

Pests, Pesticides, and Growing Populations

An interview with David Pimentel

by John F. Rohe

As an important part of this issue's feature section, *The Social Contract* asked author and environmental activist John Rohe to interview David Pimentel. The interview was conducted on Memorial Day, 2002.

JOHN ROHE: Thank you, Dr. Pimentel, for taking the time for this interview for The Social Contract.

DAVID PIMENTEL: My pleasure.

JR: Can I ask when you were born?

DP: May 24, 1925. I just had a birthday.

JR: Happy Birthday. Where were you born?

DP: Fresno, California. I spent my first six years there on a farm.

JR: And from there?

DP: From there we moved to Massachusetts, to another small farm in Middleboro.

JR: When you turned eighteen we were midway through World War II.

DP: I was a teenager. I volunteered. Yes, the war was on, and we all had a patriotic spirit. Everybody was going in. So, I decided it was a good time to go. I joined the Air Force as soon as I turned eighteen, and trained to be a pilot. I was relatively young for the Second World War. The military gave this farm boy a wonderful experience, meeting a wide variety of people.

JR: When did you start college?

DP: In 1945 when I was about 20. I was only in the Air Force for two years. When I got out, I immediately went to the University of Massachusetts and majored in animal science, and subsequently switched to entomology during

my last year in college.

JR: You are still dealing with animals.

DP: Still animals, but insects in this case.

JR: Were there any other influential events in your early life that influenced your love of animals.

DP: Yes, growing up on a farm there were many types of animals, like goats, geese, and chickens. Also there were books. I remember in particular the Thornton Burgess books. He had a book on Blacky, the crow, one on Peter Rabbit, and he really did a super job of introducing these animals and their behavior and ecology to young people in grammar school. He must have had twelve or fifteen books. Each of them dealt with a particular animal, but then he related each animal to all the other animals that existed in the ecosystem.

JR: The web of life?

DP: Yes. Burgess focused on one at a time, but related each to the other animals in that ecosystem.

JR: Well, I notice that along the way you spoke of the interconnectedness. Not just seeing one animal on its own, but the relationship between it and the surroundings. Was that a novel idea at that time?

DP: This interrelationship was a novel idea for most biologists.

*JR: Well, it's obviously difficult for many of the readers of The Social Contract who might not have been around in 1935, when you would have been reading the Burgess books, to know what was going on at that time. Darwin had released his *Origin of Species* in 1859.*

DP: Darwin, in a way, was a systematist, or a taxonomist, and collector. And what he did was carry biology a major step further. That is, he asked: what did all this collection of organisms that he was observing mean? That's when he put together his theory on natural selection, the relatedness of animals and plants. Linnaeus, in Sweden, was the first one to introduce the taxonomic system of binomial names in the 1700s.

JR: Well, it's interesting to me that the interrelated relationship of animals in your readings might have

*John F. Rohe is an attorney in Petoskey, Michigan. His most recent book is entitled *Mary Lou & John Tanton: A Journey into American Conservation*, FAIR Horizon Press, 2002.*

been one of the moving forces, one of the motivational criteria, that caused you to follow in this path.

DP: During the time of my graduate study at Cornell University (1948 to 1951) the U.S. was having a serious pollution problem with pesticides. In part, that was also a stimulus to me to become more concerned about the integrity of our environment and all of these interrelationships.

JR: We're a full ten years before Rachel Carson released her monumental work. What kind of information was out there?

DP: We were aware of this problem, but what she did in her book was to take all this information and to put it into perspective. Of course she was a beautiful writer. She put the information at a level so the general public could understand these pollution problems.

JR: You say that the information that she was banking on was already out there?

DP: Yes, I and others had already written some papers focusing on these problems.

JR: Can you tell me the approximate year and topic of those papers?

DP: I published some of my papers in 1949-1950, almost ten years before her book appeared.

JR: Do you remember the topics of the early articles?

DP: Yes. Some of them dealt with the pesticide resistance problem. Some of them dealt with ways and means of reducing the pesticide pollution problem. And some of them dealt with the impact of pesticides on beneficial organisms. One was on the ecology of insects.

JR: Did you have occasion to meet Rachel Carson in those early days?

DP: No, I never met her. When her book came out in 1962, it caused quite a controversy, especially among the pro-pesticide people. Incidentally, I am now president of the Rachel Carson Council.

JR: Is there a Rachel Carson Council website where The Social Contract readers could go?

DP: There is a website for the Council, it is <www.hometown.aol.com/rccouncil/ourpage/index.htm>.

JR: Now we've got a little gap here from 1951 to 1955.

DP: The Korean conflict started in 1950. The Air Force

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wanted me to fly jets in Korea. I was just graduating with my Ph.D. and I wasn't enthused about flying jets in Korea. I preferred to use my scientific training instead of my pilot training. I approached the U.S. Public Health Service, which is a commission corps, and I was able to have my commission transferred from the Air Force into the U.S. Public Health Service. I was sent to Puerto Rico to do research on the Indian

mongoose that had been introduced and had become a serious problem – particularly as a vector and reservoir of rabies. Another study was the ecology and control of schistosomiasis. This is a disease of humans caused by a small helminth in Puerto Rico.

JR: Once infected, it was pretty hopeless to try to reclaim a person's life. OK, so now, in 1955, you have completed your government service and you're starting the ecology curriculum at Cornell University along with adding further training to your background.

DP: I spent two winter quarters 1954-1955 at the University of Chicago as a postdoctoral investigator working with Professors T. Park and A. Emerson, two of the world's leading ecologists. Then, in 1961, I was awarded an OEDD Fellowship at Oxford University and studied under Charles Elton and Dennis Chitty – both outstanding ecologists.

JR: Did you craft that curriculum already in the early days?

DP: In 1957, I started the General Ecology course.

JR: And, how long did you teach that?

DP: For about seven or eight years.

JR: Now we're at Rachel Carson – at Silent Spring.

DP: Then I became chairman of the department of entomology and limnology, as it was called at that time, which is when I hired a faculty person to take over the course.

JR: Did you remain with the department of entomology then?

DP: I was with the department until 1969 when I resigned as chair, took a sabbatical, and went on the staff at the White House for a year. At that time, I also wrote a book on the ecological impacts of pesticides.

JR: Who was then in the White House?

DP: President Nixon. As you know, he started the Environmental Protection Agency.

JR: *You were just two years shy of the Rockefeller Report of 1972 on the U.S. population. I have a suspicion that discussions of that were already in the making while you were at the White House.*

DP: Yes, that too.

JR: *Are there any other things we would want to mention of the 1960s, before we move beyond 1970?*

DP: They were trying to ban DDT based on Rachel Carson's book, but it took another ten years after her

issue. At the same time I became Chair of the Board on Environmental Sciences in the National Academy of Sciences.

JR: *I assume you were back at Cornell.*

DP: Yes, but I did this work for Washington from Cornell University.

JR: *I'm seeing a trend. You started with animals, pesticides affecting small animals. Then you are in a transitional phase. In the early 1970s, through the NAS years, you are moving into population, global issues, the big picture, the bird's eye view, more of a global strategy, more than a strategy on somebody's cornfield.*

DP: The initial experience in the NAS prompted me to start another course that had never been taught at Cornell. It was called Environmental Policy. I started that in 1970. I took a small group of graduate students and seniors and we focused on a chosen important environmental problem. After a year's investigation, we published our report in *Science* or *Bioscience*. The very first study that we undertook with this new course focused on the energy used in agriculture. The paper was published in 1973 in *Science*, right at the peak of the energy crisis. We couldn't have timed it better.

JR: *Timing is everything.*

DP: It is. No question about it.

JR: *Clearly, today, from my out-of-the-way vantage in a remote part of the U.S., I see your name with great regularity, and you are unquestionably one of the leaders in thinking about the major issue of our day: people versus resources.*

DP: We're trying to save the world, and we're not doing a very good job at it.

JR: *What do some of your other papers address?*

DP: We've done studies on environmental and public health impact of pesticides attempting to get an economic as well as an environmental dimension of this problem. We've done more on energy. For example, what could we do to move into a renewable energy system? We have also looked at the environmental impact of energy uses, and what we could do about these problems. We have been on the soil erosion problem, and water problems in the U.S. and the world.

JR: *Well, I can't help but reflect on John Muir's comment that the more he looked out in nature, the more everything looked like it's hooked together.*

DP: It's sort of like those Burgess books I told you about. When I focus on soil, it relates to water, that relates to the population, that relates to energy use, and so forth. So

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book to ban DDT.

JR: *I presume you were pretty active in those battles.*

DP: Yes I was, giving testimony and so forth.

JR: *How would you characterize the forces that were lined up against you there?*

DP: Industry in particular fought very strongly to prevent the banning of DDT and chlorinated insecticides. So it was a tough battle.

JR: *Now, probably somewhere after 1970, you started to get more involved in looking at global links – people versus resources – the big picture – freight train momentum.*

DP: That's right. I was on several National Academy of Sciences committees. We were looking at what were going to be the primary research problems in agriculture twenty-five years into the future. I was also part of another investigation that focused on population and food production.

JR: *And what years were these?*

DP: Well, the one on looking to the future of agriculture was late 1968. But the one on population was about 1970-1972. There were some others that related to this

even though we focused on any one of these resources, each time we related it back to the total system.

JR: O.K. so where are we today?

DP: Today, we have become interested in the issue of invasive species. (Incidentally the report the students and I wrote was published in the year 2000 in *Bioscience*.)

JR: Any papers this year?

DP: The paper we have this year is on energy conservation and technology.

JR: And, when you say students, are these undergraduates?

DP: Graduate students, seniors.

JR: Do you have any expectations of where that might be published?

DP: We are tentatively planning to send it to the new journal called *Environmental Development and Sustainability*.

JR: We have read your works and we capture a glimpse of ourselves barreling onward like a freight train building momentum. There's a cliff down there and a few people are trying to apply the brakes. Where do you see this population freight train going?

DP: It is very disturbing when you ask that particular question because there is an enormous momentum built into world population numbers. This is illustrated by the fact that if the world population agreed to just two children per couple, which is zero population growth, and you asked how long would it take for the world's population to stabilize – population would continue to increase for about 70 years before stabilizing. World population would increase from approximately 6 billion today to approximately 12 billion before the population stabilized. As you know, China was trying to implement a policy of one child per family. Had they been 100 percent effective with one child per couple, they would have added a population slightly less than the U.S. population in 25 years – even with one child per couple. But again, it's the young age structure that is resulting in their rapid population increase.

JR: People have to move beyond their childbearing years before population actually starts to level out.

DP: Yes, and we have other problems. The World Health Organization reports we have more than 3 billion people who are malnourished – half of the world population. This malnutrition makes people more susceptible to AIDS, TB, malaria, and other diseases. So we have diseases on an increase worldwide due to malnourishment, we have per capita food production declining. Per capita food production has been declining

for the last 18 years despite biotechnology and all the other agricultural technologies we have available. We know we are losing valuable crop land due to soil erosion. We know that water, which is essential for agricultural production, is decreasing per capita. Then, we know that energy is crucial for food production. The U.S. has already pumped out more than 80 percent of our oil underground. We are now importing 61 percent and it is projected to go to 90 percent imports in the next 15 years.

JR: Is this going to turn around? Do you see any forces out there that would enable it to turn around? Do we just give up, go home, get drunk, throw a party, and be done with it?

DP: Earlier, in our previous papers, we used to say that if humans do not control their numbers, nature is going to do it for us. And now, we actually have clear evidence that nature is starting to do it for us. More than one-half the world population is malnourished – malaria, TB, AIDS, and other diseases are increasing. Nature is starting to control our numbers.

JR: Have you conceived any formula for what we would do if we are to make a move to take control and wrest this away from nature, and try to make some of the decisions for ourselves? What do you see as some of the moving forces to make this transition?

DP: I would like to see us do something about the population question. In the U.S., for example, I believe we need a moratorium on immigration until we decide what standard of living, what resources are available – fresh water, crop land, and land needed for renewable energy. I believe we ought to look at all these resources and where the U.S. population wants to go in the future.

JR: Do you have a sense for what the optimum U.S. population would be?

DP: Yes, we suggested about 200 million. Of course, the U.S. now has nearly 300 million.

JR: Yes, and how about globally?

DP: Globally, we suggested 2 billion, and of course, the world population is already at 6.2 billion.

JR: And, you say if we now go to ZPG, it will be at 12 billion.

DP: Yes, that's right, even with two children per couple, it would take 70 years for the world population to stabilize and by then our population would reach 12 billion.

JR: So when we see studies that project a plateauing out of 9 to 12 billion, there's a strong assumption there that the fertility rate would be at subreplacement fertility level.

DP: It has to be. For example, the UN says that by 2050 we would have 9 billion people. But, they never stated what would cause the die off to reach that 9 billion. Would they advocate zero children, or something like that? They never say what would achieve this 9 billion.

JR: *If you were to write a succinct message for the world, here, today, a succinct message, what would you say?*

DP: Two things. Number one, we ought to protect and conserve the vital resources that provide us with our food, such as crop land and fresh water, energy, and biological resources. Second, we have to stop population growth.

JR: *There are a number of places, like Italy, that have been at well below replacement level fertility for decades.*

DP: Yes, but they have a young age distribution. So they really haven't stopped increasing their population. That is true for most of Europe. Italy and the rest of Europe are severely overpopulated.

JR: *Well, fertility has a bearing on the dependency ratio between workers and retirees.*

DP: Yes, but they are overpopulated. They have to import resources primarily from developing countries which don't have adequate resources either. And so, if they could start not only reducing their reproductive rate, but also reducing their population, it would be of great benefit to them and to the world.

JR: *Now when you say we should bring down our fertility, would you send that same message to the seventy nations that are already below replacement level fertility, or does your message apply to others?*

DP: They not only have to achieve a low fertility, but they have to slowly change their age structure, because it's age structure that is the important dimension to population growth. China, Mexico, and even Europe have young age distributions.

JR: *And what do you tell a nation that has a different age structure, where you have the elderly and few young people?*

DP: As I also said in our paper, the social and economic problems of an aging population are still significantly less than the social and economic problems of a rapidly growing population.

JR: *Does your message on how many children to have then shift from one country to the next, depending on fertility, age distribution, and those factors?*

DP: Yes, each nation must take into account the fertility

related to the age structure of their population. And, of course, they have to take into account what resources are available and what standard of living the nation desires.

JR: *You've been very generous with your time, Doctor.*

DP: Well, I enjoyed talking to you. •

David Pimentel

Education

1945-1948	Univ. of Massachusetts, Amherst, B.S.
1948-1951	Cornell Univ., Ithaca, NY, Ph.D.
1961	Oxford Univ., England, (OEEC Fellow)
1961	Massachusetts Institute of Technology Cambridge, NSF Computer Scholar

Positions

1951-1955	Chief, Tropical Research Laboratory, U.S. Public Health Service, San Juan, Puerto Rico
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Rico

1955-1960	Assistant Professor of Insect Ecology, Department of Entomology, Cornell University
1960-1963	Associate Professor of Insect Ecology
1963-1969	Professor and Head of Department, Entomology and Limnology, Cornell University
1969-	Professor of Insect Ecology and Agricultural Sciences, Department of Entomology and Section of Ecology and Systematics, Cornell

Dr. Pimentel's honors include many invitations to give lectures and keynote addresses throughout the world at prestigious conferences related to agricultural ecology, pesticides, genetics, and population growth.

He has chaired various panels and commissions in relation to pesticides, pollution, energy, ecological economics, genetics, and food supply. He serves as a member of the National Board of Directors of Carrying Capacity Network, of the National Audubon Society, and of the American Institute of Biological Sciences. He is a member of the International Advisory Committee, 2020 Vision for Food Agriculture, and the Environment of the International Food Policy Research Institute.

Dr. Pimentel has contributed hundreds of articles on these topics to various books and scientific journals. He has served as editor for such books as *The Pesticide Question: Environment, Economics, and Conservation*; *Techniques for Reducing Pesticide Use: Environmental and Economic Benefits*; *Some Aspects of Integrated*