# CHAPTER 24: CONFLICT AND THE CORRUPTION OF SCIENCE

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*IMPEDIMENTS TO SCIENTIFIC PROGRESS*

The scientific method can be and often is deliberately frustrated by those who would not benefit from an improved model. Not everyone has the goal of objectivity.

SECTION 1

# Goals: Seek Not the Truth

The previous chapters have assumed that the goal is to seek scientific "truth" about some problem, hence identifying useful models. For many people, real life goals are made up of many factors, not just to seek scientific truth. (Or, if someone's goal is to seek scientific truth, they may want to keep others from finding that truth.) These factors should be obvious to you, because you have experienced them and can relate to them.

# Factors Affecting a Person's

### I. Material gain: money, time, objects, power.

Much of what people do is for tangible, material wealth or resources that lead to wealth. Our economy is based on such a resource. Such resources are at the root of many goals, and one person's gain of the resource may require concealing the truth from others. As will be noted below, companies go out of their way to conceal defects in their products, because such "truths" would deter many buyers.

### II. Emotions

*(com)passion:*

People's anger, love, sympathy, and parenting instincts often mean that they are not interested in knowing the full truth. The video about facilitated communication showed parents who wanted to believe that their autistic child could communicate; lovers are often blind to the truth about their mates; parents do not want to know what their children really did, if it is bad.

*ego:*

A person's reputation may influence her/his views. People are especially averse to admitting their own errors and fallibility, so much of progress is blocked by people refusing to change their original claims. One of the most egregious examples of ego came out of the history of medicine. In the mid 1800s, a physician named Semmelweis discovered that physicians and medical students at a maternity ward in Vienna were causing the deaths of the women: the medical staff was moving from autopsy room to maternity wards without washing their hands, and the live patients were becoming infected. He did an experiment that showed a dramatic effect of washing hands (dropping the mortality rate from 10% to less than 2%), yet his publications and advice were rebuffed by his colleagues because they did not want to believe that they -- the DOCTORS -- were killing their patients.

## III. Philosophy

Religious beliefs have stood in the way of many scientific advances. But some people just want to believe (or disbelieve) in things for no obvious reason. For example, many people believe in psychic powers, even though science has universally failed to support the existence of such powers.

## IV. Politics

Political beliefs and perhaps even laws may stand in the way of scientific progress. Laws may protect an individual's rights so that a particular kind of study cannot be undertaken -- there are certain types of data that we cannot obtain without permission. A recent proposal has even been offered in the U.S. to ban the use of any data on humans that was obtained in violation of U.S. ethics standards, even when such data were obtained outside of U.S. soil and without U.S funding. And political views may simply prevent dissemination of scientific results. A sordid and aging example was the Lysenko era in the Soviet Union, when genetics was essentially outlawed as a science, and geneticists were put in prison. The influence of Lysenko set Soviet biology and agriculture back several decades. Lysenko's views were received favorably by the Communist regime because the Communist ideology held that everyone was equal; genetics, instead, allowed intrinsic differences to exist among individuals. On a more innocuous level, politicians in Congress can have large effects on the funding of different projects, merely because of their power to make important decisions. There are instances in which a Congressman or Senator has been able to direct funding of projects that are immediately important to them rather than the population (e.g., research into Lyme disease). Likewise, factors that may impact a large number of people but do not impact a politician's constituency can get ignored (e.g., multi-drug resistant TB).

When various factors enter into goals, it is often or invariably the case that conflict arises. Different people are then typically basing their goals on different factors, hence their goals differ or conflict. When conflict is present, progress will often be impeded or fully prevented.

SECTION 3

# Arenas of Conflict

Our society is a collection of individuals and corporations with differing goals (e.g., Table 17.1). When people have conflicting goals, they don't all necessarily benefit when a model is improved. We cannot begin to reveal the ubiquitous presence of conflicting goals. To do justice to this topic we would have to review much of what is known about the human race, including history (e.g. wars), sociology (e.g. class struggle), and economics (competition between firms for the same market). Wherever we turn, there are individuals or institutions with conflicting goals. These conflicts are widespread, and it is not surprising that they have had a huge impact on science. Some poor science is certainly a consequence of ignorance. And as discussed in the correlation chapter, some poor science is certainly a consequence of the cost and difficulty of doing the science correctly. But many of the abuses of science can be traced to conflicts: If two people have conflicting goals, then it is to the advantage of each person to slow the progress of the other person toward their goal.

## Conflict and the potential for bias in science:

| **Expert witnesses in criminal cases:** |
| --- |
| Scientists that testify for the defense or prosecution are often paid for doing so. At the same time, they are sworn to give accurate testimony. |
| **Medical conferences:** |
| Consumer Reports discussed how pharmaceutical manufacturers that sponsor conferences bias the presentations at these conferences by choosing the conference speakers from a list of scientists previously known to have a favorable view toward the company's products |
| **Environmental consulting:** |
| The engineering firm that renders an opinion about the environmental effects of the latest subdivision faces a conflict of interest between doing an unbiased review and doing a review that will ensure additional business in the future. |
| **Funding for big ticket projects:** |
| Scientists explaining to the public what the benefits of projects such as the space station and the human genome project are may have incentive to overstate their case. Research funding for their project may depend on the perception by the public that the project is important, as evidenced by the death of the superconducting supercollider. |
| **Furthering political dogma:** |
| When scientists decide before gathering any data what the best solution to a problem is, the data and analyses may be selectively presented so as to support an a priori decision about what the researcher wants to show. |

There are some generalities about where to expect conflict, however. Some major categories include:

1. The buyer-seller interaction: the seller is often interested in the buyer's money, not whether the buyer is getting what is wanted.
2. The criminal court system: the prosecution and defense have opposite goals by constitutional definition.
3. Politics: the opponents for a political office have opposite goals
4. Industry and government regulation: regulation is often a situation of conflict, since the government uses its regulations to impose burdens on corporations. In some cases, however, these regulations level the playing field among companies, rather than taking away profits.

This list is not exhaustive, but it gets at several of the main categories. Some of these are obvious. Below we expand on conflict in the legal system, because it offers an interesting contrast with scientific discovery in several ways. We end the chapter with a description of a subtle form of conflict that has not entered into any of the examples above: tragedy of the commons.

# Conflict over Science and the Legal System

In principle and in practice, the U.S. legal system is a triumph of individual rights. Yet its nature, and indeed its success, is founded foremost on conflict. The introduction of scientific evidence into the courts thus exposes science to many potential abuses.

Consider a criminal trial. The purpose of the trial is to decide on the guilt or innocence of the defendant. In a case involving scientific evidence, there are at least 4 parties involved, each with different goals:

| PARTY | GOAL |
|---|---|
| A. Prosecution | Conviction |
| B. Defense | Acquittal |
| C. Jury | A fair presentation of evidence |
| D. Science Lab | future contracts, reputation for quality |

There is an obvious conflict between (A) and (B). But conflict may also arise between (D) and (A) or (D) and (B), because the goal of the lab might be to (i) support whichever agency hired it, or (ii) present a fair appraisal of the evidence, which will put it in conflict with whichever side is hurt most by the evidence.

A fundamental difference between science and our legal system. Now it might seem that, despite the conflicting goals, there is little room to argue about scientific evidence. But therein lies perhaps the most basic difference between the legal system and the scientific method. With respect to the scientific method, there are three possible outcomes that might be reached about the defendant based on the evidence at hand:

**Definitely Not Guilty | Not clear | Definitely Guilty**

The approach in science is to seek more evidence (additional data) to narrow the middle category. If more experiments/evidence are not feasible, a scientist merely states the ambiguity. But the legal system does not readily allow for these three possibilities - there are only two allowed outcomes, guilty or not guilty. (A hung jury represents a type of indecision, but judges sometimes coerce hung juries into rendering a verdict by refusing to let them go, thereby refusing to accept this "middle ground".) The task of the defense is thus to compress the middle category by convincing the jury that this ambiguous evidence contributes to the suspect's innocence, whereas the task of the prosecution is to compress the middle category and convince the jury that this ambiguous evidence contributes to the suspect's guilt. Uncertainty at some level applies to virtually all scientific data (some more-so than others), creating a nearly universal problem for the fair evaluation of scientific evidence in courts.

# Tragedy of the Commons: Conflict Between the Social Welfare and Individual Benefit

Until now, we have discussed cases in which the conflicting goals are obvious -- prosecution versus the defense, consumer versus a company selling a product. There is a more subtle conflict that pervades perhaps all attempts at providing social order -- government, and collective decision-making. The "tragedy of the commons" is a metaphor (verbal model) for a conflict that arises when apportioning resources held by many among the owners. It applies especially to public resources, but also can apply on a smaller scale (e.g., to multiple owners of a business or other resource). More generally, it is a model of conflict between what's good for the individual and what's good for the group.

Imagine that we have a single big dispenser of liquid for a class of thirsty students. Everyone is given a big cup and told that there is enough drink for everyone to have 2/3 of their cup full. We let everyone line up and pour drink into their cups, but no one can see how much another person takes. What will happen??

No doubt, the drink will all be used up before the last people in line get their chance at it.

The phrase "tragedy of the commons" was coined several decades ago by Biologist Garrett Hardin to describe the basic conflict between individuals and groups of those same individuals. In colonial days, a "common" was a public grazing area. (The Boston Commons still exists, but it is now a park.) Residents of the community were told how many head of livestock were allowed on the commons, but there was no real way of policing these quotas. Invariably, the commons was overgrazed and became useless as a grazing area.

To appreciate the problem underlying the tragedy of the commons, consider a resource owned equally by each of 10 people. By rights, everyone owns 1/10 of it. Let's say that I am one of those owners. If I take 2/10 instead of my 1/10, I get double my share. The other 9 owners must divide the remaining 8/10, so on average, each of them gets 8/90, which is only a little bit less than 9/90 (1/10). So my gain is big, but their individual losses are small. Of course, if the other 9 also behave like I do, then a few owners reap most of the benefit of this "communal" resource, and most owners lose. The other owners will object to my taking more than my share (or anyone else doing the same, unless it is them personally), so the success of such a communal resource relies on keeping track of who takes more than their share. Only if there is some way of policing or enforcing the division of resources can this tragedy be avoided.

There are many social institutions that suffer from tragedy of the commons (see table below). The success of minimizing the effects of this conflict depends on both the individual benefit of acting selfishly and the mechanisms to reward compliance with social goals or to punish non-compliance.

| TOPIC | PUBLIC BENEFIT | INDIVIDUAL COSTS AND BENEFITS |
|---|---|---|
| Taxes | schools, road, defense, social infrastructure | by avoiding taxes, you enjoy the public infrastructure and have extra dollars to spend (because of the strong individual benefit of not paying taxes, we need a powerful tax collection agency). |
| Clean Air Autos | clean air | by not maintaining a clean-air car, you avoid costly repairs but you breath the same air as everyone else. |
| Fisheries | food supply, jobs over many years | each boat makes more money as it catches more of the fish in the public fishing grounds, but the reduced fish populations affect all fishing boats equally |
| Grades | society is able to evaluate student training | higher grades benefit a student; one student's grades do not affect the average |
| Letters of Recommendation | society is able to evaluate the quality of a job candidate with accurate letters | letter writers often have agendas for the former associates, and an honest appraisal of the candidate may be in conflict with that agenda. |
| Traffic Laws | an orderly system of transportation is vital to our society | following traffic rules often increases our transit time. |
| Teaching | it is essential to train people for jobs in the economy | universities offer little reward for outstanding teaching but offer big rewards for outstanding research, and teaching detracts from research |

# Vaccines and Public Health

Unquestionably, the biggest medical advances ever are microbe-fighting drugs and vaccines. Even into the 1940s, infectious diseases took a major toll on Americans (and they still are major health problems outside of Western countries). A stroll through a cemetery from the early part of this century will reveal that death then was not confined to the elderly, as it chiefly is now. Much of this early death was from scourges that we no longer fear or, in some cases, that we even lack any familiarity with: pneumonia, TB, diptheria, tetanus, whooping cough. Other diseases, such as polio were more often crippling than lethal, but nonetheless caused annual epidemics (the President FDR had been crippled by polio).

To give a perspective, 38,000 cases of polio were reported in the U.S. in 1954. That was one of the first years of a trial vaccine for the disease, caused by a virus. Now, the number of annual cases in the U.S. is less than 10, and those are usually caused by the vaccine. Other diseases, such as diptheria, whooping cough (pertussis), measles, have likewise all but disappeared from their former, frightening levels. These diseases in particular, have been reduced to a tiny fraction of their historical levels because of vaccines. Most vaccines consist of killed or otherwise subdued microbes or parts of microbes that are injected or eaten by us to trigger our immune system to combat the real microbe. (Vaccines differ from antibiotics: antibiotics are drugs that kill the microbe directly and only work on bacteria. Vaccines trick our bodies into killing the invading microbe, which may be a bacterium or virus; some vaccines merely help our immune system block a toxic chemical.)

Vaccines offer a remarkable level of protection. They are so successful, and their efficacy is so accepted by the medical establishment and public that many of them are required for admittance to public schools. However, vaccines carry a small risk of complication, and when administering them to millions of people, a handful of those people (in some cases, a "big" handful) will develop problems, or rarely, will die.

What are the reasons for being vaccinated? There are two, and they are very different.

1. **Personal protection:** Many people get vaccinated to avoid getting a disease. This is the obvious benefit.

2. **Group benefit or herd immunity:** When a large fraction of the population is vaccinated (over 50% in most cases), the risk to an unvaccinated person of getting infected goes down. In other words, if everyone else in the population but you is vaccinated, then your chance of getting infected is tiny or zero because there is no one around to infect you. (This argument applies to diseases that are transmitted from person-to-person but not to those acquired from animals or the soil -- such as tetanus.)

Why does society require vaccination, then? Why shouldn't we let vaccination be a matter of personal choice? If someone wants to neglect vaccination, they do so at their own risk. That seems fair and seems consistent with U.S attitudes about individualism, provided we make the vaccines affordable and available to everyone. (We also need to inform the entire population about which vaccines are available and what the risks are.)

There is a compelling argument for mandatory vaccination: the herd immunity afforded by a vaccinated population protects some groups of people that cannot be immunized. One group is babies. Their immune system needs time to develop, and although they have protection from mom's antibodies for a few months, there is a window of vulnerability before vaccination in which they are susceptible. A second group is more ill-defined but very real: most vaccines do not afford 100% lifetime protection. Some people just don't ever develop a good immunity, and in others, the immunity decays with time. There is no easy way to identify these people (e.g., to give them booster inoculations). In addition, the elderly and people with compromised immune systems may have difficulty in being protected by vaccines.  Babies and non-immunized adults who have received the vaccine thus benefit from living in a population that is fully vaccinated. The argument in favor of mandatory vaccination is thus that the entire population benefits when everyone gets the vaccine.

There is a movement afoot that opposes mandatory vaccination. What would happen if we did not require these vaccinations? The answer is pretty clear that many people would not get the vaccinations, and we would have recurrent epidemics of these old diseases. Some people would certainly continue to get vaccinated (for individual reasons), but others would not on the grounds that their chance of getting the disease was small enough that vaccination was not worth the risk. They, in fact, would benefit from the many people who did get vaccinated, but as a group, they would be the ones who fueled the epidemics. Many "innocent" people would die, as would many others who were just negligent about getting vaccinated. In fact, Texas had a measles epidemic in the 1980s that killed at least a couple adults. It was suggested that this epidemic resulted from a high influx of people from Central America, who had never been vaccinated, but the epidemic affected many U.S. citizens as well. A second case is an outbreak of whooping cough in Northern Idaho in about 1996. Here, at last one young child died. The title of an editorial in an Idaho paper at the time accused parents who did not vaccinate their children as killing the children of other parents.

The vaccination example illustrates the tragedy of the commons. People make decisions for individual reasons but not for the good of society. In this case, the tragedy is avoided (a group benefit is maintained) by requiring individual compliance. However, influenza kills tens of thousands of Americans each year, yet the vaccine for that disease is not required. Influenza differs from the "childhood" diseases for which we have mandatory vaccination in that the vaccine does not confer life-long immunity. In fact, the vaccine for influenza is changed every year. It may be this need for annual vaccine renewal that makes it impractical to require population compliance.