

### **Assignment #1: What is Science?**

1. Go to [http://undsci.berkeley.edu/article/whatisscience\\_01](http://undsci.berkeley.edu/article/whatisscience_01) and read the summary of what some people think constitutes science. Click on the contents link near the top left of the page and then go to II. What is science. Check out the dozen or so subpages under that, following supplemental links as appropriate. Construct an outline of the information that is presented (to be turned in for grading)

2. Check out the paper “Texasite, a new mineral . . .” by W.W. Crook (Am. Mineral. 62, 1006-1008). It can be found at: [www.minsocam.org/ammin/AM62/AM62\\_1006.pdf](http://www.minsocam.org/ammin/AM62/AM62_1006.pdf)

Use the criteria you summarized in question #1, above, and discuss how they match the content the paper by Crook. (The match is not great.) Is Crook’s paper representative of “science?”

## **Assignment #2: The Case of W. Wilson Crook and Scientific Integrity**

Read the summary of the Crook case below and then answer the questions at the end.

W. Wilson Crook was a graduate student at the University of Michigan in the late 1970s. During his time at Michigan he wrote more than half a dozen papers that described new minerals. His 1977 publication, reporting a new mineral called Texasite, eventually led a group of Michigan faculty, and others, to suspect that he was manufacturing scientific data. Although Crook received a Masters Degree in 1977, it was subsequently revoked by action of the Michigan Board of Regents. Two court cases followed, and Crook prevailed in the first one. However, the U.S. Court of Appeals 6<sup>th</sup> District reversed the decision, which ended all legal activity in July 1986, and so Crook does not have a Masters Degree today. Additionally, new minerals that were reported by Crook and initially confirmed to exist, were discredited and removed from mineralogical data bases.

This story has many dimensions and involves science, personalities, and legal aspects. Below is a summary of the issue, but it lacks many of the scientific and personality details.

Some key references for those interested in further information:

- For a fascinating summary of the activities that led to the initial revocation of Crook's Masters Degree, and a summary of the first court decision, consult Crook v. Baker (1984 summary) which can be found at [http://www.leagle.com/decision/19842115584FSupp1531\\_11930/CROOK v. BAKER](http://www.leagle.com/decision/19842115584FSupp1531_11930/CROOK v. BAKER).
- The short, seminal paper, that started the entire controversy is "Texasite, a new mineral . . ." by W.W. Crook (Am. Mineral. 62, 1006-1008).
- The scientific publication that led to the discrediting of Crook's publications is "New data on and discreditation of "texasite," . . . by Peacor et al. (Am. Mineral. 67, 156-169, 1982)
- A summary of the second trial, that ended the matter, can be found at JUSTIA US Law case description: W.W. Crook vs University of Michigan people, U.S. Court of Appeals Sixth Circuit (1987) <http://law.justia.com/cases/federal/appellate-courts/F2/813/88/240317/>

### **As A Graduate Student**

(Much of the information below comes verbatim from the Justia US Law article cited above.)

Masters Degree, April 30, 1977
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Crook was awarded a degree of Master of Science in Geology and Mineralogy by the University on April 30, 1977. His thesis, submitted to meet a requirement for a master's degree, purported to describe a theretofore unknown mineral, which Crook called "texasite." Crook stated that he had discovered this new mineral while on a field trip in Texas. Available at the University was an electron microprobe, and Crook represented in his thesis that, with this microprobe, he had produced data which, when processed there with a computer program called EMPADR, showed that the chemical composition of "texasite" was such that it was indeed a previously unknown, naturally occurring mineral.

## Unraveling

In the latter part of 1978, after receiving an allegation that Crook had, after leaving the University, fabricated data in evaluating a mineral, professors in the Geology and Mineralogy department investigated and tentatively determined that Crook had not actually carried out the electron microprobe-cum-computer analysis as represented in his master's thesis. One reason for this suspicion was that the time log upon which a record of the use of the microprobe was kept indicated that Crook had not used the microprobe nearly enough, the professors thought, to have developed the data that were presented in the thesis. Another reason was that the thesis data as claimed by Crook were, upon reflection, really too good to be true in that the figures were so precise as to indicate that they were a product of working backward from a desired result. The department members also suspected that this "texasite," claimed by Crook to be a natural mineral, was in fact synthetic; the basis of this suspicion was, among other things, that the claimed chemical composition of the allegedly new, natural mineral was so close to that of a synthetic material which had been produced in a laboratory at the University, and a sample of such synthetic material, which had been available to Crook, was now missing. There were other questions raised concerning the validity of the thesis, but these turned out not to be the determinative ones before the hearing Committee.

Discover of potential fraud, fall 1978

The department invited Crook to return to the University to rerun his electron microprobe data on a computer using an improved EMPADR program. Crook purported to do this in February of 1979, and he delivered the results to the department. However, his work on the computer was, unknown to him, monitored on another computer. This showed that, contrary to his representation, he had simply put data into the computer that he wanted it to give back. Upon his being confronted with this deception, Crook admitted that he had delivered to the department EMPADR "results" that were not developed by the computer from his electron microprobe data. The department concluded that Crook's thesis' contention that his "texasite" was a new, natural mineral was false and that the data in the thesis represented by him to support this claim were fabricated.

## Revoking the Degree

On April 10, 1979, the Dean of the Graduate School informed Crook by letter that the Department of Geology and Mineralogy was charging him with fabrication of the data claimed by him in the thesis to have been developed by him. Specifically, the letter charged, among other things, that the analytical results were uniformly so highly precise as to be suspect, that the time consumed by Crook in the analysis was insufficient to support the claimed results, and that the "texasite" claimed in the thesis to be a new, natural mineral was in fact a synthetic analogue. The letter explained that an Ad Hoc Disciplinary Committee of faculty members had been appointed to hear the matter. Procedures were outlined and later amended. Crook was warned that if the charges were proved, his master's degree might be revoked. The date of the hearing was initially set for May 14, 1979.

Initial charges, April 1979

Crook almost immediately employed an experienced trial attorney, John Dethmers, of Lansing, Michigan who represented Crook throughout the proceedings at the University up to and including an appearance before and argument to the Board of Regents when it voted to revoke the degree. Shortly after he was employed, he obtained a continuance of the hearing to September 22, 1979.

On the Committee to hear the charges were four faculty members, none of whom were from the Department of Geology and Mineralogy, and three of whom were in science or engineering fields; the

fifth member, Rosberg, a law professor and a non-voting member unless there was a tie, was designated as chairman.

On June 20, 1979, the department filed with the Committee and served on Crook a much more complete and scientific statement of charges with supporting documents, and, within a couple of weeks, the department served two additional documents when they became available. Although it was contemplated that Crook would respond by August 1, he did not file his response until September 7. The department then filed some rebuttal documents on September 19. The hearing was held on September 22, 1979.

At the hearing, in addition to the Committee, were Crook, his wife, his parents, and his lawyer, Dethmers. Also present were professors in the Geology Department, other persons who would likewise make statements, and Roderick Daane, who was general counsel of the University. At the request of Dethmers, all persons who were expected to and who did testify or make statements were sworn by the court reporter at the inception of the hearing. Opening statements were made by Professor Kelly, chairman of the department, Daane, Crook and his attorney, Dethmers.

Hearing at the  
University of  
Michigan,  
September 1979

It was a part of the procedure that had been established that while Crook was entitled to be represented by counsel, his counsel would not be allowed to examine and cross-examine witnesses. Neither Daane, for the department, nor Dethmers, for Crook, was allowed to do this, although the record reflects that Dethmers did in fact pose a few questions and make some statements during the proceeding.

The record reflects that the procedure followed by the Committee was an informal one. The Committee asked questions and the participants, including Crook, made statements and asked questions. Both the department and Crook were allowed to make submissions after the hearing and to comment on the submissions of the other. The hearing consumed eight hours, all in one day.

In its report, filed on March 7, 1980, the Committee stated that the burden was on the department to prove its charges by "clear and convincing" evidence. The report then carefully reviewed the evidence in great detail and found that the department had so proved that Crook had fabricated his thesis data submitted to prove that "texasite" was a new, natural mineral. The report further stated that the Committee felt that it was not competent to determine whether the material that had been the subject of the thesis was a natural mineral or was synthetic material that had been produced by another in a laboratory at the University. The Committee did not make a recommendation as to what action should be taken as a result of the fraud it found.

The Executive Board of the Graduate School, after considering Crook's response to the Committee's report, on May 7, 1980, unanimously voted to recommend rescission of Crook's degree. This recommendation was then to be reviewed by the Vice-President of Academic Affairs, Dr. Alfred Sussman, who, however, recused himself because he had drafted the original charges. In his stead, the recommendation was reviewed by Vice-President Dr. Charles G. Overberger, a scientist in charge of scientific research, who had not been involved in the matter. On July 18, 1980, Dr. Overberger sent a memorandum to the Regents stating that he had reviewed the Committee's report and recommended that the Regents rescind Crook's degree.

On October 16, 1980, the Regents had the question of the rescission of Crook's degree on their agenda. The report of the Committee and the recommendation of the Executive Board of the Graduate School and Dr. Overberger were before them. Crook's attorney, Dethmers, argued his client's

Vote of Regents to  
rescind degree,  
October 1980

case to the Regents. The Regents voted to rescind the degree.

### **Extent of the Alleged Fraud**

The magnitude of the accusations made against Crook cannot be overstated. During the various hearings, and in publications subsequently, the University of Michigan argued that all or part of the information in the following articles had most likely been fabricated:

1. Crook, W. W. III (1976) Yttrocrasite from central Texas. *The Mineralogical Record*, 7, 182-183.
2. Crook, W. W. III (1977) Texasite, a new mineral: the first example of a differentiated rare-earth species. *American Mineralogist*, 62, 1006-1008.
3. Crook, W. W. III (1977) New data on yttrocrasite from the Clear Creek pegmatite, Burnet County, Texas. *American Mineralogist*, 62, 1009-1011.
4. Crook, W. W. III (1978) Texasite from Colorado. *The Mineralogical Record*, 9, 251-252.
5. Crook, W. W. III (1978) Tveitite from the Barringer Hill district, Texas. *The Mineralogical Record*, 9, 387.
6. Crook, W. W. III, Ewing, R. C., and Ehlmann, A. J. (1978) Rolandite from the Barringer Hill rare-earth pegmatite district, Llano and Burnet Counties, Texas. *American Mineralogist*, 63, 754-756.
7. Crook, W. W. III and Jambor, J. L. (1979) Nickelbischofite, a new nickel chloride hydrate. *Canadian Mineralogist*, 17, 107-109.
8. Crook, W. W. III and Marcotty, L.A. (1978) Albrittonite, a new cobalt chloride hydrate from Oxford, Llano County, Texas. *American Mineralogist*, 63, 410-412.
9. Crook, W. W. III (1979) Yttomicrolite, a new mineral, and a redefinition of hjelmite. *American Mineralogist*, 64, 890-892.
10. Oswald, S. G. and Crook, W. W. III (1979) Cuprohydromagnesite and cuproartinite, two new minerals from Gabbs, Nevada. *American Mineralogist*, 64, 886-889.

### **District Court**

So, the Regents voted to take away Crook's degree. However, before the Regents officially acted, Crook filed action with the District Court to enjoin the recession of the degree.

District Court, May 1984
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It is telling that, at the University of Michigan proceedings, Crook had argued that all charges against him were false. He said that everything he reported was valid and that any irregularities or confusion were due to poor record keeping or to personal vendettas against him. These matters were raised in the District Court but were only peripheral to the main legal arguments. In District Court, Crook:

1. Argued that the Univ of Michigan had no legal authority to, and could not, revoke a Master of Science degree after it was awarded.
2. Argued that, even if the University could revoke the degree, the University did not follow the appropriate legal process to do so.
3. And so, Crook argued that the degree could not be revoked.

The District Court denied a preliminary injunction, so the Regents went ahead and rescinded the degree. At the same time, the court case continued. The trial lasted 9 days. The district court concluded that Crook's master's degree constituted an important property interest and that, in revoking the degree for

fabrication of thesis data, an important liberty interest was also implicated. The district court further found that Crook was denied a due process right to notice and an opportunity to be heard. and the trial concluded with the District Judge deciding that Crook had not been granted due process, and declaring the degree revocation to be invalid. She ordered the Regents to restore the degree and to pay Crook a substantial sum of money to cover his legal fees. In making her decision, the District Court Judge ducked issue #1 because she concluded that #2 was a valid argument.

### **U.S. Court of Appeals**

The University of Michigan subsequently appealed the District Court opinion (U.S. Court of Appeals - 6<sup>th</sup> Circuit; hearing July 1986; decision March, 1987; rehearing denied May, 1987). The Appeals Court reversed the District Court decision and sided with the University on all key issues:

U.S. Court of Appeals, July 1986
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*“We conclude, as heretofore stated, that the Regents did have the power and authority to revoke Crook's degree and that the University afforded to him due process of law. We therefore vacate the district judge's judgment . . .”*

The Court of Appeals cited numerous errors made by the District Court Judge and strongly criticized the original trial and the Judge's findings.

This ended all administrative and legal actions.

### **Your Assignment**

A. Prepare an outline of the rebuttal paper by Peacor et al. (“New data on and discreditation of “texasite,” . . . by Peacor et al.; Am. Mineral. 67, 156-169, 1982). Your outline should be several pages long and should summarize the information in the article.

B. Answer the following questions – using several paragraphs or more for each. Be sure to include evidence and facts in your answers as well as opinions.

1. Do you think Crook was a fraud and that revoking the degree was correct?
2. Assuming that Crook did fake the discoveries, hypothesize about what his motives may have been. And, discuss how clever (or unclever) he was. Do you suppose he was surprised when he was “caught?” Discuss.
3. If Crook's discoveries were fakes, then what is the deal with his coauthors? Why did he include them on his papers? Do you think they knew what was going on?
4. Consider the rebuttal paper by Peacor and others carefully. Does it appear to be “good science” to you? Why or why not? Why do you think the authors wrote this rebuttal paper? Perhaps it was due to scientific integrity, but Crook argued that it was largely personal and related to the authors' pride and ego. Discuss.
5. At the time that Peacor and others published their rebuttal, and the courts decided it was OK for the University to revoke the degree, Crook was working for a petroleum company. Should the petroleum company have fired him? After all, when he got the job he had a Masters Degree – that was later rescinded. Is this important? What other ramifications or thinking should the managers of the petroleum

company have considered?