efficiency is required for commercial sales. In this collaboration DVO will lead patent filings. Revenue is to be shared equally between DVO, BEST, and ANDGAR. Dr. Pappu stated that the example given in the collaborative agreement was that for an estimated cost of $300,000 for the nutrient recovery system, the profit would be 10%, and BEST would then receive $7,500 with WSU getting the other $2,500 as per their licensing agreement.

Shulin Chen also has another company called Integrated Lipid Biofuels that is run by him. Dr. Frear is not a member of Integrated Biofuels but Dr. Frear is listed as an inventor on some of their technologies and could potentially benefit financially.

D. Claudio Stöckle, February 6, 2015 **(Exhibit 9)**
Chair, Department of Biological Systems Engineering, Washington State University

Dr. Stöckle was interviewed [redacted]. Dr. Stöckle noted that he had discussed the misconduct allegation with Dr. Frear before the first inquiry committee was formed, and he had discussed the issue with Dan Nordquist, Director of the WSU

Office of Grant and Research Development. Dr. Stöckle has not discussed the issue with Dr. Chen.

Dr. Stöckle stated in the interview that after completion of his Ph.D., Dr. Frear was looking for jobs and had some offers but was unsure about taking a tenure track career path. Dr. Stöckle believes Dr. Frear talked with Chad Kruger, Director of the Center for Sustaining Agriculture and Natural Resources (CSANR), who was interested in supporting and retaining him at WSU. As a result, Dr. Frear became an Assistant Research Professor (non-tenure track) in BSysE with a 50% paid appointment through the CSANR. It was made clear that Dr. Frear did not stay at WSU because of BEST, with Dr. Stöckle noting that "business wasn't that spectacular." In July 2013, a faculty position was created for Dr. Frear in the BSysE department because of his reputation, both in the state and nationally, in anaerobic digestion. When asked if the complainant, Dr. Smith, had competed for this faculty position, Dr. Stöckle replied no, the position was created for Dr. Frear.

[redacted] As far as he knew, there was no animosity between Drs. Frear and Smith. Dr. Smith went on to become a post doc in Professor Pius Ndegwa's BSysE laboratory.

Dr. Stöckle did not recall if students had to take Responsible Conduct of Research training [redacted]

Dr. Stöckle was asked about the Dr. Frear reanalysis of the Vander Haak anaerobic digester samples that are the subject of the misconduct allegation. Dr. Stöckle said that Dr. Frear did not talk to him about the reanalysis, and that he had little involvement in Dr. Frear's day-to-day activities. Dr. Stöckle did not recall [redacted]

The committee asked if Dr. Stöckle perceived a conflict of interest situation when BEST has a business relationship with DVO and Dr. Frear is publishing on the performance of a DVO digester. His reply was that conflict of interest (COI) annual reports were signed every year and as long as intellectual property or financial dealings were not involved there should not be a conflict of interest problem. When asked who was helping Dr. Frear understand COI issues he replied that Dr. Frear is older, not naïve, and mature enough to understand things.

E. Scott Economu, February 6, 2015 (**Exhibit 8**)
Past Technician, Water Quality Laboratory, Washington State University

Mr. Economu reported in this phone interview that he worked as a technician in the WQL from 2004 to 2007, in the Department of Civil and Environmental Engineering as part of the CMR/CESAR programs from 2007 to 2010, and at the Nuclear Radiation Center until May 2014.

He is currently at Gonzaga University. He claimed that Dr. Frear had not provided references for his position at Gonzaga University, nor had he discussed this case with Dr. Frear or anyone in BSysE since leaving the BSysE department.

Mr. Economu ran some of the original TS/VS/FS experiments together with the undergraduate technicians. He also programmed the Excel files, which contain the original TS/VS/FS data, to perform some preliminary calculations, specifically for Dr. Frear. The protocols for these analyses are relatively simple but require 1-2 days in ovens to finish drying. The data from these analyses was logged into "notebooks" by pairs of students and/or Mr. Economu who checked the entries for typos. These files were then either emailed to or printed out and given to Dr. Frear. The fate of these notebooks is unknown to Mr. Economu and they were not present among the items sequestered for this investigation; it is likely that they were routinely thrown away. The original TS/VS/FS data exists only in electronic form with the file names, "Vanderhaak 0nnn06B.xls," representing the results of the analyses done on weekly samples provided by the Vander Haak Dairy (**Exhibit 17**).

Digester samples were frozen on delivery and thawed for analysis. About 250 mL of 500 mL of delivered samples were used in the first battery of tests. Samples were infrequently reanalyzed but Dr. Frear may have occasionally asked Mr. Economu to rerun an analysis of a single sample. Samples were disposed of when the freezer became full; but they could be held longer than a year.

Dr. Frear would occasionally discuss problematic data with Mr. Economu; never the other way around. Mr. Economu was not aware of a hard drive failure of the data computer.

Mr. Economu's new sworn testimony disagrees with his earlier sworn testimony in that he did not recall the Excel spreadsheets in his earlier testimony that, in his later testimony, he says he made expressly for Dr. Frear. Also, in his earlier testimony, he said that he had disposed of remaining sample after the initial battery of analyses were completed. In the first interview he comes across as being purposely evasive and forgetful of details that he remembers clearly in the second interview. In the second interview, he backs away from his earlier claim that it would have been difficult for anyone to reanalyze samples.

F. Craig Frear, February 13, 2015
Assistant Professor, Department of Biological Systems Engineering, Washington State University

Dr. Frear was explicitly asked by the investigation committee to bring "all of his existing lab notebooks" to his February 13 interview. He brought two standard-size, brown laboratory notebooks to the interview, which had been prepared by students other than Dr. Frear (**Exhibits 26, 27**). He did not provide any of his own relevant laboratory notebooks. He stated that his only laboratory notebook with relevant data had been lost during Spring 2008 in high winds at WSU's Knott Dairy Farm. He stated he had only one laboratory notebook [redacted] after he lost that one, he did not start another one.

Dr. Frear summarized his employment during the 2004-2009 period, when he worked full-time as a grant writer for Dr. Chen, [redacted] the laboratory sample analysis was completed by undergraduate students and Mr. Economu. Dr. Frear initially stated [redacted] **(Exhibit 28)**.

Dr. Frear first met Steve Dvorak (Mr. Dvorak) at an EPA AGSTAR conference around 2008-9, and had since then met him regularly at those conferences and had frequent email contact with him since then. Dr. Frear had also contacted DVO to get anaerobic digester information during, but did not talk to Mr. Dvorak. Most of his communications concerning the Vander Haak anaerobic digester were with ANDGAR. Dr. Frear did not believe DVO ever used his Ph.D. or *CLEAN* paper data for marketing. Dr. Frear reported that BEST has never had any contracts with DVO, although there were some joint patent and licensing agreements associated with nutrient recovery. Dr. Frear said BEST works primarily as a holding company, and has never had a profit. Dr. Frear state that he has never received a salary from BEST, except for some required half-time work in connection with two Phase I SBIR grants. BEST was initially formed with Dr. Chen and WSU at Dr. Chen's request. When the *CLEAN* paper was submitted it did not occur to Dr. Frear that there was any conflict of interest. The data for the paper had been collected during the period 2006-2008 and, to his knowledge, DVO had never used the data.

Dr. Frear explained how the samples were tested for VS/FS/TS (**Exhibit 29**). Weights and volumes for samples were entered on WQL data sheets (**Exhibit 18**). At this time values for VS/TS data were recorded on a spreadsheet on a WQL computer. The WQL datasheets were lost from the laboratory soon after the weights were entered into the computer. Dr. Frear back-calculated the samples' "drying" weights and "firing" weights data and recorded these data into his laboratory notebook (**Exhibit 23**). The WQL computer file was deleted after the data was entered in the laboratory notebook. Earlier, he had noticed a number of problems with the student data and asked Mr. Economu to try to resolve some of the problems. After this, Dr. Frear still thought that the VS/FS/TS values were too low because of problems with the procedures that the students were using and biogas measuring problems at the Vander Haak farm. This is what prompted Dr. Frear to do the reanalysis of the samples. Some of the problems with data inconsistencies were discussed at weekly WQL anaerobic digester group meetings. Dr. Frear stated that he did not re-test any samples for chemical oxygen demand (COD).

Dr. Frear stated that the data from re-testing has been lost. This includes his laboratory notebook which was blown into a manure pit at WSU's Knott Dairy Farm during a wind storm in March 2008, the photocopied pages of the laboratory notebook which were lost at his sister's house in Lewiston, Idaho in February 2008, and the data file on his office computer. He stated that the data file on his computer was overwritten in subsequent analysis and data manipulations to such an extent that he lost track of the original data. But Dr. Frear did retain summary results which included means and standard deviations.

Later, [redacted], he reported that he recreated the VS/FS/TS data by working with the original student data and adding mostly integer multiples of 10 to recreate a data set with the same means and standard deviations that he had determined from his reanalysis. He stated that he did not repeat the analysis a third time because of time constraints and the limited amount of sample material that was still available. Dr. Frear did not want to go back to using the original student data because he thought the student data had fundamental flaws. Dr. Frear stated that he did not believe he changed the COD data, and he did not know why the COD data also had integer value changes, but that the COD values might have been adjusted by him to be consistent with the other data values. Dr. Frear reported that he did some additional adjustment to the data to correct some inconsistencies before submitting the *CLEAN* paper, which Dr. Frear wrote by himself, with some editorial contributions from the coauthors.

Dr. Frear submitted a summary of his account of the relevant events and information for the investigation (**Exhibit 29**).

Dr. Frear displayed a bar graph comparing relationships between VS/TS/FS for the student data sets by volume and weight, and [redacted] Dr. Frear stated that he decided the student data error bars were too large but that there was often significant variation in analyses of this type by different labs. Dr. Frear stated that none of the data sets show evidence of any significant anaerobic digester settling problems.

Dr. Frear reviewed a copy of his *CLEAN* paper with highlighted entries referencing any contentious portions, and pointed out that no citations to the paper had any reference to anaerobic digester settling. Dr. Frear refuted (with reference to Environmental Protection Agency reports and Vander Haak Dairy information for the last ten years) the claim by Dr. Smith that the anaerobic digesters had settling problems.

G. Shulin Chen, February 16, 2015 (**Exhibit 11**)
Professor, Department of Biological Systems Engineering, Washington State University

Dr. Chen was interviewed because Dr. Frear was a member of his research group and an employee of his when the alleged research misconduct occurred. Dr. Frear worked for Dr. Chen for two to three years as an editor before [redacted] WSU also has a policy of allowing a person to be a student while continuing as a full time employee of WSU. This allowed [redacted] This was an attractive option to them both.

[redacted] he was a full-time grant writer, so he did not have time to do sample analysis. Sample analysis was usually done by undergraduate students (trained by Mr. Lomber) or by the laboratory technicians Mr. Lomber and Mr. Economu. Dr. Chen affirmed that Dr. Frear's basic function was to analyze the results of the sample testing, and had a limited role in testing samples

from the Vander Haak anaerobic digester. This role was also true of the nutrient recovery work; Dr. Frear's role was crunching numbers.

Dr. Chen was asked if he recalled Dr. Frear reanalyzing the Vander Haak anaerobic digester samples himself for TS, FS, and VS, to which Dr. Chen replied, "I don't remember the details. It is possible." Dr. Chen confirmed that there would have been enough sample left to re-do these analyses, stating the AD samples were at least 250 mL or 500 mL. He did not recall asking Dr. Frear to re-do the TS/VS/FS tests. He did recall discussions with Dr. Frear about the difficulty of collecting the samples they wanted from the digester but not discussions about TS/VS/FS data problems. Dr. Frear may have had such discussions with the technicians, students, but Dr. Chen did not recall discussions either at the weekly anaerobic digester meeting or in other meetings with Dr. Frear. Dr. Frear may have discussed the issue but Dr. Chen does not remember. Dr. Chen does not take notes of group meeting discussions.

Dr. Chen requires all of his students to maintain a laboratory notebook, preferably one with carbon copy pages, however this is not enforced. Students typically buy the large brown 8.5 inch x 11 inch sized notebooks on project funds. When they graduate they leave their notebooks with Dr. Chen, [redacted]
Dr. Frear stayed on as an Associate Research faculty after completing his Ph.D. At this point Dr. Chen stated that Dr. Stöckle made sure [redacted]
However, Dr. Chen later stated in the interview that [redacted] Dr. Chen stated that after Dr. Frear graduated, Dr. Chen told him he would be supportive of his choices of career but "my relationship with him ended at graduation" and he was not knowledgeable or apparently involved in the BSysE department's decision to hire Dr. Frear as a Research Associate Professor. Dr. Chen did not discuss this position with Dr. Frear. Dr. Frear's position in BSysE would have to be approved by Dr. Stöckle (chair of BSysE at the time) with input from faculty. He knew that Dr. Frear's position was split with CSANR. Statements made by Dr. Chen during this part of the interview gave the impression that he was distancing himself from Dr. Frear.

Dr. Chen was asked about the formation of BEST and his role in the company. Dr. Chen stated that the idea for the company came from them both. Dr. Frear wanted to make a difference in the real world and this is the first step to make that happen. The purpose of the company was to commercialize intellectual property and pay for patent applications. Money to capitalize the company came from Dr. Frear and "a little bit from me." [Note: documentary evidence shows that Dr. Frear invested $30,000 and Dr. Chen invested $60,000 (**Exhibit 31**).] Dr. Frear was the manager and Dr. Chen the majority owner, but Dr. Chen states he did not have much of a role. As far as Dr. Chen knows, Dr. Frear did not draw a salary from BEST. No money has been made with BEST but Dr. Frear may do consulting work through BEST. Dr. Chen stated his relationship with DVO is strictly professional but that Dr. Frear was much closer to DVO and interacts with them to develop technology together.

Dr. Chen was asked if there was a conflict of interest concern in Dr. Frear's *CLEAN* paper in which Dr. Chen is a co-author. There was a heated response: "Absolutely no. The University has to take a position on this." Dr. Chen stated that everything they have done is according to University policy and that he did not know of the DVO collaborative agreement until it was signed. He stated that he thinks Dr. Frear's academic career is more important to Dr. Frear than DVO. Dr. Chen then stated that he had no knowledge of the paper's submission to the journal and had not read the final version. Graduate students are expected to submit papers based on dissertation chapters but he seldom knows which journal students submit to. When asked what the biggest issues were in Dr. Frear's COI management plan, Dr. Chen stated: [redacted] his research can't be impacted by financial interest, and (2) no WSU resources were to be used to benefit the company **(Exhibit 32?)**.

Dr. Chen was told that Dr. Frear had reconstructed the TS/VS/FS data and was asked if he was aware of this reconstruction process. He responded that he recalled discussing sampling challenges but did not recall details on reconstructing the data. When it was explicitly stated what Dr. Frear had done in adjusting the TS/VS/FS, and COD values, Dr. Chen responded, "This is certainly not consistent with what we would accept." Dr. Chen stated that this was the first time he had heard about this and wanted clarification if Dr. Frear said he did this. He was then told that Dr. Frear said that he had performed "adjusting of the data." Dr. Chen then noted there is a relationship between COD and VS so one could estimate COD from the TS/VS/FS data. When asked [redacted] Dr. Chen replied that his laboratory has procedures on how to analyze data, but did not elaborate [redacted]

H. Bryan Van Loo, February 18, 2015 (phone interview) **(Exhibit 12)**
Vice President, Regenis (former employee of ANDGAR Corp.)

Mr. Van Loo was employed by ANDGAR and responsible for maintaining nine co-digesters in the northwestern United States. He stated that the Vander Haak digester has never been shut down, has been running for approximately ten years and that none of the other digesters that he maintains has needed to be shut down. Mr. Van Loo described typical input/output content for the digester, with approximately 7.5% TS input and 5-6% TS output. Material in the plug-flow digester is mixed by recirculation of biogas and travels through the digester in approximately twenty-one days. Samples from influent and effluent were taken on the same day, but there was a lot of variation in sample analysis from different analysis laboratories, with some evidence of occasional faulty laboratory work. There was no evidence of settling of solids in any of the digesters, except for one that was not properly operated and maintained.

I. Stephen W. Dvorak, February 18, 2015 (phone interview) **(Exhibit 14)**
Founder and CEO, DVO, Inc. (formerly GHD, Inc.)

Mr. Dvorak founded GHD, Inc. in 1989. His current company, renamed DVO, Inc. (DVO), is a minor player in the world market but a major player in the emerging United States market having installed ninety of the one hundred fifty existing anaerobic digesters in the United States. DVO has two patents with WSU (Patent Application Numbers US 2014/0314657 A1 and US

2012/0118035 A1) that both deal with nutrient recovery systems that are added on to anaerobic digesters.

Mr. Dvorak's relationship with Dr. Frear began around 2005-2007 with the installation of the Vander Haak digester, but he has routinely met with Dr. Frear at Environmental Protection Agency, United States Department of Agriculture, and AGSTAR conferences and, on one occasion, presented jointly with Dr. Frear. DVO has no patents, disclosures, or applications with BEST that do not involve WSU. Mr. Dvorak considers BEST as a holding company for patent development. DVO shares data and expertise with WSU, mostly through phone conversations with students, and DVO has donated equipment to the lab, but has never paid consulting fees to BEST, Dr. Frear, or Dr. Chen.

Mr. Dvorak stated that "DVO values the research that WSU has done on anaerobic digestion but relies on DVO's own internal data for digester development and marketing." They do rely somewhat on EPA-AGSTAR reports, especially for information on European digesters. It is the opinion of the investigation committee that DVO would not have used WSU data as a marketing tool for anaerobic digesters.

Mr. Dvorak downplayed his association with Dr. Frear. He and Dr. Frear have presented their work on nutrient recovery at the EPA-AGSTAR conference for the last two years.

J. Katrina Mealey, February 18, 2015 (**Exhibit 13**)
Chair, Conflict of Interest Review Committee, Washington State University

Dr. Mealey was interviewed to better understand the Dr. Frear / BEST conflict of interest (COI) management plan. This plan was put into place before she was on the COI Review Committee. The committee's principle concern with these management plans is [redacted] not held up because of patent filings. A provisional patent can be filed in sixty days so this is the timeline used to gauge whether [redacted] to better ensure COI is managed appropriately. Dr. Mealey noted that the Department Chair has a big role in overseeing the plan [redacted] Dr. Mealey stated she would have preferred [redacted] Dr. Stöckle could provide neutral oversight of the COI plan as department chair. It was noted in the interview that [redacted] he was a full-time employee of Dr. Chen's in his role as a grant writer, and Dr. Frear was the principal manager of BEST where Dr. Chen is a majority owner. This is a situation that Dr. Mealey thought should probably be discouraged. It was also noted that [redacted]

The COI Review Committee receives annual reports but has limited authority to investigate and enforce compliance. It is assumed that if the annual report is signed then the plan has been followed. If plans are not followed, the Vice President for Research is notified as violation of state ethics laws could be an issue and thus a serious concern for the University.

X. ANALYSIS

The TS/VS/FS data ("GDH Manure Digester Data.xls" in the VDH CoDigestion Data tab used to prepare the above publications have highly unlikely differences in their values for most of the effluent and influent samples compared to the original data file ("Van Final Fixed.xls", prepared by the Water Quality Laboratory **(Exhibits 16, 33)**. These differences are often integer or integer multiples of 10, i.e., 10, 20, 30. So many integer value differences from retesting is not credible; especially since the values for TS/VS/FS are reported to four significant figures and two decimal places.

The committee examined these data files in detail. An example of the differences the committee found between the data that Dr. Frear used in his publications and the data in "Van Final Fixed.xls" is shown in Table 1 on the right. Shown are the number of samples showing precise integer differences for the influent TS/VS/FS values. Of the twenty-eight samples, sixteen had higher values of VS, five had higher values of TS, and eleven had lower values of FS. Effluent samples displayed similar integer differences between these two data files. The trend was that influent VS and TS values increased and influent FS values decreased. The changed TS/VS data in "GHD Manure Digester Data.xls" depict an anaerobic digester that produces significantly more biogas, operates with smaller variations in inputs and outputs, and with a better return-on-investment than the one based on the data in "Van Final Fixed.xls."

Table 1. Number of weekly samples (n=28) displaying integer differences for Influent samples

Digester Influent	# of samples		
Difference (g/mL)	TS	VS	FS
-30			2
-20			1
-10			8
+10	2	7	
+20	3	6	
+30	1	3	

Dr. Frear has admitted to changing the values in this way to better match a re-testing of the Vander Haak Dairy digester samples that he did for TS/VS/FS in January 2008. The data for this reanalysis was lost, so Dr. Frear "reconstructed" this lost data set from the original data by adjusting the values in this manner. He believed that the reconstructed data would portray the Vander Haak digester more accurately than the original data in "Van Final Fixed.xls." His actions constitute a significant departure from accepted practices in university research.

According to Dr. Frear, no physical evidence of his reanalysis exists for the following reasons which, taken together, are not credible:

i. The WQL paper worksheets Dr. Frear used to record weights of crucibles and samples for TS and VS analyses were lost from the WQL soon after he entered the data into an Excel spreadsheet on a computer in WQL.
ii. Dr. Frear transcribed the TS/VS/FS data *by hand* from an Excel spreadsheet on a WQL computer into his laboratory notebook and then deleted the Excel spreadsheet rather

than copying the spreadsheet onto a USB flash drive and then onto his office computer.

iii. Instead, Dr. Frear entered the TS/VS/FS data from his laboratory notebook into his office computer.

iv. Dr. Frear photocopied his laboratory notebook pages containing his TS/VS/FS data but he states that these pages were lost at his sister's house in Lewiston, Idaho in February 2008 and not returned to him until sometime in 2011.

v. Dr. Frear's laboratory notebook, the only existing physical evidence that the Vander Haak digester samples were retested, was then lost when it was blown into a manure pit at WSU's Knott Dairy during a windstorm in March 2008.

vi. The reanalysis data was also "lost" from his office computer due to being over written by his subsequent analyses and data manipulations. What was saved on loose leaf paper was the overall averages and standard deviations for the influent and effluent TS/VS/FS values.

The chemical oxygen demand (COD) data also displays integer differences between the data file Dr. Frear used in his publications and the original data file for influent and effluent samples as shown in Table 2. Nineteen effluent samples had lower COD by integer values. Six influent samples were higher and two were lower. The data are generally biased, with influent higher and effluent lower, indicating more organic carbon has been consumed by the digester.

Table 2. Number of weekly samples (n=28) displaying integer differences for COD

COD	Number of samples	
Difference (g/L)	Influent	Effluent
-50	1	
-20	1	6
-10		13
30	2	
40	3	
60	1	

Dr. Frear stated that he did not re-test the samples for COD so there is no reason these values should be different from the original data file "Van Final Fixed.xls." When asked about these differences, Dr. Frear stated that he "must have" changed the COD values in his analysis so that they were consistent with the VS values. Mr. Chen stated in his interview that there is a relationship between COD and TS and VS, so it makes sense that if the TS and VS values were changed, that the COD should also be changed. These metrics are measures of the organic carbon content in the samples.

The committee also identified a significant number of occurrences of integer value differences in the alkalinity data (n=9) for the influent samples.

BEST signed a collaborative agreement with DVO in June 2010, two months before Dr. Frear submitted his paper on the performance of the DVO-designed co-digester installed at the Vander Haak Dairy (**Exhibit 34**). This appears to be an apparent commercial/financial conflict of interest (COI) that should have been acknowledged by Dr. Frear in the COI disclosures required by the journal. In interviewing Dr. Frear and Dr. Chen, it was clear there is a lack of understanding on COI issues.

Dr. Frear submitted this paper to the journal, *CLEAN–Soil, Air, Water* without the telling his co-authors about his retesting of the samples and his reanalysis of the data. Dr. Chen stated in his interview that he had not seen the final draft of this paper.

Dr. Frear took the WSU Office of Research online Responsible Conduct of Research (RCR) training [redacted] in 2014 as a research assistant professor in BSysE. This online training contains relevant material on managing conflicts of interest and data management.

Mr. Dvorak downplayed his association with Dr. Frear. He and Dr. Frear have presented their work on Nutrient Recovery at the EPA-AGSTAR conference for the last two years. On a public website [http://www.pacificlean.net/partners/], Mr. Dvorak's relationship with BEST is described as:

> "…Dr. Craig Frear and Dr. Shulin Chen have decades of research and industrial experience in anaerobic digestion, nutrient management, and bioenergy development. BEST, LLC, has put together an impressive team of industrial specialists across the nation and world to provide first class, proven anaerobic technology to the organics management industry. The team includes DVO, Incorporated, of Chilton, Wisconsin, the largest farm-based anaerobic digestion provider and developer in the United States. DVO, Inc., has designed and developed over 70 projects across the US, representing over two-thirds of all developed projects. DVO, Incorporated, and its president, Steve Dvorak, PE, hold several key digester patents and have proprietary ownership of their specialized mixed, plug-flow digester, which is especially adept at treating high-solids waste containing various contaminants with reduced need for operational maintenance while also maintaining superior levels of biogas production. Another partner is ANDGAR Corporation of Ferndale, Washington, which is a specialty construction management company with years of project experience fabricating, installing, and managing project development of anaerobic digestion systems, particularly those designed by DVO, Incorporated."

… and in the cited WSU USDA SBIR proposal subaward to BEST (2009) (**Exhibit 35**):

> "BEST has a long relationship with both GHD, Inc and ANDGAR Corporation, two leading commercial AD developers for farm applications. This relationship includes several consulting contracts as well as planned developments for projects both in the US and in China. BEST has been working closely with ANDGAR in developing a proposal to pilot test the nutrient recovery technology licensed by BEST from WSU. Further, the two have been working closely in trying to best integrate the proposed technology into other important proprietary technologies that ANDGAR and GHD are presently commercializing. … ANDGAR, GHD and BEST have plans in action to push this technology [i.e., nutrient recovery] forward to speedy commercialization through the assistance of such potential award grants as is being proposed here. … development of such a technology, particularly with its integrated abilities and potential for reduced operating costs, cost offsets and saleable products, is of great commercial and business value."

INVESTIGATION COMMITTEE RESPONSE TO VICE PRESIDENT FOR RESEARCH CHARGE

At the request of Dr. Christopher J. Keane, Vice President for Research and Research Integrity Officer at Washington State University, this committee was formed to review the research misconduct allegation of falsification of data represented in publications authored by the Respondent:

• Does a preponderance of the evidence prove that Respondent committed falsification of data as defined by Executive Policy #33?

Yes.

• If so, does a preponderance of the evidence prove the falsification of data constituted a significant departure from accepted practices of the relevant research community?

Yes.

• If so, does a preponderance of the evidence prove the falsification of data was committed intentionally, knowingly, or recklessly, and not merely carelessly? If you conclude that falsification of data was committed carelessly, please address how this could happen.

Yes. The respondent committed falsification intentionally and knowingly. This falsification was not committed carelessly.

• If you find a preponderance of evidence that Respondent committed falsification of data, did that have a significant impact on the research record, research subjects, other researchers, institutions, or the public welfare?

Yes. It will impugn the research integrity and reputation of WSU's research units, including the home unit, the Department of Biological Systems Engineering, it defames the reputation of Dr. Chen and all of Dr. Frear's [redacted] co-authors, and may have a negative impact on the careers of students that have trained with him.

• Did Respondent receive or participate in any responsible conduct of research training?

Yes. **(Exhibit 28)**

IX. FINDINGS OF FACT

Based on a preponderance of the evidence, the Committee makes the following Findings:

1. Dr. Frear is currently an Assistant Professor in the Department of Biological Systems Engineering, which is in the College of Agricultural, Human and Natural Resource Sciences at Washington State University.

2. [redacted]

3. Dr. Frear was employed full-time by Dr. Shulin Chen from 2003 - 2006 as a grant writer. He was employed as a Research Assistant from August 2006 - May 2007 and from August 2007 - May 2008. From August 2008 - July 2009, he was employed as a grant writer (**Exhibit 36**).

4. Dr. Frear took [redacted] He took the online Responsible Conduct of Research Education training for faculty and staff when he joined the BSysE faculty in 2014. Both of these modules contain material dealing with conflict of interest and expectations with regard to data management (**Exhibit 28**).

5. Dr. Frear filed a certificate of formation for BEST, LLC on November 4, 2005. On March 15, 2008, a founder's agreement facilitated capitalization of the company using investments of $60,000 by Dr. Chen and $30,000 from Dr. Frear. Dr. Frear is listed as CEO of BEST in one or more NSF SBIRs submitted on behalf of BEST.

6. [redacted] (**Exhibit 19**).

7. Influent and effluent samples were collected weekly in the spring, summer, and fall of 2006 from the Vander Haak Dairy anaerobic digester. These samples were sent to the WSU Water Quality Laboratory (WQL) for analysis of various metrics including total solids (TS), volatile solids (VS), fixed solids (FS), chemical oxygen demand (COD), and alkalinity.

8. The samples were tested by Scott Economu along with undergraduate students who had been trained by Jonathan Lomber. Dr. Frear had minimal or no role in the sample testing. [redacted]

9. The Vander Haak digester data set from samples collected from May 2, 2006 to November 14, 2006 were analyzed by Dr. Frear and results of the data analysis of digester performance appear in the following publications:

9a. [redacted]

9b. Frear, C., Liao, W., Ewing, T., & Chen, S. (2011). Evaluation of co-digestion at a commercial dairy anaerobic digester. *CLEAN - Soil, Air, Water, 37*(7), 697-704. **(Exhibit 21)**

9c. Kruger, C., G. Yorgey, S. Chen, H. Collins, C. Feise, C. Frear, D. Granatstein, S. Higgins, D. Huggins, C. MacConnell, K. Painter, C. Stöckle. (2010). Baseline Performance Monitoring of Commercial Dairy Anaerobic Digester. In *Climate Friendly Farming: Improving the Carbon Footprint of Agriculture in the Pacific Northwest* (Chapter 3). CSANR Research Report 2010-001. Washington State

University: http://csanr.wsu.edu/pages/Climate-Friendly-Farming-Final-Report/. **(Exhibit 20)**

10. The relevant data sets associated with these publications are listed below:

10a. The original TS/VS/FS test results obtained by Scott Economu and the undergraduate interns in the Water Quality Laboratory are contained in the set of files named "Vanderhaak 0xxx06B.xls" where 0xxx06B represents the date the sample was taken at the Vander Haak digester. **(Exhibit 17)**

10b. The TS/VS/FS data was then consolidated into a spreadsheet named "Van Final Fixed.xls" by Scott Economu and then either printed out and delivered or emailed to Craig Frear. **(Exhibit 16)**

10c. The data used in the three publications above is contained in the file "GHD Manure Digester Data.xls" (in the VDH CoDigestion Data tab) which was emailed to Dr. Smith in December 2012. **(Exhibit 16)**

10d. Dr. Frear provided a data set named "GHD Manure Digester Data RF.xls" along with a detailed explanation of the discrepancies to the editor of the *CLEAN* paper on January 25, 2014. The journal editor emailed this data set and Dr. Frear's explanation for the discrepancies to Dr. Smith in January 2014.

11. Differences exist in the data entries for TS/VS in "Van Final Fixed.xls" and in "GHD Manure Digester Data.xls," and many of these differences are integer multiples of 10. One of the consequences of these changes is that the average VS is increased by 20% and the standard deviation is decreased by a factor of about 5.

12. Dr. Frear testified very specifically that he discussed the Vander Haak data including reanalysis of his TS/VS data at weekly meetings with Dr. Chen and his research group. Dr. Chen testified that he did not recall any discussion of the reanalysis of the TS/VS data with Dr. Frear, nor had Dr. Chen asked him to do the TS/VS reanalysis.

13. Neither Dr. Chen, Mr. Lomber, nor Mr. Economu can verify that the TS/VS reanalysis was ever performed by Dr. Frear.

14. Dr. Frear has explained in his forty-nine page statement that, while he had lost his TS/VS reanalysis data, he had retained the "mean" and standard deviations of his TS/VS data on a piece of paper **(Exhibit 37)**. He reconstructed his TS/VS data from "Van Final Fixed.xls" so that it would provide the same TS/VS average and standard deviations as he had recorded on that piece of paper (labsheet). Dr. Frear's explanation of why no physical evidence of his reanalysis exists is not credible.

15. The TS/VS data in the "GHD Manure Digester Data.xls" file were recreated without using a scientifically credible approach. That recreation of data was a significant departure from

accepted practices of the relevant research community. This recreated data is the same data that was used in [redacted] the CSANR report, and the *CLEAN* paper.

16. In the same file, "GHD Manure Digester Data.xls", the Chemical Oxygen Demand (COD) data had also been changed, often by integer multiples of 10. When asked about these changes during his 2015 interview, Dr. Frear admits that he had not retested the Vander Haak sample CODs, but that the changes to the data set "must have" come from him to make the COD data consistent with the TS/VS data.

17. While Dr. Frear explained why he modified the TS/VS data to match his lost TS/VS results, there is no test data to support the changes to COD in the "GHD Manure Digester Data.xls" file and he admits that he did not retest the Vander Haak sample CODs.

18. Dr. Frear stated in his interview that the laboratory notebook from which the scanned, retested data originated, was the only laboratory notebook that he had ever used [redacted] and that, when it was lost, he did not replace it or start a new one. The committee finds it not credible that, [redacted] Dr. Frear had used only thirty-five pages of his laboratory notebook with a single data set occupying eight of those pages.

19. Dr. Frear declared no "conflict of interest" when he submitted the *CLEAN* paper even though he and Dr. Chen have several patents on nutrient recovery with Mr. Dvorak and Mr. Van Loo, as well as a Collaboration Agreement on a Nutrient Recovery System between BEST, DVO, and ANDGAR and managed through WSU-OIPA. This agreement indicates how revenues will be divided among the participants (**Exhibit 34**).

X. CONCLUSIONS OF LAW

Based on the Findings of Fact, we reach the following conclusions:

A. Jurisdiction: This Committee was properly charged and has authority to decide this case. Respondent was notified of the case and given the opportunity to respond to the allegations.
B. We conclude, based on a preponderance of evidence, that Dr. Craig Frear fabricated experimental data, knowingly and intentionally falsified experimental data, and failed to disclose a conflict of interest when submitting a manuscript to a peer-reviewed journal.

XI. RECOMMENDED ACTIONS

The *CLEAN* paper should be withdrawn. All webpages citing that paper or using data from that paper should be removed from internal (WSU) and external websites.

[redacted]

[redacted] In a similar way, the patents filed with WSU having Dr. Frear as an inventor should be checked to make sure that they are supported by existing data records.

The investigating committee feels that the Respondent's actions as described in this document and summarized in Item B: Conclusions of Law, are so egregious that his tenure-track appointment should be re-evaluated.

3/13/15

Alan Genz — Date
Professor, Department of Mathematics

3/13/15

Cornelius Ivory — Date
Professor, School of Chemical Engineering and Bioengineering

3/13/15

Thomas Jobson — Date
Professor, Department of Civil and Environmental Engineering

Exhibit List
Research Misconduct Case # 2014-01
March 13, 2015

Exhibit No.	Description	Source
1	*Washington State University Policy for Responding to Allegations of Research Misconduct*	Office of Research
2	Research Misconduct Case # 2014-01 Inquiry Final Decision	Office of Research
3	Notification of Investigation to Respondent	Office of Research
4	Investigation Charge Letter to Committee	Office of Research
5	Interview with Simon Smith, January 22, 2015	Office of Research
6	Interview with Sita Pappu, January 30, 2015	Office of Research
7	Interview with Jonathan Lomber, January 30, 2015	Office of Research
8	Interview with Scott Economu, February 6, 2015	Office of Research
9	Interview with Claudio Stöckle, February 6, 2015	Office of Research
10	Interview with Craig Frear, February 13, 2015	Office of Research
11	Interview with Shulin Chen, February 16, 2015	Office of Research
12	Interview with Bryan Van Loo, February 18, 2015	Office of Research
13	Interview with Katrina Mealey, February 18, 2015	Office of Research
14	Interview with Stephen Dvorak, February 18, 2015	Office of Research
15	Scientific Misconduct Investigation Briefing - January 23, 2015 Prepared by Simon A. Smith, Ph.D.	Simon Smith
16	4/3/14 email from Craig Frear to Sandy Watson and Judy Endejan responding to Sandy Watson's request for Excel files. Titled, "Excel File Request" **Attachment A**: *Table Response.docx*; Summary document **Attachment B**: *GHD Manure Digester Data RF.xls*; Data file **Attachment C**: *GHD Manure Digester Data.xls*; Data file **Attachment D**: *Van Final Fixed.xls*; Data file	Craig Frear
17	3/17/14 email from Simon Smith to Sandy Watson with data files. Titled, "RE: Forensic copies" **Attachment A**: *Van Final Fixed.xls*; Data file **Attachment B**: *Vanderhaak 051606B.xls*; Data file **Attachment C**: *Vanderhaak 062006B.xls*; Data file **Attachment D**: *Vanderhaak 072506B.xls*; Data file **Attachment E**: *Vanderhaak 082906B.xls*; Data file **Attachment F**: *Vanderhaak 100306B.xls*; Data file **Attachment G**: *VDH Data1.xls*; Data file **Attachment H**: *Vander Haak Final Data 1205 to 1206.xls*; Data file	Simon Smith

Exhibit No.	Description	Source
	Attachment I: *Vanderhaak 052306B.xls*; Data file **Attachment J**: *Vanderhaak 062706B.xls*; Data file **Attachment K**: *Vanderhaak 080106B.xls*; Data file **Attachment L**: *Vanderhaak 090506B.xls*; Data file **Attachment M**: *Vanderhaak 101006B.xls*; Data file **Attachment N**: *Vander Haak Final Data 1205 to 1206.xlsm*; Data file **Attachment O**: *Vanderhaak 053006B.xls*; Data file **Attachment P**: *Vanderhaak 070506B.xls*; Data file **Attachment Q**: *Vanderhaak 080806B.xls*; Data file **Attachment R**: *Vanderhaak 091206B.xls*; Data file **Attachment S**: *Vanderhaak 101716B.xls*; Data file **Attachment T**: *Vanderhaak 050206B.xls*; Data file **Attachment U:** *Vanderhaak 060606B.xls*; Data file **Attachment V**: *Vanderhaak 071106B.xls*; Data file **Attachment W**: *Vanderhaak 081506B.xls*; Data file **Attachment X**: *Vanderhaak 091906B.xls*; Data file **Attachment Y**: *Vanderhaak 102306B.xls*; Data file **Attachment Z**: *Vanderhaak 050906B.xls*; Data file **Attachment AA**: *Vanderhaak 061306B.xls*; Data file **Attachment AB**: *Vanderhaak 071806B.xls*; Data file **Attachment AC**: *Vanderhaak 082206B.xls*; Data file **Attachment AD**: *Vanderhaak 092606B.xls*; Data file **Attachment AE**: *Vanderhaak 102406B.xls*; Data file	
18	3/31/14 email from Simon Smith to Sandy Watson with files for interview on April 1, 2014. Titled, "Files for Research Misconduct Committee Interview on April 1st." **Attachment A**: *CSAW 021717.pdf*; 2/17/14 letter from Simon Smith to Müfit Bahadir with analysis **Attachment B**: *Reply to New CF Data.pdf*; 2/2/14 letter from Simon Smith to Müfit Bahadir with his analysis **Attachment C**: *CASW Response.docx*; 1/25/14 letter from Simon Smith to Müfit Bahadir with his analysis **Attachment D**: *CSAW Concerns.pdf*; 1/24/14 letter from Simon Smith to Müfit Bahadir stating his concerns with *CLEAN* paper **Attachment E**: *AllData01.xlsx*; Data file **Attachment F**: *Copy of Codigestion Manure Digester Data RF.xls*; Data file **Attachment G**: *VDH Data1.xls*; Data file **Attachment H**: *Van Final Fixed.xls*; Data file	Simon Smith

Exhibit No.	Description	Source
19	Fear, C. (2009). *Anaerobic Digestion Strategies for Dairy Manures* (Doctoral dissertation).	Craig Frear
20	Kruger, C., G. Yorgey, S. Chen, H. Collins, C. Feise, C. Frear, D. Granatstein, S. Higgins, D. Huggins, C. MacConnell, K. Painter, C. Stöckle. (2010). Baseline Performance Monitoring of Commercial Dairy Anaerobic Digester. In *Climate Friendly Farming: Improving the Carbon Footprint of Agriculture in the Pacific Northwest* (Chapter 3). CSANR Research Report 2010-001. Washington State University: http://csanr.wsu.edu/pages/Climate-Friendly-Farming-Final-Report/.	Office of Research
21	Frear, C., Liao, W., Ewing, T., & Chen, S. (2011). Evaluation of co-digestion at a commerical dairy anaerobic digester. *CLEAN - Soil, Air, Water, 37*(7), 697-704.	Office of Research
22	1/24/14 email from Simon Smith to Müfit Bahadir, editor, regarding *CLEAN* article. Titled, "1 of 8 FW: Concerns about a 'Clean - Soil, Air, Water' paper"; Forwarded to Sandy Watson 3/23/14. **Attachment**: *CSAW Concerns.pdf*; 1/24/14 letter from Simon Smith to Müfit Bahadir	Simon Smith
23	1/26/14 email from Müfit Bahadir to Professor Bulent Topkaya regarding *CLEAN* article. Titled, "3 of 8 FW: Re: Concerns about a 'Clean - Soil, Air, Water' paper"; Forwarded to Sandy Watson 3/23/14. **Attachment**: "Re: Concerns about a 'Clean - Soil, Air, Water' paper" (Outlook file); 1/25/14 email from Craig Frear to Müfit Bahadar, Bulent Topkaya, and Prisca Henheik addressing issues raised about *CLEAN* article. **Attachment A**: *Scans of Lab Notebook TSVS data.pdf*; Scanned laboratory notebook pages **Attachment B**: *CASW Response.docx*; 1/25/14 letter from Craig Frear to Müfit Bahadir responding to issues raised in *CLEAN* article **Attachment C**: *Codigestion Manure Digester Data RF.xls*; Data file	Simon Smith
24	2/12/14 email from Müfit Bahadir to Craig Frear, Simon Smith, Prisca Henheik, and Bulent Topkaya explaining that *CLEAN* editorial board found no justification for manipulated or faked data. Titled, "6 of 8 FW: Concerns about a 'Clean - Soil, Air, Water' paper"; Forwarded to Sandy Watson 3/23/14.	Simon Smith
25	WSU Water and Waste Analysis Lab. Data Sheet for Total Solids (TS) Dried at 103-105C Analysis and for Volatile Solids (TVS) Ignited at 550C Analysis	Jonathan Lomber

Exhibit No.	Description	Source
26	Laboratory Notebook of Nicholas Kennedy Titled, "BSYSE, Biological Engineering, Nicholas Kennedy, 1630 NE Valley Rd. Apt L304 Pullman, WA 99163" Dates: 9/16/2010 - 7/16/2012	Craig Frear
27	Laboratory Notebook of Cynthia Alwine Titled, "Biological Systems Engineering, Washington State University, Cynthia Alwine, LJ Smith III, 335-7257" Dates: 4/14/2010 - 4/20/2011	Craig Frear
28	Responsible Conduct of Research Training Record for Craig Frear	Office of Research
29	2/12/15 email from Judy Endejan to Lisa Brown-Haas, Sherry Gordon, and Craig Frear with a document for distribution to the committee members prior to Craig Frear's interview on 2/13/15. Titled, "Committee Response II.docx" **Attachment**: *Committee Response II.docx*; Document titled, "February 13, 2015 Response of Dr. Craig Frear to Allegations of Research Misconduct by Dr. Simon Smith"	Judy Endejan
30	Bar graph titled, "Series 1"	Craig Frear
31	BEST, LLC Founders Agreement	Office of Commercialization
32	Conflict of Interest Management Plan – WSU COI # 2006-02	Office of Research Assurances
33	Print out from Van Final Fixed.xls data file; Sheet named "Vander Haak Data"	Simon Smith
34	Restated Nutrient Recovery System Collaboration Agreement	Office of Commercialization
35	Sub-award Agreement between BEST, LLC and Washington State University Prime Award No. 2009-00215 Sub-award No. 02009-00215 WSU Sub Project Title: Ammonia Removal and Recovery System Integrated with Anaerobic Digestion for Mitigating Air and Water Quality Impacts of Animal Operations	Office of Commercialization
36	Respondent Positions Held at WSU 3/17/2003 - Present	Office of Research
37	4/30/14 email from Judy Endejan to Sandy Watson, Sherry Gordon, and Craig Frear with Craig Frear's statement attached. Titled, "FW: Dr. Craig Frear" **Attachment**: *Statement of Dr. Craig Frear with Exhibits 1 through 5.pdf*	Judy Endejan