Pfiesteria Hysteria: A Case History
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In late summer in many of the estuarine rivers in the southern U. S. there are massive fish mortalities, i.e. fish kills in which numerous fish die. These episodic fish kills have been linked with stress due to low oxygen levels in the water, which are caused by high temperature and organic load (Paerl, 1999).

Dr. Edward Noga in the Department of Animal Science at North Carolina, as part of his research program, is culturing fish in aquaria. He is having trouble keeping fish alive. He notices that when the fish die there are blooms of phytoplankton in the water. He contacts a colleague, Dr. JoAnn Burkholder in the Botany Department, to identify the phytoplankton and see if this could be the problem. Dr. Burkholder identifies a dinoflagellate, and after a series of experiments concludes that this dinoflagellate, *Pfiesteria piscicida*, is responsible for the fish dying, that the dinoflagellate has many life stages, including vegetative vs. carnivorous stages, and that the change to the predator phase is related to the presence of organic load. There are numerous species of dinoflagellates that produce toxins that have adverse effects on other biota. Note that any specific toxin associated with this species has not yet been isolated and identified. In the process of this laboratory research, she and her assistant experienced disorientation and confusion, which they related to the exposure to the aerosol of the supposed toxin coming from the dinoflagellate. In conducting research in the field where fish kills were occurring she found massive blooms of this dinoflagellate and concluded that the dinoflagellate was the cause for the fish kills. Because she is aware of similar symptoms of disorientation and rashes in fishermen exposed to water with blooms of the dinoflagellate, she thinks that it might be something caused by the dinoflagellate to all people in contact with blooms of this alga.

Noga and Burkholder have continued collaborative laboratory research, with the agreement that they would jointly publish. Some time later Noga finds a copy of galleys in his mail to be published in the journal Nature. Burkholder is senior author and Noga is co-author. This is the first time he has ever seen the manuscript. He is upset because he feels the publication of these data are premature. During the time research was going on Burkholder was persistently suggesting that they publish, yet Noga felt publication was premature, judging from what he considered unsubstantiated data. She said she had given him the opportunity to publish, he did not want to publish, therefore she went ahead and did it, adding his name to the publication (Burkholder et al., 1992). In subsequent publications Burkholder describes the algae in such terms as: "lieing in ambush", "stalking its prey", and "gorging on the fish flesh". She also publishes what she feels was *Pfiesteria*-caused neurological effects on her and her technician.

Burkholder became an advocate of organic controls in North Carolina rivers, specifically those related to increasingly dense swine industry in coastal North Carolina because of what she regards as the potential health risks associated with *Pfiesteria* outbreaks. One should note that much of the data are anecdotal. The total number of persons so far "affected" is less than 100: there have been no deaths documented (though
advertisements from the publishing house of Barker, 1997 alludes to "deaths"); and the documented duration, of neurological effects by medical doctors at the University of Maryland, is two to three days. She began addressing lay groups about her perceived danger of the eutrophication associated with swine cultures. Other marine scientists questioned the strength of her observations and conclusions. When asked for the specific dinoflagellate cultures by the scientists contesting her work, she refused to share the cultures, suggesting that other scientists did not know how to handle cultures to obtain the carnivore stage and that she would become marginalized as just the provider of phytoplankton cultures to other scientists who would get the major credit for any scientific findings. The relations between her and other members of the scientific community become stressed and she objects to the criticism she is receiving by the scientists, accusing them of various motives e.g. jealousy, personal professional advancement.

Burkholder convinces state politicians to allocate funds for research on \textit{Pfiesteria}, with the implication that the money would be for her research. To administer this research endeavor, the state passes the money to the North Carolina Sea Grant Program. Following standard peer review processes, the Director of the North Carolina Sea Grant Program advertises a competitive research grant program for \textit{Pfiesteria} research. Burkholder protested that this process would cause needless delays and alleged in a letter to the governor of North Carolina that the division of environmental management was trying to sabotage her research (Associated Press, 1996). After peer review several investigators, including Burkholder, were awarded research grants. Burkholder objects (she only receives somewhere over half of the whole money) because she felt this money was allocated for her. She says that, unless she receives the whole money, she will not supply cultures for others to do research. The Governor of the state of North Carolina is upset that Burkholder did not receive all the funds, and persuades the Chancellor of the University to fire the Sea Grant Director, Copeland. Two problems arise: The Chancellor forgets that Copeland is also a Tenured Professor, and secondly, the Sea Grant Program is nationally funded and the National Office objects to the state firing the Director without discussing the fact with the National Office.

Environmental groups have emphasized that it is the over fertilization of coastal waters by agro-industry of swine in North Carolina and chickens in Maryland that has caused this health menace and that these activities must be curtailed. Scientists have argued that funds are needed to carry out the research to prove the hypothesis that \textit{Pfiesteria} is really the cause of the fish kills and human health effects. One million dollars per year has been allocated for this research and is awarded through a competitive federal grant program. Burkholder formally complained to the federal granting agency that she was discriminated against in the review process. A special review panel did not find support for Burkholder's contention.

The Reverend Van Impy, a North Carolina evangelical pastor has preached that the \textit{Pfiesteria} is prophesized in the Book of Revelations where the 7 angels pour the 7 bowls of the wrath of God. The second bowl, according to Revelations, poisoned the ocean and the waters turned to blood.

\textbf{Level I Exercise}

1. What are the ethical problems in this case study?
2. Using the table below, fill in an activity described in the case study that is relevant for each of Merton's norms. Mark (X) whether the activity was appropriate or inappropriate according to Merton's norms for scientists.
<table>
<thead>
<tr>
<th>NORM</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized Skepticism</td>
<td>objection to criticism, symptoms of illness</td>
</tr>
<tr>
<td>Originality of data</td>
<td>data was probably original</td>
</tr>
<tr>
<td>Communalism</td>
<td>wouldn't share cultures or data</td>
</tr>
<tr>
<td>Disinterestedness</td>
<td>advocacy, allocation through politics</td>
</tr>
<tr>
<td>Universalism</td>
<td>hired a young woman</td>
</tr>
</tbody>
</table>

3. Select one of the norms above and discuss the activities according to Kant's "Categorical Imperative".
4. Select one of the norms above and discuss the activity according to Bentham and Mill's "Theories of Utilitarianism".
5. Would the appropriateness of the activities have been different if the medical symptoms had been lethal?

**Level II (Adapted from Gary Comstock, 2000)**

1. Apply the methods for Applied Ethics, to this case study, using the Reflective Equilibrium Test.
2. Moral Intuitions. Write a statement about Dr. Burkholder's intuition that, in her mind, excused her violations of Merton's norms.
3. Screen intuitions for bias. Write one question this individual might ask herself as a checking procedure against prejudice.
4. State screened intuitions as particular moral judgements (pmj). Underline the conclusion statement of the view. Call the underlined conclusion the Particular Moral Judgement or (pmj).
5. Identify factual and normative reasons for the pmj. Write one factual premise that supports the pmj.
   Write one normative premise that supports the pmj.
6. Build an argument for validity. Write "V" for valid and "I" for invalid in front of each premise in your argument. An argument is valid if and only if it is not logically possible for its conclusion to be false when all of its premises are true. Is your argument valid?
7. Check for Soundness. A sound argument must be valid and all of the premises must be true or justifiable.
8. Is your argument sound?
9. This is an actual case. What do you think should have happened? What do you think happened?