

Barking Up the Wrong Tree? Industry Funding of Academic Research

Nellie Shepherd is a graduate student at a large Midwestern university working with a group of graduate students and post-doctoral fellows in the lab of Dr. Thomas Katz. The primary focus of the lab group's research is various aspects of the fate, transport and biological effects of 1,3,5-trimethyltriazinetriene (TTT) in aquatic systems. TTT is a by-product of several chemical manufacturing processes and is extremely difficult to remove from wastewater. Katz, a well-established scientist, is internationally known for his work on TTT. Much of his current research is funded on an annual basis by a consortium of chemical companies that generate wastewater containing TTT. Katz has the highest funding level and best equipped laboratory in the department; however, his students find him distant and communication difficult.

For her dissertation research, Nellie is attempting to determine what environmental factors have contributed to the decline of native fish species downstream from the point at which wastewater from several chemical companies is released into the Missouri river. In addition to TTT, the wastewater contains numerous other substances, including dipropyl phthalate (DPP). At present, no regulatory levels have been established for TTT or DPP; for a variety of reasons, there is much public interest in TTT whereas DPP has been largely ignored.

In a field survey, Nellie found large differences between enzyme levels in fish collected upstream and downstream from the area where wastewater enters the river, with the lowest levels in fish collected closest to the source of wastewater. Short-term experiments conducted by Katz's lab several years earlier did not indicate that native fish species were adversely affected by exposure to TTT, although enzyme levels were not analyzed. An extensive literature search yielded a series of papers indicating that exposure to DPP decreased enzyme levels in several European fish species and linking low enzyme levels to increased susceptibility to disease. Nellie is concerned that DPP, rather than TTT, is the cause of the biochemical changes she has observed and designs a series of simple lab experiments to determine whether exposure to DPP decreases enzyme levels in native fish species.

Nellie arranges a meeting with Katz in which she summarizes the papers she has found showing effects of DPP similar to those she has observed. She also describes the experiments she feels are needed to determine if DPP decreases enzyme levels. Katz tells her that she is barking up the wrong tree and insists that she limit her research to the effects of TTT because that is what the lab's funding is designated for. Nellie is surprised by Katz's response to her proposed experiments. When she tries to pursue the issue, she is abruptly dismissed.

Nellie discusses her meeting with Katz with several members of the lab group. Everyone she talks to feels that her concerns about DPP are valid. Several weeks later, one of the post-docs tells her that Katz confided in him that he didn't want Nellie to "open up another can of worms for the chemical industry." Nellie knows that loss of the chemical industry funding would be devastating to the lab. She realizes that she can probably complete her dissertation without addressing DPP. However, if DPP has caused the decline of native fish species, this issue needs to be addressed quickly because several of the fish species are considered to be on the verge of extinction. Nellie has the materials and reagents she needs to conduct the experiments evaluating DPP.

Discussion Questions

1. Should Nellie proceed with the experiments evaluating DPP?
 2. What issues are involved in such a decision?
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Scenario 1

Nellie decides to obey Katz's instructions. She does not include an evaluation of DPP in her work. She refocuses her dissertation topic, limiting it to the effects of exposure to TTT. Results of her work support the preliminary experiments and indicate that TTT has no major adverse effect on the fish species studied. Katz asks Nellie to include an evaluation of the effects of elevated water temperature on fish enzyme levels. Discharge of water used for cooling by an electrical power plant has caused a 3° C increase in the average annual water temperature of the Missouri River in Nellie's study area.

Discussion Questions

3. Has Nellie compromised her integrity by omitting DPP from her research?
 4. In what way is the analysis of this case changed by Katz's request that temperatures be evaluated?
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Scenario 2

Nellie proceeds with the experiments evaluating the effects of DPP on two fish species. Her results indicate that exposure to DPP results in decreased enzyme levels.

Now that she has the additional data, Nellie recalls Katz's irritation when she initially suggested evaluating DPP. Because of her apprehension, she decides not to tell Dr. Katz about these experiments and proceeds with her dissertation research as described in Scenario 1.

Discussion Questions

5. By conducting the experiments and not divulging the results, has Nellie compromised her integrity more than in scenario 1?
 6. Was she wrong to have conducted these experiments using resources obtained from chemical consortium funds earmarked for research on TTT?
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Scenario 3

Nellie decides to tell Katz the results of the experiments with DPP. He becomes irritated when she admits that she has conducted the experiments, and he informs her that if she wishes to continue her investigation of DPP, she will need to find another source of funding and another laboratory to work in.

Discussion Questions

7. Is Katz's behavior appropriate? Note: The research of some of the other graduate students in the lab group involves compounds other than TTT.
8. What is the primary source of Nellie's conflict? How might this conflict be avoided?

9. What constraints on a graduate student's research are appropriate? What constraints are not appropriate?

10. Is it appropriate for Katz to accept funding that is restrictive (either explicitly or implicitly)?

11. Is it appropriate for Katz to allow Nellie to select a dissertation topic that could potentially conflict with funding constraints? How much latitude should a student be allowed in choice of a research topic?

12. Would Nellie's behavior be considered differently if she were working for a consulting firm with Katz as her supervisor rather than as a graduate student? How might public perception of her work change in this setting?

Commentary

The underlying issue in this case study is the conflict of interest that arises from the impact of private industry funding on Katz's behavior as an academic researcher. The basis for this conflict of interest, as described by Pritchard (1996), is the influence that one position (affiliation with private industry) has on another position (a scientist's behavior and judgment). This case is presented from the perspective of a graduate student to illustrate some of the problems conflict of interest can create for students and to generate discussion about some of the less commonly considered aspects of conflict of interest.

Discussions of conflict of interest typically address issues of data falsification or bias and financial gain rather than influences on experimental design, or in this case, selection of experiments. Whereas falsification or bias of data can be discovered by duplication of experiments, it is more difficult to detect the influence conflict of interest may have on experimental design.

Some university researchers have turned to private industry as a funding source because availability of funds from many government sources has decreased and competition for remaining funds has correspondingly increased. Industry stands to benefit from such funding arrangements in that research conducted by academic institutions is generally perceived by the public as more objective than similar work performed by consultants in-house. It may also be less expensive for industry to fund universities than to hire consultants. Whether or not industry expects recipients of funds to have the allegiance expected of hired consultants, a researcher's perception of such expectations could affect his or her objectivity.

Conflict of interest is not obvious in this case. Had it not been for Katz's comment to the post-doc, it would appear that Nellie's proposed work would deviate from that of the lab and possibly from Katz's area of expertise. Thus, the primary problem would arise from Nellie's work being inappropriate for Katz's lab. However, in addition to his comment to the post-doc, Katz's conflict of interest is made apparent by his suggestion that Nellie evaluate effects of water temperature in addition to those of TTT (Scenario 1). By including elevated water temperature (a potential problem not associated with the chemical industry) and excluding DPP (which is associated with the chemical industry) from Nellie's study, Katz shows a bias in favor of the study of factors that could vindicate (or at least not implicate) the chemical industry in the decline of fish species. If indeed funding has been designated solely for research involving TTT, Katz could be considered to have misused funds by having Nellie evaluate the effects of water temperature (Scenario 1) and having other students work on compounds other than TTT (Scenario 2). Thus, rather than misusing funds for research involving compounds or factors other than TTT, Katz's choice of what to study appears to be influenced by his concern for the interests of the chemical consortium. Concerns of this nature would be expected of consultants hired by the chemical consortium, but they are not generally expected of university-based researchers.

None of the information provided in this case indicates that the chemical consortium expects the research conducted by Katz's lab to be less than totally objective. However, because the lab's primary source of funding is the chemical consortium and funding is renewed annually, Katz's concern about continued funding is understandable. Perhaps he can justify denying Nellie funding to evaluate DPP because he has been able to support the majority of his lab's research without any such conflicts. Thus, one could rationalize that much more good than bad has resulted from the chemical consortium funding.

The funding arrangement with the chemical consortium is lucrative, as indicated by Katz's well-equipped lab, which can make it difficult for Katz to be objective about the potential for conflicts of interest. Because of the financial advantages offered by industrial funding, it's important for academic institutions to establish an external (non-departmental) review system to evaluate appropriateness of funding. Requiring longer-term funding arrangements (perhaps three to five years) would also provide increased financial stability and perhaps lessen perceived pressures.

Secondary issues in this case include Katz's responsibilities to his student Nellie and her responsibilities to Katz, as well as the general responsibilities of scientists. As this case is written, Katz has allowed Nellie to get into a difficult situation. Regardless of what she does, she loses either her enjoyment of science, her integrity, or her funding. Perhaps by restricting her choice of dissertation topics, Katz could have avoided many of the problems presented in this case. However, it seems inevitable that at some point, a seemingly uncontroversial topic would take on a direction that could be perceived as being potentially deleterious to members of the chemical consortium.

In addition to being contrary to basic principles of science, a significant concern, particularly over the long term, is the potential effect of Katz's biased behavior on public perception of science. Blumenthal (1996) describes the importance of public trust to the scientific enterprise. Similarly, Frankel (1996) writes that the public perceives and characterizes present-day science as objective and disinterested. Actions of scientists that undermine these principles and perceptions could result in loss of public trust and ultimately diminished government funding.

Environmental concerns are another issue in this case. The potential loss of species is a significant concern, perhaps a greater concern than obtaining a degree or renewed funding. If indeed DPP is adversely affecting native fish, and based on information in the case, it is incumbent on Nellie (as well as upon Katz) to express her concerns about DPP to someone who can (or will) do the necessary research.

Environmental concerns could well take precedence over any others. Nellie could change schools or live her life without an advanced degree; Katz could find other funding

if the chemical consortium opted to discontinue his funding; and lab employees could find other jobs. Once gone, however, a species cannot be recreated.

References

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Frankel, M. "Perception, Reality, and the Political Context of Conflict of Interest in University-Industry Relationships." *Academic Medicine* 71 (1996; 12): 1297-1304

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**Commentary on
“Barking Up the Wrong Tree?
Industry Funding of Academic Research”**

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This story is told from the perspective of a graduate student who is disturbed because she suspects that her lab director acts with a conflict of interest in steering her away from the research she thinks she should pursue. The case effectively brings out how integral ethics is to scientific research. What it is appropriate to investigate is a central ethical concern in this situation. At the same time, the case allows focus on ethical questions about the management of a research lab; communication needs in a research group; relations between the lab director and a dissertation student; the responsibilities of each; the responsibilities of a post-doc, and others in the lab; the influence of funding source on the research; the integrity of the researcher; and responsibilities toward the environment. The short narrative effectively presents the situation with its ambiguities.

The lab director, Dr. Thomas Katz, has won an international reputation and acquired the funding for a group of graduate students and post-docs and for a well-equipped lab. However, he comes across to students as distant and inaccessible. The graduate student at the center of this case, Nellie Shephard, is engaged in dissertation research to determine environmental factors that have contributed to the decline of fish species that have been exposed to wastewater from chemical plants. Her disagreement with her lab director centers on what possibly damaging substance in the wastewater should be the focus of her investigation. One substance, TTT, has attracted public attention, has already been investigated to some extent by this lab, and has not been implicated in damage to the fish. In addition, the lab gets its funding from a consortium of chemical companies that generate wastewater containing TTT, and the funds are designated for studying the effects of TTT.

Nellie’s reading of the literature has convinced her that DPP, another substance in the wastewater, may be the culprit. She designs some experiments to test her hypothesis. Katz refuses to approve Nellie’s proposed experiments, saying there is no need to evaluate DPP when the funding has been given for studying TTT, and he curtly cuts off further discussion.

Katz’s apparently cold and discourteous treatment of Nellie, at a sensitive juncture in determining the scope of her dissertation research, creates a highly unsettling situation for Nellie. His failure to show interest in her proposal could well undermine her self-confidence as a researcher. His unwillingness to discuss fully the rationale for rejecting research on DPP has evidently damaged Nellie’s trust in Katz. She is ready to believe that his judgment is biased by dependence on the consortium for funding, and she is receptive

to a post-doc's gossip supporting her belief. As she considers that DPP might be the cause of the looming disappearance of fish species and that she has on hand the materials needed to conduct the necessary experiments, her distress increases.

The control of funding needed to conduct research gives lab directors great power in carving out dissertation projects. Presumably, a process of negotiation usually occurs so that a student contributes to defining the scope of the research and comes to believe and in and identify with the project. Ordinary respect for persons dictates that such a process should take place, and pedagogical considerations weigh in as well. The negative consequences of failure to show respect and discuss the rationale for the research are evident in this case. Nellie believes her own integrity may be compromised by following Katz's instructions and serious harm to the environment may come about as well. We do not know if she is correct, nor does she, but Katz has created a predicament for her.

If Katz had discussed the funding and the scope of their research earlier (in a lab meeting, for example), he might have headed off this crisis for Nellie. By considering whether preliminary investigation of DPP might be justified under the terms of the funding or whether mention of the need to follow up on DPP might be justified in Nellie's report of the work she does complete, he might have performed better as a scientist and teacher and forestalled her suspicions. As it is, Nellie is entitled to her concern that Katz has a conflict of interest that biases his judgment in denying approval to investigate DPP. However, the situation is ambiguous; it may be that he has valid reasons but is too peremptory to convey them.

The post-doc's involvement raises additional questions about how the lab director operates, especially in communicating with the members of the research group. Is the post-doc to be trusted? Has the post-doc correctly interpreted what the lab director allegedly said? Does Katz really think the lab would serve the chemical companies well by refraining from pursuing investigation that would "open up another can of worms"? Nellie should not have to rely on the post-doc for an answer to the question. The lab should have regular channels of communication that leave less to gossip, rumor and surmise.

The lab's posture toward the consortium that supports the research should have been made explicit and explained to the members of the group when the funding came in and should be conveyed clearly to new members. These are reasonable expectations for a responsibly managed research group. The university's commitment to the independence of university research is very valuable to society, and the university should have clear policies protecting the independence of research funded by private business organizations. Research conducted within business organizations also must meet reasonable standards of

independence to be trustworthy, but business organizations do not make the same public commitment to the independence of their research that universities do.

In Scenario 1, Katz asks Nellie to include investigation of elevated water temperature on fish enzyme levels. Consideration of this factor is legitimate, but the request raises a question because it is not obvious that study of temperature is justified under the terms of the funding. Nellie's suspicions of conflict of interest are fueled, as well as, in all likelihood, a sense that her own idea of investigating DPP is not adequately appreciated. Whether Nellie's integrity is at stake is not clear, for she does not know why Katz has slighted her proposal.

If, as in Scenario 2, Nellie goes ahead with her experiments, finds that fish enzymes are indeed decreased, and does not report her findings, she is at fault on two counts. Without approval, she carries out research using funding presumably not designated for these experiments, and she holds back the results. She should not go this route.

In Scenario 2 B), Nellie reports her findings, and Katz is irritated. That reaction to her going ahead without approval is not out of line. It might not even be out of line to tell her courteously that if she wants to work on DPP, she must find other funding and another lab. However, Katz allows other students to work on other compounds. So Nellie is owed an explanation of his refusal to approve her study of DPP. Her suspicions may be correct, but they may not be.

It seems that Nellie must either follow Katz's instructions or find another lab in which to pursue the research that seems important to her. Perhaps the fault is not entirely Katz's. We do not know how others in the lab, who think Nellie's concerns are valid, get along with Katz, and Nellie herself may not know. It would be useful to her to find out about their situations, how they deal with Katz. Could Nellie have opened a discussion about her goals and research interests with Katz (or another senior person who knows this lab) at an earlier point? She might have learned at the outset whether this lab was a good fit for her.