Chapter 2

Tools for Research …

your taxes at work

Project X, a popular film released in 1987, gave many Americans their first glimpse into animal experiments carried out by their own armed forces. The film's plot centers on an air force experiment designed to see whether chimpanzees could continue to "fly" a simulated plane after being exposed to radiation. A young air force cadet assigned to duty in the laboratory becomes attached to one particular chimpanzee, with whom he can communicate in sign language. When this chimpanzee's turn for exposure to radiation comes, the young man (with the assistance of his attractive girlfriend, naturally) determines to liberate the chimpanzees.

The plot was fiction, but the experiments were not. They were based on experiments that have been conducted over many years at Brooks Air Force Base, in Texas, and variations of which are continuing. But filmgoers did not get the whole story. What happened to the chimpanzees in the film was very much a softened version of what really happens. So we should consider the experiments themselves, as described in documents issued by Brooks Air Force Base.

As indicated in the film, the experiments involve a kind of flight simulator. The device is known as a Primate Equilibrium Platform, or PEP. It consists of a platform that can be made to pitch and roll like an airplane. The monkeys sit in a chair that is part of the platform. In front of them is a

control stick, by means of which the platform can be returned to a horizontal position. Once monkeys have been trained to do this, they are subjected to radiation and to chemical warfare agents, to see how these affect their ability to fly. (A photograph of the Primate Equilibrium Platform appears following page 157.)

The standard training procedure for the PEP is described in a Brooks Air Force Base publication entitled "Training Procedure for Primate Equilibrium Platform."[1] The following is a summary:

Phase I (chair adaptation): The monkeys are "restrained" (in other words, tied down) in the PEP chair for one hour per day for five days, until they sit quietly.

Phase II (stick adaptation): The monkeys are restrained in the PEP chair. The chair is then tipped forward and the monkeys are given electric shocks. This causes the monkey to "turn in the chair or bite the platform.… This behavior is redirected toward the [experimenter's] gloved hand which is placed directly over the control stick." Touching the hand results in the shock being stopped, and the monkey (who has not been fed that day) is given a raisin. This happens to each monkey one hundred times a day for between five and eight days.

Phase III (stick manipulation): This time when the PEP is tipped forward, merely touching the stick is not enough to stop the electric shock. The monkeys continue to receive electric shocks until they pull the stick back. This is repeated one hundred times per day.

Phases IV–VI (push stick forward and pull stick back): In these phases the PEP is tipped back and the monkeys are shocked until they push the stick forward. Then the PEP is again tilted forward, and they must again learn to pull the stick back. This is repeated one hundred times per day. Then the platform switches randomly between backward and forward and the monkeys are again shocked until they make the appropriate response.

Phase VII (control stick operational): Up to this point, although the monkeys have been pulling the control stick backward and forward, it has not affected the position of the platform. Now the monkey controls the position of the platform by pulling the stick. In this phase the automatic shocker does not function. Shocks are manually given at approximately every three or four seconds for a 0.5 second duration. This is a slower rate than previously, to ensure that correct behavior is not punished and therefore, to use the jargon of the manual, "extinguished." If the monkey does stop performing as desired, the training returns to phase VI. Otherwise, training continues in this phase until the monkey can maintain the platform at a nearly horizontal level and avoid 80 percent of the shocks given.
The time taken for training the monkeys in phases III through VII is ten to twelve days.

After this period, training continues for another twenty days. During this further period a randomizing device is used to make the chair pitch and roll more violently, but the monkey must maintain the same level of performance in returning the chair to the horizontal or else receive frequent electric shocks.

All this training, involving thousands of electric shocks, is only preliminary to the real experiment. Once the monkeys are regularly keeping the platform horizontal most of the time, they are exposed to lethal or sublethal doses of radiation or to chemical warfare agents, to see how long they can continue to "fly" the platform. Thus, nauseous and probably vomiting from a fatal dose of radiation, they are forced to try to keep the platform horizontal, and if they fail they receive frequent electric shocks. Here is one example, taken from a United States Air Force School of Aerospace Medicine report published in October 1987—after *Project X* had been released.[2]

The report is entitled "Primate Equilibrium Performance Following Soman Exposure: Effects of Repeated Daily Exposures to Low Soman Doses." Soman is another name for nerve gas, a chemical warfare agent that caused terrible agony to troops in the First World War, but fortunately has been very little used in warfare since then. The report begins by referring to several previous reports in which the same team of investigators studied the effects of "acute exposure to soman" on performance in the Primate Equilibrium Platform. This particular study, however, is on the effect of low doses received over several days. The monkeys in this experiment had been operating the platform "at least weekly" for a minimum of two years and had received various drugs and low doses of soman before, but not within the previous six weeks.

The experimenters calculated the doses of soman that would be sufficient to reduce the monkeys' ability to operate the platform. For the calculation to be made, of course, the monkeys would have been receiving electric shocks because

of their inability to keep the platform level. Although the report is mostly concerned with the effect of the nerve poison on the performance level of the monkeys, it does give some insight into other effects of chemical weapons:

The subject was completely incapacitated on the day following the last exposure, displaying neurological symptoms including gross incoordination, weakness, and intention tremor … These symptoms persisted for several days, during which the animal remained unable to perform the PEP task.[3]

Dr. Donald Barnes was for several years principal investigator at the U.S. Air Force School of Aerospace Medicine, and in charge of the experiments with the Primate Equilibrium Platform at Brooks Air Force Base. Barnes estimates that he irradiated about one thousand trained monkeys during his years in this position. Subsequently he has written:

For some years, I had entertained suspicions about the utility of the data we were gathering. I made a few token attempts to ascertain both the destination and the purpose of the technical reports we published but now acknowledge my eagerness to accept assurances from those in command that we were, in fact, providing a real service to the U.S. Air Force and, hence, to the defense of the free world. I used those as surances as blinkers to avoid the reality of what I saw in the field, and even though I did not always wear them comfortably, they did serve to protect me from the insecurities asso ciated with the potential loss of status and income.…

And then, one day, the blinkers slipped off, and I found myself in a very serious confrontation with Dr. Roy DeHart, Commander, U.S. Air Force School of Aerospace Medicine. I tried to point out that, given a nuclear confrontation, it is highly unlikely that operational commanders will go to charts and figures based upon data from the rhesus monkey to gain estimates of probable force strength or second strike capability. Dr. DeHart insisted that the data will be invaluable, asserting, "They don't know the data are based on animal studies."[4]

Barnes resigned and has become a strong opponent of animal experimentation; but experiments using the Primate Equilibrium Platform have continued.

Project X lifted the veil on one kind of experiment conducted by the military. We have now examined that in a little detail, although
it would take a long time to describe all the forms of radiation and chemical warfare agents tested, in varying doses, on monkeys in the Primate Equilibrium Platform. What we now need to grasp is that this is just one very small part of the total amount of military experimentation on animals. Concern about this experimentation goes back several years.

In July 1973 Representative Les Aspin of Wisconsin learned through an advertisement in an obscure newspaper that the United States Air Force was planning to purchase two hundred beagle puppies, with vocal cords tied to prevent normal barking, for tests of poisonous gases. Shortly afterward it became known that the army was also proposing to use beagles—four hundred this time—in similar tests.

Aspin began a vigorous protest, supported by antivivisection societies. Advertisements were placed in major newspapers across the country. Letters from an outraged public began pouring in. An aide from the House of Representatives Armed Services Committee said that the committee had received more mail on the beagles than it had received on any other subject since Truman sacked General MacArthur, while an internal Department of Defense memo released by Aspin said that the volume of mail the department had received was the greatest ever for any single event, surpassing even the mail on the bombings of North Vietnam and Cambodia.[5] After defending the experiments initially, the Defense Department then announced that it was postponing them and looking into the possibility of replacing the beagles with other experimental animals.

All this amounted to a curious incident—curious because the public furor over this particular experiment implied a remarkable ignorance of the nature of standard experiments performed by the armed services, research establishments, universities, and commercial firms of many different kinds. True, the proposed air force and army experiments were designed so that many animals would suffer and die without any certainty that this suffering and death would save a single human life or benefit humans in any way at all; but the same can be said of millions of other experiments performed each year in the United States alone. Perhaps the concern arose because the experiments were to be done on beagles. But if so, why has there been no protest at the following experiment, conducted more recently:

Under the direction of the U.S. Army Medical Bioengineering Research and Development Laboratory at Fort Detrick, in

Frederick, Maryland, researchers fed 60 beagle dogs varied doses of the explosive TNT. The dogs were given the TNT in capsules every day for six months. Symptoms observed included dehydration, emaciation, anemia, jaundice, low body temperature, discolored urine and feces, diarrhea, loss of appetite and weight loss, enlarged livers, kidneys and spleen, and the beagles became uncoordinated. One female was "found to be moribund [dying]" during week 14 and was killed; another was found dead during week 16. The report states that the experiment represents "a portion" of the data which the Fort Detrick laboratory is developing on the effects of TNT on mammals. Because injuries were observed even at the lowest doses, the study failed to establish the level at which TNT had no observable effects; thus, the report concludes "additional studies … of TNT in beagle dogs may be warranted."[6]

In any case, it is wrong to limit our concern to dogs. People tend to care about dogs because they generally have more experience with dogs as companions; but other animals are as capable of suffering as dogs are. Few people feel sympathy for rats. Yet rats are intelligent animals, and there can be no doubt that rats are capable of suffering and do suffer from the countless painful experiments performed on them. If the army were to stop experimenting on dogs and switch to rats instead, we should not be any less concerned.

Some of the worst military experiments are carried out at a place known as AFRRI—the Armed Forces Radiobiology Research Institute, in Bethesda, Maryland. Here, instead of using a Primate Equilibrium Platform, experimenters have tied animals down in chairs and irradiated them or have trained them to press levers and observed the effects of

irradiation on their performance. They have also trained monkeys to run in an "activity wheel," which is a kind of cylindrical treadmill. (See photograph following page 157.) The monkeys receive electric shocks unless they keep the wheel moving at speeds above one mile per hour.

In one experiment using the primate activity wheel, Carol Franz of the behavioral sciences department at AFRRI trained thirty-nine monkeys for nine weeks, two hours per day, until they could alternate "work" and "rest" periods for six continuous hours. They were then subjected to varying doses of radiation. Monkeys receiving the higher doses vomited up to seven times. They were then put back into the activity wheel to measure the effect of the radiation on their ability to "work." During this period, if a monkey did not move the wheel for one minute, "shock intensity was increased to 10 mA." (This is an extremely intense electric shock, even by the quite excessive standards of American animal experimentation; it must cause very severe pain.) Some monkeys continued to vomit while in the activity wheel. Franz reports the effect that the various doses of radiation had on performance. The report also indicates that the irradiated monkeys took between a day and a half and five days to die.[7]

Since I do not wish to spend this entire chapter describing experiments conducted by the United States armed forces, I shall turn now to nonmilitary experimentation (although we shall, in passing, examine one or two other military experiments where they are relevant to other topics). Meanwhile, I hope that United States taxpayers, whatever they think the size of the military budget should be, will ask themselves: Is this what I want the armed forces to be doing with my taxes?

We should not, of course, judge all animal experimentation by the experiments I have just described. The armed services, one might think, are hardened to suffering by their concentration on war, death, and injury. Genuine scientific research, surely, will be very different, won't it? We shall see. To begin our examination of nonmilitary scientific research, I shall allow Professor Harry F. Harlow to speak for himself. Professor Harlow, who worked at the Primate Research Center in Madison, Wisconsin, was for many years editor of a leading psychology journal, and until his death a few years ago was held in high esteem by his colleagues in psychological research. His work has been cited approvingly in many basic textbooks of psychology, read by millions of students taking introductory psychology courses over the last twenty years. The line of research he began has been continued after his death by his associates and former students.

In a 1965 paper, Harlow describes his work as follows:

For the past ten years we have studied the effects of partial social isolation by raising monkeys from birth onwards in bare wire cages.… These monkeys suffer total maternal deprivation More recently we have initiated a series of stud ies on the effects of total social isolation by rearing monkeys from a few hours after birth until 3, 6, or 12 months of age in [a] stainless steel chamber. During the prescribed sentence in this apparatus the monkey has no contact with any animal, human or sub-human.

These studies, Harlow continues, found that

sufficiently severe and enduring early isolation reduces these animals to a social-emotional level in which the primary social responsiveness is fear.[8]

In another article Harlow and his former student and associate Stephen Suomi described how they were trying to induce psychopathology in infant monkeys by a technique that appeared not to be working. They were then visited by John Bowlby, a British psychiatrist. According to Harlow's account, Bowlby listened to the story of their troubles and then toured the Wisconsin laboratory. After he had seen the monkeys individually housed in bare wire cages he asked, "Why are you trying to produce psychopathology in monkeys? You already have more psychopathological monkeys in the laboratory than have ever been seen on the face of the earth."[9]

Bowlby, incidentally, was a leading researcher on the consequences of maternal deprivation, but his research was conducted with children, primarily war orphans, refugees, and institutionalized children. As far back as 1951, before Harlow even began his research on nonhuman primates, Bowlby concluded:

The evidence has been reviewed. It is submitted that evidence is now such that it leaves no room for doubt regarding the general proposition that the prolonged deprivation of the young child of maternal care may have grave and far-reaching effects on his character and so on the whole of his future life.[10]

This did not deter Harlow and his colleagues from devising and carrying out their monkey experiments.

In the same article in which they tell of Bowlby's visit, Harlow and Suomi describe how they had the "fascinating idea" of inducing depression by "allowing baby monkeys to attach to cloth surrogate mothers who could become monsters":

The first of these monsters was a cloth monkey mother who, upon schedule or demand, would eject high-pressure compressed air. It would blow the animal's skin practically off its body. What did the baby monkey do? It simply clung tighter and tighter to the mother, because a frightened infant clings to its mother at all costs. We did not achieve any psychopathology.

However, we did not give up. We built another surrogate monster mother that would rock so violently that the baby's head and teeth would rattle. All the baby did was cling tighter and tighter to the surrogate. The third monster we built had an embedded wire frame within its body which would spring forward and eject the infant from its ventral surface. The infant would subsequently pick itself off the floor, wait for the frame to return into the cloth body, and then cling again to the surrogate. Finally, we built our porcupine mother. On command, this mother would eject sharp brass spikes over all of the ventral surface of its body. Although the infants were distressed by these pointed rebuffs, they simply waited until the spikes receded and then returned and clung to the mother.

These results, the experimenters remark, were not so surprising, since the only recourse of an injured child is to cling to its mother.

Eventually, Harlow and Suomi gave up on the artificial monster mothers because they found something better: a real monkey mother who was a monster. To produce such mothers, they reared female monkeys in isolation, and then tried to make them pregnant. Unfortunately the females did not have normal sexual relations with male monkeys, so they had to be made pregnant by a technique that Harlow and Suomi refer to as a "rape rack." When the babies were born the experimenters observed the monkeys. They found that some simply ignored the infants, failing to cuddle the crying baby to the breast as normal monkeys do when
they hear their baby cry. The other pattern of behavior observed was different:

The other monkeys were brutal or lethal. One of their favorite tricks was to crush the infant's skull with their teeth. But the really sickening behavior pattern was that of smashing the infant's face to the floor, and then rubbing it back and forth.[11]

In a 1972 paper, Harlow and Suomi say that because depression in humans has been characterized as embodying a state of "helplessness and hopelessness, sunken in a well of despair," they designed a device "on an intuitive basis" to reproduce such a "well of despair" both physically and psychologically. They built a vertical chamber with stainless steel sides sloping inward to form a rounded bottom and placed a young monkey in it for periods of up to forty-five days. They found that after a few days of this confinement the monkeys "spend most of their time huddled in a corner of the chamber." The confinement produced "severe and persistent psychopathological behavior of a depressive nature." Even nine months after release the monkeys would sit clasping their arms around their bodies instead of moving around and

exploring their surroundings as normal monkeys do. But the report ends inconclusively and ominously:

Whether [the results] can be traced specifically to variables such as chamber shape, chamber size, duration of confinement, age at time of confinement or, more likely, to a combination of these and other variables remains the subject of further research.[12]

Another paper explains how, in addition to the "well of despair," Harlow and his colleagues created a "tunnel of terror" to produce terrified monkeys,[13] and in yet another report Harlow describes how he was able "to induce psychological death in rhesus monkeys" by providing them with terry cloth-covered "mother surrogates" that were normally kept at a temperature of 99 degrees Fahrenheit, but could be rapidly chilled to 35 degrees Fahrenheit to simulate a kind of maternal rejection.[14]

Harlow is now dead, but his students and admirers have spread across the United States and continue to perform experiments
in a similar vein. John P. Capitanio, under the direction of one of Harlow's students, W. A. Mason, has conducted deprivation experiments at the California Primate Research Center at the University of California, Davis. In these experiments, Capitanio compared the social behavior of rhesus monkeys "reared" by a dog with that of monkeys "reared" by a plastic hobbyhorse. He concluded that "although members of both groups were clearly abnormal in the extent of their social interactions," the monkeys who had been kept with the dog coped better than those kept with the plastic toy.[15]

After leaving Wisconsin, Gene Sackett continued deprivation studies at the University of Washington Primate Center. Sackett has raised rhesus monkeys, pigtail macaques, and crab-eating macaques in total isolation to study the differences in personal behavior, social behavior, and exploration behavior. He found differences among the different monkey species which "question the generality of the 'isolation syndrome' across primate species." If there are differences even among closely related species of monkeys, generalization from monkeys to humans must be far more questionable.[16]

Martin Reite of the University of Colorado conducted deprivation experiments on bonnet monkeys and pigtailed macaques. He was aware that Jane Goodall's observations of orphaned wild chimpanzees described "profound behavioral disturbances, with sadness or depressive affective changes as major components." But because "in comparison with monkey studies, relatively little has been published on experimental separations in great apes," he and other experimenters decided to study seven infant chimpanzees who had been separated from their mothers at birth and reared in a nursery environment. After periods ranging between seven and ten months, some of the infants were placed in isolation chambers for five days. The isolated infants screamed, rocked, and threw themselves at the walls of the chamber. Reite concluded that "isolation in infant chimpanzees may be accompanied by marked behavioral changes" but noted that (you guessed it) more research was needed.[17]

Since Harlow began his maternal deprivation experiments some thirty years ago, over 250 such experiments have been

conducted in the United States. These experiments subjected over seven thousand animals to procedures that induced distress, despair,
anxiety, general psychological devastation, and death. As some of the preceding quotations show, research now feeds off itself. Reite and his colleagues experimented on chimpanzees because relatively little experimental work had been done on the great apes, as compared with monkeys. They apparently felt no need to address the basic question of why we should be doing any experiments on maternal deprivation in animals at all. They did not even try to justify their experiments by claiming they were of benefit to human beings. That we already have extensive observations of orphaned chimpanzees in the wild seems not to have been of interest to them. Their attitude was plain: this has been done with animals of one species, but not with animals of another, so let's do it to them. The same attitude recurs constantly throughout the psychological and behavioral sciences. The most amazing part of the story is that taxpayers have paid for all this research—to the tune of over $58 million for maternal deprivation research alone.[18] In this respect, but not only in this respect, animal experimentation in civilian life is not so different from military experimentation.

The practice of experimenting on nonhuman animals as it exists today throughout the world reveals the consequences of speciesism. Many experiments inflict severe pain without the remotest prospect of significant benefits for human beings or any other animals. Such experiments are not isolated instances, but part of a major industry. In Britain, where experimenters are required to report the number of "scientific procedures" performed on animals, official government figures show that 3.5 million scientific procedures were

performed on animals in 1988.[19] In the United States there are no figures of comparable accuracy. Under the Animal Welfare Act, the U.S. secretary of agriculture publishes a report listing the number of animals used by facilities registered with it, but this is incomplete in many ways. It does not include rats, mice, birds, reptiles, frogs, or domestic farm animals used for experimental purposes; it does not include animals used in secondary schools; and it does not include experiments performed by facilities that do not transport animals interstate or receive grants or contracts from the federal government.

In 1986 the U.S. Congress Office of Technology Assessment (OTA) published a report entitled "Alternatives to Animal Use in Research, Testing and Education." The OTA researchers attempted
to determine the number of animals used in experimentation in the U.S. and reported that "estimates of the animals used in the United States each year range from 10 million to upwards of 100 million." They concluded that the estimates were unreliable but their best guess was "at least 17 million to 22 million."[20]

This is an extremely conservative estimate. In testimony before Congress in 1966, the Laboratory Animal Breeders Association estimated that the number of mice, rats, guinea pigs, hamsters, and rabbits used for experimental purposes in 1965 was around 60 million.[21] In 1984 Dr. Andrew Rowan of Tufts University School of Veterinary Medicine estimated that approximately 71 million animals are used each year. In 1985 Rowan revised his estimates to distinguish between the number of animals produced, acquired, and actually used. This yielded an estimate of between 25 and 35 million

animals used in experiments each year.[22] (This figure omits animals who die in shipping or are killed before the experiment begins.) A stock market analysis of just one major supplier of animals to laboratories, the Charles River Breeding Laboratory, stated that this company alone produced 22 million laboratory animals annually.[23]

The 1988 report issued by the Department of Agriculture listed 140,471 dogs, 42,271 cats, 51,641 primates, 431,457 guinea pigs, 331,945 hamsters, 459,254 rabbits, and 178,249 "wild animals": a total of 1,635,288 used in experimentation. Remember that this report does not bother to count rats and mice, and covers at most an estimated 10 percent of the total number of animals used. Of the nearly 1.6 million animals reported by the Department of Agriculture to have been used for experimental purposes, over 90,000 are reported to have experienced "unrelieved pain or distress." Again, this is probably at most 10 percent of the total number of animals suffering unrelieved pain and distress—and if experimenters are less concerned about causing unrelieved pain to rats and mice than they are to dogs, cats, and primates, it could be an even smaller proportion.

Other developed nations all use large numbers of animals. In Japan, for example, a very incomplete survey published in 1988 produced a total in excess of eight million.[24]

One way of grasping the nature of animal experimentation as a large-scale industry is to look at the commercial products to which it gives rise and the way in which they are sold. Among
these "products" are, of course, the animals themselves. We have seen how many animals Charles River Breeding

Laboratories produces. In journals like *Lab Animal*, animals are advertised as if they were cars. Beneath a photograph of two guinea pigs, one normal and one completely hairless, the advertising copy says:

When it comes to guinea pigs, now you have a choice. You can opt for our standard model that comes complete with hair. Or try our new 1988 stripped down, hairless model for speed and efficiency.

Our euthymic, hairless guinea pigs are the product of years of breeding. They can be used for dermatologic studies for hair producing agents. Skin sensitization. Transdermal therapy. Ultraviolet studies. And more.

An advertisement for Charles River in *Endocrinology* (June 1985) asked:

"You want to see our operation?"

When it comes to operations, we give you just what the doctor ordered. Hypophysectomies, adrenalectomies, castrations, thymectomies, ovariectomies and thyroidectomies. We perform thousands of "endocrinectomies" every month on rats, mice or hamsters. Plus additional special surgery (spleenectomy, nephrectomy, cecetomy) on request.… For surgically altered research animals to fit your very specific research animals needs, call [phone number]. Our operators are available almost any time.

In addition to the animals themselves, animal experiments have created a market for specialized equipment. *Nature*, a leading British scientific journal, carries a section called

"New on the Market," which recently informed its readers about a new piece of research equipment:

The latest animal research tool from Columbus Instruments is an air-tight animal treadmill for the collection of oxygen consumption data during exercise. The treadmill has isolated running lanes with separate electrical shock stimuli which can be configured for up to four rats or mice.… The basic £9,737 system includes a belt speed controller and an adjustable voltage shocker. The £13,487 fully automatic system can be programmed to run consecutive experiments with rest periods in between, and automatically monitors the number of trips to the shocker grid, time spent running, and time spent on the shocker grid.[25]

Columbus Instruments make several other ingenious devices. In *Lab Animal* it advertises:

The Columbus Instruments Convulsion Meter makes possible objective and quantitative measurements of animal convulsions. A sensor precision platform load cell converts the vertical components of convulsion force into proportional electrical signals.… The user must observe the animal's behavior and activate the meter by a push-button switch when a convulsion is noticed. At the end of the experiment the totalized force and the totalized, time of the convulsions will be obtained.

Then there is *The Whole Rat Catalog*. Published by Harvard Bioscience, it consists of 140 pages of equipment for use in experimenting on small animals, all written in cute advertising jargon. Of the transparent plastic rabbit restrainers, for instance, the catalog tells us: "The only thing

that wiggles is the nose!" Sometimes, however, a little sensitivity to the controversial nature of the subject is shown: the description of the Rodent Carrying Case suggests, "Use this unobtrusive case to carry your favorite animal from one place to another without attracting attention." In addition to the usual cages, electrodes, surgical implements, and syringes, the catalog advertises Rodent Restraint Cones, Harvard Swivel-Tether Systems, Radiation Resistant Gloves, Implantable FM Telemetry Equipment, Liquid Diets for Rats and Mice in Alcohol Studies, Decapitators for both small and large animals, and even a Rodent Emulsifier which "will quickly reduce the remains of a small animal to a homogenous suspension."[26]

Presumably corporations would not bother to manufacture and advertise such equipment unless they expected considerable sales. And the items are not going to be bought unless they are going to be used.

Among the tens of millions of experiments performed, only a few can possibly be regarded as contributing to important medical research. Huge numbers of animals are used in university departments such as forestry and psychology; many more are used for commercial purposes, to test new cosmetics, shampoos, food coloring agents, and other inessential items. All this can happen only because of our prejudice against taking seriously the suffering of a being who is not a member of our own species. Typically, defenders of experiments on animals do not deny that animals suffer. They cannot deny the animals' suffering, because they need to stress the similarities between humans and other animals in order to claim that their experiments may have some relevance for human purposes. The experimenter who forces

rats to choose between starvation and electric shock to see if they develop ulcers (which they do) does so because the rat has a nervous system very similar to a human being's, and presumably feels an electric shock in a similar way.

There has been opposition to experimenting on animals for a long time. This opposition has made little headway because experimenters, backed by commercial firms that profit by supplying laboratory animals and equipment, have been able to convince legislators and the public that opposition comes from uninformed fanatics who consider the interests of animals more important than the interests of human beings. But to be opposed to what is going on now it is not necessary to insist that all animal experiments stop immediately. All we need to say is that experiments serving no direct and urgent purpose should stop immediately, and in the remaining fields of research, we should, whenever possible, seek to replace experiments that involve animals with alternative methods that do not.

To understand why this seemingly modest change would be so important we need to know more about the experiments that are now being performed and have been performed for a century. Then we will be able to assess the claim by defenders of the present situation that experiments on animals are done only for important purposes. The following pages, therefore, describe some experiments on animals. Reading the reports of these experiments is not a pleasant experience; but we have an obligation to inform ourselves about what is done in our own community, especially since we are paying, through our taxes, for most of this
research. If the animals have to undergo these experiments, the least we can do is read the reports and inform ourselves

about them. That is why I have not attempted to tone down or gloss over some of the things that are done to animals. At the same time I have not tried to make these things worse than they really are. The reports that follow are all drawn from accounts written by the experimenters themselves and published by them in the scientific journals in which experimenters communicate with one another.

Such accounts are inevitably more favorable to the experimenters than reports by an outside observer would be. There are two reasons for this. One is that the experimenters will not emphasize the suffering they have inflicted unless it is necessary to do so in order to communicate the results of the experiment, and this is rarely the case. Most suffering therefore goes unreported. Experimenters may consider it unnecessary to include in their reports any mention of what happens when electric shock devices are left on when they should have been turned off, when animals recover consciousness in the midst of an operation because of an improperly administered anesthetic, or when unattended animals sicken and die over the weekend. The second reason scientific journals are a source favorable to experimenters is that they include only those experiments that the experimenters and editors of the journals consider significant. A British government committee found that only about one quarter of experiments on animals ever found their way into print.[27] There is no reason to believe that accounts of a higher proportion of experiments are published in the United States; indeed since the proportion of minor colleges with researchers of lesser talents is much higher in the United States than in Britain, it seems probable that an even smaller proportion of experiments yield results of any significance at all.

So in reading the following pages bear in mind that they are drawn from sources favorable to the experimenters; and if the results of the experiments do not appear to be of sufficient importance to justify the suffering they caused, remember that these examples are all taken from the small fraction of experiments that editors considered significant enough to publish. One last warning. The reports published in the journals always appear under the names of the experimenters. I have generally retained
these names, since I see no reason to protect experimenters behind a cloak of anonymity. Nevertheless, it should not be assumed that the people named are especially evil or cruel people. They are doing what they were trained to do and what thousands of their colleagues do. The experiments are intended to illustrate not sadism on the part of individual experimenters but the institutionalized mentality of speciesism that makes it possible for these experimenters to do these things without serious consideration of the interests of the animals they are using.

Many of the most painful experiments are performed in the field of psychology. To give some idea of the numbers of animals experimented on in psychology laboratories, consider that during 1986 the National Institute of Mental Health funded 350 experiments on animals. The NIMH is just one source of federal funding for psychological experimentation. The agency spent over $11 million on experiments that involved direct manipulation of the brain, over $5 million on experiments that studied the effects drugs have on behavior, almost $3 million on learning and memory experiments, and over $2 million on experiments involving sleep deprivation, stress, fear, and anxiety. This government agency spent more than $30 million dollars on animal experiments in one year.[28]

One of the most common ways of experimenting in the field of psychology is to apply electric shocks to animals. This may be done with the aim of finding out how animals react to various kinds of punishment or to train animals to perform different tasks. In the first edition of this book I described experiments conducted in the late Sixties and early Seventies in which experimenters gave electric shocks to animals. Here is just one example from that period:

O. S. Ray and R. J. Barrett, working in the psychology research unit of the Veterans Administration Hospital, Pittsburgh, gave electric shocks to the feet of 1,042 mice. They then caused convulsions by giving more intense shocks through cup-shaped electrodes applied to the animals' eyes or through clips attached to their ears. They reported that unfortunately some of the mice
who "successfully completed Day One training were found sick or dead prior to testing on Day Two."[29]

Now, nearly twenty years later, as I write the second edition of this book, experimenters are still dreaming up trifling new variations to try out on animals: W. A. Hillex and M. R. Denny of the University of California at San Diego placed rats in a maze and gave them electric shocks if, after one incorrect choice, on their next trial they failed to choose which way to go within three seconds. They concluded that the "results are clearly reminiscent of the early work on fixation and regression in the rat, in which the animals were typically shocked in the stem of the T-maze just preceding the choice point.…" (In other words, giving the rats electric shocks at the point in the maze at which they had to choose, rather than before that point—the novel feature of this particular experiment—made no significant difference.) The

experimenters then go on to cite work done in 1933, 1935, and other years up to 1985.[30]

The following experiment is simply an attempt to show that results already known to occur in humans also apply to mice: Curt Spanis and Larry Squire of the University of California, San Diego, used two different types of shock in one experiment designed to examine how "electroconvulsive shock" affects memory in mice. The mice were placed in the light compartment of a chamber with two compartments, the other one being dark. When the mice crossed over from the light compartment to the dark compartment their feet were given an electric shock. After "training," the mice received "electroconvulsive shock treatment … administered four times at 1-hour intervals … [and] seizures occurred in each case." The electroconvulsive shock treatment caused retrograde amnesia, which lasted at least twenty-eight days. Spanis and Squire concluded that this was the case because the mice did not remember to avoid crossing over into the dark compartment, which caused them to receive electric shocks. Spanis and Squire noted that their findings were "consistent" with findings that Squire had already made in studies based on psychiatric patients. They acknowledged that the results of the experiment "cannot strongly support or reject" ideas about memory loss because of the "high variability of the scores in the various groups." Nevertheless, they claim: "These findings extend the parallel between experimental amnesia in laboratory animals and human amnesia."[31]

In a similar experiment J. Patel and B. Migler, working at ICI Americas, Inc., in Wilmington, Delaware, trained squirrel monkeys to press a lever to obtain food pellets. The monkeys

were then fitted with metal collars around their necks, through which they were given electric shocks each time they received a food pellet. They could avoid the shocks only if they waited three hours before trying to obtain food. It took eight weeks of training sessions, for six hours a day, for the monkeys to learn to avoid shocks in this way. This was supposed to produce a "conflict" situation, and the monkeys were then given various drugs to test whether monkeys on the drugs would elicit more shocks. The experimenters reported that they had also adapted the test for rats, and that it would be "useful in identifying potential anti-anxiety agents."[32]

Experiments in conditioning have been going on for over eighty-five years. A report compiled in 1982 by the New York group United Action for Animals found 1,425 papers on "classical conditioning experiments" on animals. Ironically, the futility of much of this research is grimly revealed by a paper published by a group of experimenters at the University of Wisconsin. Susan Mineka and her colleagues subjected 140 rats to shocks that could be escaped and also subjected them to shocks that could not be escaped in order to compare the levels of fear generated by such different kinds of shocks. Here is the stated rationale for their work:

Over the past 15 years an enormous amount of research has been directed toward understanding the differential behavior and physiological effects that stem from exposure to controllable as opposed to uncontrollable aversive elements. The general conclusion has been that exposure to uncontrollable aversive events is considerably more stressful for the organism than is exposure to controllable aversive events.

After subjecting their rats to various intensities of electric shock, sometimes allowing them the possibility of escape and sometimes not, the experimenters were unable to determine what mechanisms could be considered correct in accounting for their
results. Nonetheless, they said that they believed their results to be important because "they raise some question about the validity of the conclusions of the hundreds of experiments conducted over the past 15 years or so."[33]

In other words, fifteen years of giving electric shocks to animals may not have produced valid results. But in the bizarre world of psychological animal experiments, this finding serves as justification for yet more experiments giving inescapable electric shock to yet more animals so that "valid" results can finally be produced—and remember, these "valid results" will still only apply to the behavior of trapped animals subjected to inescapable electric shock.

An equally sad tale of futility is that of experiments designed to produce what is known as "learned helplessness"—supposedly a model of depression in human beings. In 1953 R. Solomon, L. Kamin, and L. Wynne, experimenters at Harvard University, placed forty dogs in a device called a "shuttlebox," which consists of a box divided into two compartments, separated by a barrier. Initially the barrier was set at the height of the dog's back. Hundreds of intense electric shocks were delivered to the dogs' feet through a grid floor. At first the dogs could escape the shock if they learned to jump the barrier into the other compartment. In an attempt to "discourage" one dog from jumping, the experimenters forced the dog to jump one hundred times onto a grid floor in the other compartment that also delivered a

shock to the dog's feet. They said that as the dog jumped he gave a "sharp anticipatory yip which turned into a yelp when he landed on the electrified grid." They then blocked the passage between the compartments with a piece of plate glass and tested the dog again. The dog "jumped forward and smashed his head against the glass." The dogs began by showing symptoms such as "defecation, urination, yelping and shrieking, trembling, attacking the apparatus, and so on; but after ten or twelve days of trials dogs who were prevented from escaping shock ceased to resist. The experimenters reported themselves "impressed" by this, and concluded that a combination of the plate glass barrier and foot shock was "very effective" in eliminating jumping by dogs.[34]

This study showed that it was possible to induce a state of hopelessness and despair by repeated administration of severe inescapable shock. Such "learned helplessness" studies were further
refined in the 1960s. One prominent experimenter was Martin Seligman of the University of Pennsylvania. He electrically shocked dogs through a steel grid floor with such intensity and persistence that the dogs stopped trying to escape and "learned" to be helpless. In one study, written with colleagues Steven Maier and James Geer, Seligman describes his work as follows:

When a normal, naive dog receives escape/avoidance training in a shuttlebox, the following behavior typically occurs: at the onset of electric shock the dog runs frantically about, defecating, urinating, and howling until it scrambles over the barrier and so escapes from shock. On the next trial the dog, running and howling, crosses the barrier more quickly, and so on, until efficient avoidance emerges.

Seligman altered this pattern by strapping dogs in harnesses and giving them shocks from which they had no means of escape. When the dogs were then placed in the original shuttlebox situation from which escape was possible, he found that

such a dog reacts initially to shock in the shuttlebox in the same manner as the naive dog. However in dramatic contrast to the naive dog it soon stops running and remains silent until shock terminates. The dog does not cross the barrier and escape from shock. Rather it seems to "give up" and passively "accept" the shock. On succeeding trials the dog continues to fail to make escape movements and thus takes 50 seconds of severe, pulsating shock on each trial.… A dog previously exposed to inescapable shock … may take unlimited shock without escaping or avoiding at all.[35]

In the 1980s, psychologists have continued to carry out these "learned helplessness" experiments. At Temple University in Philadelphia, Philip Bersh and three other experimenters trained rats to recognize a warning light that alerted them to a shock that would be delivered within five seconds. Once they understood the warning, the rats could avoid the shock by moving into the safe compartment. After the rats had learned this avoidance behavior, the experimenters walled off the safe chamber and subjected them to prolonged periods of inescapable shock. Predictably,
they found that even after escape was possible, the rats were unable to relearn the escape behavior quickly.[36]

Bersh and colleagues also subjected 372 rats to aversive shock testing to try to determine the relationship between Pavlovian conditioning and learned helplessness. They

reported that the "implications of these findings for learned helplessness theory are not entirely clear" and that "a substantial number of questions remain."[37]

At the University of Tennessee at Martin, G. Brown, P. Smith, and R. Peters went to a lot of trouble to create a specially designed shuttlebox for goldfish, perhaps to see if Seligman's theory holds water. The experimenters subjected forty-five fish to sixty-five shock sessions each and concluded that "the data in the present study do not provide much support for Seligman's hypothesis that helplessness is learned."[38]

These experiments have inflicted acute, prolonged pain on many animals, first to prove a theory, then to disprove the theory, and finally to support modified versions of the original theory. Steven Maier, who with Seligman and Geer was a coauthor of the previously quoted report on inducing learned helplessness in dogs, has made a career out of perpetuating the learned helplessness model. Yet in a recent review article, Maier had this to say about the validity of this "animal model" of depression:

It can be argued that there is not enough agreement about the characteristics, neurobiology, induction, and prevention/cure of depression to make such comparison meaningful.… It would thus appear unlikely that learned helplessness is a model of depression in any general sense.[39]

Although Maier tries to salvage something from this dismaying conclusion by saying that learned helplessness may constitute a model not of depression but of "stress and coping," he has effectively admitted that more than thirty

years of animal experimentation have been a waste of time and of substantial amounts of taxpayers' money, quite apart from the immense amount of acute physical pain that they have caused.

In the first edition of this book, I reported on an experiment performed at Bowling Green University in Ohio by P. Badia and
two colleagues, and published in 1973. In that experiment ten rats were tested in sessions that were six hours long, during which frequent shock was "at all times unavoidable and inescapable." The rats could press either of two levers within the test chamber in order to receive warning of a coming shock. The experimenters concluded that the rats did prefer to be warned of a shock.[40] In 1984 the same experiment was still being carried out. Because someone had suggested that the previous experiment could have been "methodologically unsound," P. Badia, this time with B. Abbott of Indiana University, placed ten rats in electrified chambers, subjecting them again to six-hour shock sessions. Six rats received inescapable shock at intervals of one minute, sometimes preceded by a warning. Then they were allowed to press one of two levers to receive either shocks that were preceded by a warning signal or unsignaled shocks. The remaining four rats were used in a variation of this experiment, receiving shocks at two-minute and four-minute intervals. The experimenters found, once again, that the rats preferred shock that was signaled, even if it resulted in their receiving more shocks.[41]

Electric shock has also been used to produce aggressive behavior in animals. In one study at the University of Iowa, Richard Viken and John Knutson divided 160 rats into groups and "trained" them in a stainless steel cage with an electrified

floor. Pairs of rats were given electric shocks until they learned to fight by striking out at the other rat while facing each other in an upright position or by biting. It took an average of thirty training trials before the rats learned to do this immediately on the first shock. The researchers then placed the shock-trained rats in the cage of untrained rats and recorded their behavior. After one day, all the rats were killed, shaved, and examined for wounds. The experimenters concluded that their "results were not useful in understanding the offensive or defensive nature of the shock-induced response."[42]

At Kenyon College in Ohio, J. Williams and D. Lierle performed a series of three experiments to study the effects that stress control had on defensive behavior. The first experiment was based on the assumption that uncontrollable shock enhances fear. Sixteen rats were placed in plexiglass tubes and were given inescapable electric shocks to their tails. They were then placed as intruders into an
already established colony of rats and their interactions with the others were recorded. In the second experiment, twenty-four rats were able to control the shock through training. In the third experiment, thirty-two rats were exposed to inescapable shock and controllable shock. The experimenters concluded:

Although these findings and our theoretical formulations emphasize the interrelationships among shock controllability, the predictability of shock termination, conditioned stress cues, fear, and defensive behavior, further experimentation is necessary to examine the precise nature of these complex interactions.[43]

This report, published in 1986, cited earlier experimental work in this field going back to 1948.

At the University of Kansas, a unit calling itself the Bureau of Child Research has been inflicting electric shock on a variety of animals. In one experiment, Shetland ponies were deprived of water until they were thirsty and then given a water bowl that could be electrified. Two loudspeakers were placed on either side of the ponies' heads. When noise came from the left speaker, the bowl was electrified and the ponies received an electric shock if they were drinking. They learned to stop drinking when they heard the noise from the left speaker, but not from the right. Then the speakers were moved closer together, until the ponies could no longer distinguish between them and so could not avoid shock. The researchers pointed to similar experiments on white rats, kangaroo rats, wood rats, hedgehogs, dogs, cats, monkeys, opossums, seals, dolphins, and elephants, and concluded that ponies have great difficulty in distinguishing the direction of noises as compared with other animals.[44]

It is not easy to see how this research is going to benefit children. Indeed, in general, what is so disturbing about the examples of research given above is that despite the suffering the animals have gone through, the results obtained, even as reported by the experimenters themselves, are trivial, obvious, or meaningless. The conclusions of the experiments cited above show, clearly enough, that experimental psychologists have put a lot of effort into telling us in scientific jargon what we knew all along, and what we could have found out in less harmful ways with a
little thought—and these experiments were supposedly more significant than others that did not get published.

We have looked at only a very small number of psychology experiments that involve electric shock. According to the Office of Technology Assessment report,

A survey of the 608 articles appearing from 1979 through 1983 in the American Psychological Association journals that typically publish animal research identified 10 percent of the studies as using electric shock.[45]

Many other journals not associated with the American Psychological Association also publish reports of animal studies that have used electric shock; and we must not forget the experiments that never get published at all. And this is only one kind of painful or distressing research carried out on animals within the field of psychology. We have already looked at maternal deprivation studies; but one could fill several books with brief descriptions of yet more kinds of psychological experimentation, such as abnormal behavior, animal models of schizophrenia, animal movements, body maintenance, cognition, communication, predator-prey relations, motivation and emotion, sensation and perception, and sleep, food, and water deprivation. We have considered but a few of the tens of thousands of experiments performed annually in the field of psychology, but they should be enough to show that many, many experiments still being conducted cause great pain to animals and offer no prospect of yielding really momentous or vital new knowledge. Unfortunately, animals have become, for the psychologist and for other experimenters, mere tools. A laboratory may consider the cost of these "tools," but a certain callousness toward them becomes apparent, not only in the experiments performed but also in the wording of the reports. Consider, for instance, Harlow and Suomi's mention of their "rape

rack" and the jocular tone in which they report on the "favorite tricks" of the female monkeys born as a result of its use.

Detachment is made easier by the use of technical jargon that disguises the real nature of what is going on. Psychologists, under the influence of the behaviorist doctrine that only what can be observed should be mentioned, have developed a considerable collection of terms that refer to pain without appearing to do so. Alice Heim, one of the few psychologists who has spoken out against the pointless animal experimentation of her colleagues, describes it this way:

The work on "animal behavior" is always expressed in scientific, hygienic-sounding terminology, which enables the indoctrination of the normal, non-sadistic young psychology student to proceed without his anxiety being aroused. Thus techniques of "extinction" are used for what is in fact torturing by thirst or near starvation or electric-shocking; "partial reinforcement" is the term for frustrating an animal by only occasionally fulfilling the expectations which the experimenter has aroused in the animal by previous training; "negative stimulus" is the term used for subjecting an animal to a stimulus which he avoids, if possible. The term "avoidance" is O.K. because it is an observable activity. The term "painful" or "frightening" stimulus are less O.K. since they are anthropomorphic, they imply that the animal has feelings—and that these may be similar to human feelings. This is not allowable because it is non-behavioristic and unscientific (and also because this might deter the younger and less hard-boiled researcher from pursuing certain ingenious experiments. He might allow a little play to his imagination). The cardinal sin for the experimental

psychologist working in the field of "animal behavior" is anthropomorphism. Yet if he did not believe in the analogue of the human being and the lower animal even he, presumably, would find his work largely unjustified.[46]

We can see the kind of jargon to which Heim refers in the reports of experiments I have already cited. Note that even when Seligman feels compelled to say that the subjects of his experiments "gave up" trying to escape shock, he finds it necessary to place the term in quotation marks, as if to say that he is not really imputing any kind of mental processes to the dog. Yet the logical consequence of this view of "scientific method" is that experiments on animals cannot teach us anything about human beings.

Amazing as it may seem, some psychologists have been so concerned to avoid anthropomorphism that they have accepted this conclusion. This attitude is illustrated by the following autobiographical statement, which appeared in *New Scientist*:

When fifteen years ago I applied to do a degree course in psychology, a steely-eyed interviewer, himself a psychologist, questioned me closely on my motives and asked me what I believed psychology to be and what was its principal subject matter? Poor naive simpleton that I was, I replied that it was the study of the mind and that human beings were its raw material. With a glad cry at being able to deflate me so effectively, the interviewer declared that psychologists were not interested in the mind, that rats were the golden focus of study, not people, and then he advised me strongly to trot around to the philosophy department next door.…[47]

Perhaps not many psychologists would now proudly state that their work has nothing to do with the human mind. Nevertheless many of the experiments that are performed on rats can only be explained by assuming that the experimenters really are interested in the behavior of the rat for its own sake, without any thought of learning anything about humans. In that case, though, what possible justification can there be for the infliction of so much suffering? It is certainly not for the benefit of the rat.

So the researcher's central dilemma exists in an especially acute form in psychology: either the animal is not like us, in which case there is no reason for performing the experiment; or else the animal is like us, in which case we ought not to perform on the animal an experiment that would be considered outrageous if performed on one of us.

Another major field of experimentation involves the poisoning of millions of animals annually. Often this too is done for trivial reasons. In Britain in 1988, 588,997 scientific procedures were performed on animals to test drugs and other materials; of these, 281,358 were not related to the testing of medical or veterinary products.[48] In the United States no accurate figures are available,
but if the proportion is similar to Britain the number of animals used in testing must be at least three million. In fact it is probably double or triple that figure, because there is so much research and development in this field in the United States and the Food and Drug Administration requires extensive testing of new substances before they are released. It may be thought justifiable to require tests on animals of potentially life-saving drugs, but the same kinds of tests are used for products like cosmetics, food coloring, and floor

polishes. Should thousands of animals suffer so that a new kind of lipstick or floor wax can be put on the market? Don't we already have an excess of most of these products? Who benefits from their introduction, except the companies that hope to profit from them?

In fact, even when the test is carried out on a medical product, it is most probably not going to do anything to improve our health. Scientists working for the British Department of Health and Social Security examined drugs marketed in Britain between 1971 and 1981. New drugs, they found,

have largely been introduced into therapeutic areas already heavily oversubscribed … for conditions which are common, largely chronic and occur principally in the affluent Western Society. Innovation is therefore largely directed towards commercial returns rather than therapeutic need.[49]

To appreciate what is involved in introducing all these new products it is necessary to know something about the standard methods of testing. In order to determine how poisonous a substance is, "acute oral toxicity tests" are performed. These tests, developed in the 1920s, force animals to ingest substances, including nonedible products such as lipstick and paper. Often the animals will not eat the substance if it is simply placed in their food, so experimenters either force-feed the animals by mouth or insert a tube down their throats. Standard tests are carried out for fourteen days but some may last for up to six months—if the animals survive that long. During this time, the animals often display classic symptoms of poisoning, including vomiting, diarrhea, paralysis, convulsions, and internal bleeding.

The most widely known acute toxicity test is the LD50. LD50 stands for "lethal dose 50 percent": the amount of the substance
that will kill half of the animals in the study. To find that dose level, sample groups of animals are poisoned. Normally, before the point at which half of them die is reached, the animals are all very ill and in obvious distress. In the case of fairly harmless substances it is still considered good procedure to find the concentration that will make half the animals die; consequently enormous quantities have to be force-fed to the animals, and death may be caused merely by the large volume or high concentration given to the animals. This has no relevance to the circumstances in which humans will use the product. Since the very point of these experiments is to measure how much of the substance will poison half the animals to death, dying animals are not put out of their misery for fear of producing inaccurate results. The U.S. Congress Office of Technology Assessment has estimated that "several million" animals are used each year for toxicological testing in the United States. No more specific estimates for the LD50 test are available.[50]

Cosmetics and other substances are tested in animals' eyes. The Draize eye irritancy tests were first used in the 1940s, when J. H. Draize, working for the U.S. Food and Drug Administration, developed a scale for assessing how irritating a substance is when placed in rabbits' eyes. The animals are usually placed in holding devices from which only their heads protrude. This prevents them scratching or rubbing their eyes. A test substance (such as bleach, shampoo, or ink) is then placed in one eye of each rabbit. The method used is to pull out the lower eyelid and place the substance into the small "cup" thus formed. The eye is then held closed. Sometimes

the application is repeated. The rabbits are observed daily for eye swelling, ulceration, infection, and bleeding. The studies can last up to three weeks. One researcher employed by a large chemical company has described the highest level of reaction as follows:

Total loss of vision due to serious internal injury to cornea or internal structure. Animal holds eye shut urgently. May squeal, claw at eye, jump and try to escape.[51]

But, of course, when in the holding device the rabbits can neither claw at their eyes nor escape (see photograph following page 157). Some substances cause such serious damage that the
rabbits' eyes lose all distinguishing characteristics—the iris, pupil, and cornea begin to resemble one massive infection. Experimenters are not obliged to use anesthetics, but sometimes they will use a small amount of topical anesthetic when introducing the substance, provided it does not interfere with the test. This does nothing to alleviate the pain that can result after two weeks of having oven cleaner in the eye. U.S. Department of Agriculture figures show that, in 1983, toxicology testing laboratories used 55,785 rabbits, and chemical companies an additional 22,034. It can be assumed that many of these were used for Draize tests, although no estimate of the number is available.[52]

Animals are also subjected to other tests to determine the toxicity of many substances. During inhalation studies, animals are placed in sealed chambers and forced to inhale sprays, gases, and vapors. In dermal toxicity studies, rabbits have their fur removed so that a test substance can be placed on their skin. The animals are restrained so that they do not

scratch at their irritated bodies. The skin may bleed, blister, and peel. Immersion studies, in which animals are placed in vats of diluted substances, sometimes cause the animals to drown before any test results can be obtained. In injection studies, the test substance is injected directly into the animal, either under the skin, into the muscles, or directly into an organ.

These are the standard procedures. Here are two examples of how they are carried out:

In England, the Huntingdon Research Institute, together with the giant corporation ICI, carried out experiments in which forty monkeys were poisoned with the weed-killer paraquat. They became very ill, vomited, had difficulty in breathing, and suffered from hypothermia. They died slowly, over several days. It was already known that paraquat poisoning in humans results in a slow and agonizing death.[53]

We began this chapter with some military experiments. Here is a military experiment involving an LD50 test:

Experimenters at the U.S. Army Medical Research Institute of Infectious Diseases poisoned rats with T-2. This is a poison which, according to the Department of State, has "the added advantage of being an effective terror weapon that causes bizarre and horrifying symptoms" such as "severe bleeding," blisters, and vomiting, so that humans and animals may be "killed in a gruesome manner." The T-2 was administered intramuscularly, intravenously, subcutaneously, interperitoneally—i.e., injected into the muscle tissue, into the veins, under the skin, and into the lining of the

abdomen—and through the nose and mouth, and on the skin. All eight tests were to determine LD50 values. Death usually occurred between nine and eighteen hours after exposure, but the rats exposed through the skin took an average of six days to die. Before death the animals were unable to walk or eat, had rotting of the skin and intestines, restlessness, and diarrhea. The experimenters reported that their findings were "quite compatible with earlier published studies of subacute and chronic exposure to T-2."[54]

As this example illustrates, it is not only products intended for human consumption that are tested. Chemical warfare agents, pesticides, and all kinds of industrial and household goods are fed to animals or put in their eyes. A reference book, *Clinical Toxicology of Commercial Products*, provides data, mostly from animal experiments, on how poisonous hundreds of commercial products are. The products include insecticides, antifreeze, brake fluid, bleaches, Christmas tree sprays, church candles, oven cleaners, deodorants, skin fresheners, bubble baths, depilatories, eye makeup, fire extinguishers, inks, sun-tan oils, nail polish, mascara, hair sprays, paints, and zipper lubricants.[55]

Many scientists and physicians have criticized this type of testing, pointing out that the results are inapplicable to human beings. Dr. Christopher Smith, a physician from Long Beach, California, has said:

The results of these tests cannot be used to predict toxicity or to guide therapy in human exposure. As a board-certified emergency medicine physician with over 17 years of experience in the treatment of accidental poisoning and toxic exposures, I know of no instance in which an emergency

physician has used Draize test data to aid in the management of an eye injury. I have never used results from animal tests to manage accidental poisoning. Emergency physicians rely on case reports, clinical experience and experimental data from clinical trials in humans when determining the optimal course of treatment for their patients.[56]

Toxicologists have known for a long time that extrapolation from one species to another is a highly risky venture. The most notorious drug to have caused unexpected harm to humans is thalidomide—which was extensively tested on animals before it was released. Even after thalidomide was suspected of causing deformities in humans, laboratory tests on pregnant dogs, cats, rats, monkeys, hamsters, and chickens all failed to produce deformities. Only when a particular strain of rabbit was tried were deformities produced.[57] More recently, Opren passed all the usual animal tests before it was released and extensively touted as a new "wonder drug" for the treatment of arthritis by its manufacturer, the pharmaceutical giant Eli Lilly. Opren was suspended from use in Britain after sixty-one deaths and over 3,500 reports of adverse reactions. A report in *New Scientist* estimated that the real toll could have been much higher.[58] Other drugs that were considered safe after animal tests but later proved harmful are the heart disease drug Practolol, which caused blindness, and the cough suppressant Zipeprol, which produced seizures and comas in some of those who took it.[59]

As well as exposing people to harm, testing on animals may lead us to miss out on valuable products that are dangerous to animals but not to human beings. Insulin can produce deformities in infant rabbits and mice, but not in humans.[60] Morphine, which is calming to human beings, causes mice to

go into drug frenzies. And as another toxicologist has said: "If penicillin had been judged by its toxicity on guinea pigs, it might never have been used on man."[61]

After decades of mindless animal testing, there are now some signs of second thoughts. As Dr. Elizabeth Whelan, a scientist and executive director of the American Council on Science and Health, has pointed out: "It doesn't take a Ph.D. in the sciences to grasp the fact that rodent exposure to the saccharin equivalent of 1,800 bottles of soda pop a day doesn't relate well to our daily ingestion of a few glasses of the stuff." Whelan has welcomed the fact that officials at the Environmental Protection Agency recently downgraded earlier estimates of risks of pesticides and other environmental chemicals, noting that the evaluation of cancer risk, derived from animal extrapolation, was based on "simplistic" assumptions that "strain credibility." This means, she says, that "our regulators are beginning to take note of the scientific literature rejecting the infallibility of the laboratory animal test."[62]

The American Medical Association has also admitted that animal models have questionable accuracy. An AMA representative testified at a congressional hearing on drug testing that "frequently animal studies prove little or nothing and are very difficult to correlate to humans."[63]

Fortunately much progress has been made in eliminating such animal testing since the first edition of this book appeared. Most scientists then did not take seriously the possibility that effective substitutes could be found for tests that use animals to measure toxicity. They were persuaded to do so by the hard work of a large number of opponents of animal experiments.

Prominent among them was Henry Spira, a former civil rights activist who put together coalitions against the Draize and LD50 tests. The Coalition to Abolish the Draize Test began by inviting Revlon, as the largest cosmetics company in the United States, to put one tenth of one percent of its profits toward developing an alternative to the Draize test. When Revlon declined, full-page advertisements appeared in *The New York Times* asking "HOW MANY RABBITS DOES REVLON BLIND FOR BEAUTY'S SAKE?"[64] People in rabbit costumes appeared at Revlon's annual general meeting. Revlon got the message and allocated the requested funds to pay for research on alternatives to animal experiments. Other companies, such as Avon and Bristol-Myers, followed suit.[65] As a result, early British work in this field by the Fund for the Replacement of Animals in Medical Experiments was taken up on a larger scale in the United States, especially at the Johns Hopkins Center for Alternatives to Animal Testing, in Baltimore. Increasing interest led to the launching of several major new journals, such as *In-Vitro Toxicology, Cell Biology and Toxicology*, and *Toxicology in Vitro*.

It took some time for this work to show results, but gradually the interest in alternatives grew. Corporations such as Avon, Bristol-Myers, Mobil, and Procter & Gamble began using alternatives in their own laboratories, thus reducing the number of animals used. Toward the end of 1988, the rate of change began to
quicken. In November, an international campaign against Benetton led by the Washington, D.C., organization People for the Ethical Treatment of Animals persuaded the fashion chain to stop using animal tests in its cosmetics division.[66] In December 1988 Noxell Corporation, manufacturer of Noxzema skin creams and Cover Girl cosmetics, announced

that it would use a screening test that would reduce by 80 to 90 percent the number of animals otherwise used for eye safety testing; subsequently Noxell stated that it used no animals at all in safety tests during the first half of 1989.[67]

Now the momentum was building fast. In April 1989, Avon announced that it had validated tests using a specially developed synthetic material called Eytex as a replacement for the Draize test. As a result, nine years after Spira began his campaign Avon ceased to use the Draize test.[68] Still more good news was to come. In May 1989 both Mary Kay Cosmetics and Amway announced that they had ceased to use laboratory animals for consumer product safety testing while they reviewed plans for using alternatives.[69] In June, Avon, under pressure from another campaign led by People for the Ethical Treatment of Animals, announced a permanent end to all animal testing.[70] Eight days after the Avon announcement, Revlon said that it had completed its long-term plan to eliminate animal testing in all phases of research, development, and manufacturing of all its products, and therefore it was ending animal testing. Then Fabergé abandoned the use of animals for testing in its cosmetics and toiletries business. Thus within a few months (though on the basis of many years of work) the first, second, and fourth largest United States cosmetics companies had given up all animal testing.[71]

Although the most dramatic developments have taken place in the highly public and therefore relatively vulnerable cosmetics industry, the movement against animal testing is also taking effect in wider areas of industry. As a report in *Science* put it:

Prodded by the animal welfare movement, major manufacturers of pharmaceuticals, pesticides and household products have made significant advances in recent years toward the goal of reducing the number of animals used in toxicity testing. Alternative methods, such as cell and tissue culture and computer modeling, are increasingly being seen not just
as good public relations but as desirable both economically and scientifically.[72]

The report went on to quote Gary Flamm, director of the Food and Drug Administration Office of Toxicology Sciences, as saying that the LD50 "should be replaceable in the vast majority of cases." A *New York Times* article quoted a senior toxicologist at G. D. Searle and Company as admitting that "an awful lot of the points made by the animal welfare movement are extreme but right."[73]

There seems to be little doubt that as a result of all these developments, an immense amount of needless pain and suffering has been avoided.[74] Precisely how much is hard to say, but millions of animals would have suffered each year in tests that will now not be performed. The tragedy is that if only the toxicologists, the corporations, and the regulatory agencies had cared more about the animals they were using, millions of animals could have been spared acute pain. It was not until the Animal Liberation movement began to make people aware of the issue that those in charge of the testing business really thought about animal suffering. The most callous, stupid things were done just because regulations required them; and no one bothered to try to change the regulations. It was not until 1983, for example, that U.S. federal agencies stated that substances known to be caustic

irritants, such as lye, ammonia, and oven cleaners, did not need to be tested on the eyes of conscious rabbits.[75] But the battle is by no means over. To quote once more from the report in *Science* of April 17, 1987:

Unnecessary testing is still wasting a lot of animals, not only because of outmoded requirements but because much existing information is not easily accessible. Theodore M. Farber, director of the [U.S. Environmental Protection Agency's] Toxicology Branch said that his agency has files of 42,000 completed tests, and 16,000 LD50 tests. He said these could be of far more use in eliminating redundant tests if they were computerized for easy accessibility. "Many of us in regulatory toxicology see the same studies over and over again," said Farber.

Stopping this waste of animal lives and animal pain should not be difficult, if people really want to do it. Developing completely adequate alternatives to all tests for toxicity will take longer, but it should be possible. Meanwhile there is a simple way to cut down the amount of suffering involved in such tests. Until we have developed satisfactory alternatives, as a first step we should just do without any new but potentially hazardous substances that are not essential to our lives.

When experiments can be brought under the heading "medical" we are inclined to think that any suffering they involve must be justifiable because the research is contributing to the alleviation of suffering. But we have already seen that the testing of therapeutic drugs is less likely to be motivated by the desire for maximum good to all than by the desire for maximum profit. The broad label "medical

research" can also be used to cover research that is motivated by a general intellectual curiosity. Such curiosity may be acceptable as part of a basic search for knowledge when it involves no suffering, but should not be tolerated if it causes pain. Very often, too, basic medical research has been going on for decades and much of it, in the long run, turns out to have been quite pointless. As an illustration, consider the following series of experiments stretching back nearly a century, on the effects of heat on animals:

In 1880 H. C. Wood placed a number of animals in boxes with glass lids and placed the boxes on a brick pavement on a hot day. He used rabbits, pigeons, and cats. His observations on a rabbit are typical. At a temperature of 109.5 degrees Fahrenheit the rabbit jumps and "kicks hind legs with great fury." The rabbit then has a convulsive attack. At 112 degrees Fahrenheit the animal lies on its side slobbering. At 120 degrees Fahrenheit it is gasping and squealing weakly. Soon after it dies.[76]

In 1881 a report appeared in *The Lancet* on dogs and rabbits whose temperatures had been raised to 113 degrees Fahrenheit. It was found that death could be prevented by cool air currents, and the results were said to indicate "the importance of keeping down the temperature in those cases in which it exhibits a tendency to rise to [an] extreme height."[77]

In 1927 W. W. Hall and E. G. Wakefield of the U.S. Naval Medical School placed ten dogs in a hot humid chamber to produce experimental heatstroke. The animals first showed restlessness, breathing difficulties, swelling and congestion of the eyes, and thirst. Some had convulsions. Some died early

in the experiment. Those who did not had severe diarrhea and died after removal from the chamber.[78]

In 1954 at Yale University School of Medicine, M. Lennox, W. Sibley, and H. Zimmerman placed thirty-two kittens in a "radiant-heating" chamber. The kittens were "subjected to a total of 49 heating periods.… Struggling was common, particularly as the temperature rose." Convulsions occurred on nine occasions: "Repeated convulsions were the rule." As many as thirty convulsions occurred in rapid sequence. Five kittens died during convulsions, and six without convulsions. The other kittens were killed by the experimenters for autopsies. The experimenters reported: "The findings in artificially induced fever in kittens conform to the clinical and EEG findings in human beings and previous clinical findings in kittens."[79]

The following experiment was performed at the K. G. Medical College, Lucknow, India. I include it as an example of the triumph of Western methods of research and attitudes to animals over the ancient tradition of Hinduism, which has more respect for nonhuman animals than the Judeo-Christian tradition. In 1968 K. Wahal, A. Kumar, and P. Nath exposed forty-six rats to high temperature for four hours. The rats became restless, breathed with difficulty, and salivated profusely. One animal died during the experiment and the others were killed by the experimenters because "they could not survive anyway."[80]

In 1969 S. Michaelson, a veterinarian at the University of Rochester, exposed dogs and rabbits to heat-producing microwaves until their temperatures reached the critical level of 107 degrees Fahrenheit or greater. He observed that dogs

start panting shortly after microwave exposure begins. Most "display increased activity varying from restlessness to extreme agitation." Near the point of death, weakness and prostration occur. In the case of rabbits "within 5 minutes, desperate attempts are made to escape the cage," and the rabbits die within forty minutes. Michaelson concluded that an increase in heat from microwaves produces damage "indistinguishable from fever in general."[81]

At the Heller Institute of Medical Research, Tel Aviv, Israel, in experiments published in 1971 and paid for by the United States Public Health Service, T. Rosenthal, Y. Shapiro, and others placed thirty-three dogs "randomly procured from the local dog pound" in a temperature-controlled chamber and forced them to exercise on a treadmill in temperatures as high as 113 degrees Fahrenheit until "they collapsed in heatstroke or reached a predetermined rectal temperature." Twenty-five of the dogs died. Nine more dogs were then subjected to a temperature of 122 degrees Fahrenheit without treadmill exercise. Only two of these dogs survived longer than twenty-four hours, and autopsies showed that all had hemorrhaged. The experimenters concluded: "The findings are in accordance with what is reported in the literature on humans."[82] In a further report published in 1973, the same researchers describe experiments on fifty-three dogs, involving various combinations of heat and treadmill exercise. Six of the dogs vomited, eight had diarrhea, four went into convulsions, twelve lost muscle coordination, and all salivated excessively. Of ten dogs whose rectal temperature reached 113 degrees Fahrenheit, five died "at the moment of maximum rectal temperature" and the other five died between thirty minutes and eleven hours after the end of the experiment. The experimenters concluded that "the sooner

the heatstroke victim's temperature is brought down, the greater the chances of recovery."[83]

In 1984 experimenters working for the Federal Aviation Administration, stating that "animals occasionally die from heat stress encountered during shipping in the nation's transportation systems," subjected ten beagles to experimental heat. The dogs were isolated in chambers, fitted with muzzles, and exposed to 95 degrees Fahrenheit combined with high humidity. They were given no food or water, and were kept in these conditions for twenty-four hours. The behavior of the dogs was observed; it included "deliberate agitated activity such as pawing at the crate walls, continuous circling, tossing of the head to shed the muzzle, rubbing the muzzle back and forth on the floor of the crate, and aggressive acts on the sensor guards." Some of the dogs died in the chambers. When the survivors were removed, some vomited blood, and all were weak and exhausted. The experimenters refer to "subsequent experiments on more than 100 beagles."[84]

In a further example of military experimentation, R. W. Hubbard, of the U.S. Army Research Institute of Environmental Medicine in Natick, Massachusetts, has been publishing papers with titles such as "Rat Model of Acute Heatstroke Mortality" for more than a decade. It is well known that when rats are hot they spread saliva over their bodies; the saliva plays the same cooling role as sweating in humans. In 1982 Hubbard and two colleagues noted that rats unable to produce saliva will spread urine if no other fluid is available.[85] So in 1985 the same three researchers, joined by a fourth, injected rats with the drug atropine, which inhibits both sweating and the secretion of saliva. Other rats had their salivary glands removed by surgery. The experimenters then

placed the rats in chambers at 107 degrees Fahrenheit until their body temperature rose to 108.7 degrees Fahrenheit. The researchers drew diagrams comparing the "urine spreading pattern" of a rat who had either been given atropine or had been surgically "desalivated" with that of an untreated rat. They found the "atropinized heat-stressed rat model" to be "a promising tool with which to examine the role of dehydration in heat illness."[86]

Here we have cited a series of experiments going back into the nineteenth century—and I have had space sufficient to include only a fraction of the published literature. The experiments obviously caused great suffering; and the major finding seems to be the advice that heatstroke victims should be cooled—something that seems to be fairly elementary common sense and in any case had already been borne out by observations on human beings who have suffered natural heatstroke. As for the application of this research to human beings, B. W. Zweifach showed in 1961 that dogs are physiologically different from human beings in ways that affect their response to heatstroke, and hence they are a poor model for heatstroke in human beings.[87] It is hard to take seriously the suggestion that small furry animals drugged with atropine who spread urine over themselves when hot will be a better model.

Similar series of experiments are to be found in many other fields of medicine. In the New York City offices of United Action for Animals there are filing cabinets full of photocopies of experiments
reported in the journals. Each thick file contains reports on numerous experiments, often fifty or more, and the labels on the files tell their own story: "Acceleration," "Aggression,"

"Asphyxiation," "Blinding," "Burning," "Centrifuge," "Compression," "Concussion," "Crowding," "Crushing," "Decompression," "Drug Tests," "Experimental Neurosis," "Freezing," "Heating," "Hemorrhage," "Hindleg Beating," "Immobilization," "Isolation," "Multiple Injuries," "Prey Killing," "Protein Deprivation," "Punishment," "Radiation," "Starvation," "Shock," "Spinal Cord Injuries," "Stress," "Thirst," and many more. While some of the experiments may have led to advances in medical knowledge, the value of this knowledge is often questionable, and in some cases the knowledge might have been gained in other ways. Many of the experiments appear to be trivial or misconceived, and some of them were not even designed to yield important benefits.

Consider, as another example of the way in which endless variations of the same or similar experiments are carried out, these experiments relating to the experimental production of shock in animals (by which is meant not electric shock but the mental and physical state of shock that often occurs after a severe injury). As long ago as 1946 a researcher in the field, Magnus Gregersen of Columbia University, surveyed the literature and found over eight hundred published papers dealing with experimental studies of shock. He describes the methods used to induce shock:

The use of a tourniquet on one or more extremities, crush, compression, muscle trauma by contusion with light hammer blows, Noble-Collip drum [a device in which animals are placed and the drum rotated; the animals tumble repeatedly to the bottom of the drum and injure themselves], gunshot wounds, strangulation or intestinal loops, freezing, and burns.

Gregersen also notes that hemorrhage has been "widely employed" and "an increasing number of these studies has been done without the complicating factor of anesthesia." He is not, however, pleased by all this diversity, and complains that the variety of methods makes it "exceedingly difficult" to evaluate the results of different researchers; there is, he says, a "crying need"
for standardized procedures that will invariably produce a state of shock.[88]

Eight years later the situation had not changed much. S. M. Rosenthal and R. C. Millican wrote that "animal investigations in the field of traumatic shock have yielded diversified and often contradictory results." Nevertheless they looked forward to "future experimentation in this field" and like Gregersen they discouraged the use of anesthesia: "The influence of anesthesia is controversial … [and] in the reviewers' opinion prolonged anesthesia is best avoided.…" They also recommended that "adequate numbers of animals must be employed to overcome biological variations."[89]

In 1974 experimenters were still working on "animal models" of experimental shock, still carrying out preliminary experiments to determine what injuries might be inflicted to produce a satisfactory "standard" state of shock. After decades of experiments designed to produce shock in dogs by causing them to hemorrhage, more recent studies indicated that (surprise!) hemorrhage-induced shock in dogs is not like shock in humans. Noting these studies, researchers at the University of Rochester caused hemorrhage in pigs, which they think may be more like humans in this respect, to determine what volume of blood loss might be suitable for the production of experimental shock.[90]

Hundreds of experiments are also performed annually in which animals are forced to become addicted to drugs. On cocaine alone, for example, over 500 studies have been conducted. An analysis of just 380 of these estimated that they cost about $100 million, most of it tax money.[91] Here is one example:

In a laboratory at Downstate Medical Center run by Gerald Deneau, rhesus monkeys were locked into restraining chairs. The animals were then taught to self-administer cocaine directly into the bloodstream in whatever quantities they wanted by pushing a button. According to one report,

the test monkeys pushed the button over and over, even after convulsions. They went without sleep. They ate five to six times their normal amount, yet became emaciated.… In the end, they began to mutilate themselves and, eventually, died of cocaine abuse.

Dr. Deneau has acknowledged that "few people could afford the massive doses of cocaine these monkeys were able to obtain."[92]

Even though five hundred animal experiments have been conducted involving cocaine, this is only a small part of the total amount of experimentation that involves turning animals into addicts. In the first edition of this book I reported on a similar set of addiction experiments, using morphine and amphetamines. Here are some more recent examples:

At the University of Kentucky, beagles were used to observe withdrawal symptoms from Valium and a similar tranquillizer called Lorazepam. The dogs were forced to become addicted

to the drug and then, every two weeks, the tranquillizers were withdrawn. Withdrawal symptoms included twitches, jerks, gross body tremors, running fits, rapid weight loss, fear, and cowering. After forty hours of Valium withdrawal, "numerous tonic-clonic convulsions were seen in seven of nine dogs.… Two dogs had repeated episodes of clonic seizures involving the whole body." Four of the dogs died—two while convulsing and two after rapid weight loss. Lorazepam produced similar symptoms but not convulsive deaths. The experimenters reviewed experiments going back to 1931 in which barbiturate and tranquillizer withdrawal symptoms had been observed in rats, cats, dogs, and primates.[93]

After reviewing the history of experiments showing that "withdrawal-like effects can occur following single administrations of opiates in several species," including dogs, mice, monkeys, and rats, D. M. Grilly and G. C. Gowans of Cleveland State University proceeded to test a hypothesis that morphine withdrawal produces hypersensitivity to pain. Rats were trained by a procedure that involved an average of 6,387 training trials in "shock discrimination." In these trials, the rats had to respond to receiving an electric shock. The rats were then injected with morphine and exposed to electric shocks one, two, three, and seven days after. The experimenters noted that sensitivity to shock was elevated during the days immediately following morphine administration.[94]

Here is an even more bizarre example of drug research:

At the University of California at Los Angeles, Ronald Siegel chained two elephants to a barn. The female elephant was

used in range-finding tests "to determine procedures and dosages for LSD administration." She was given the drug orally and by dart-gun. After this the experimenters dosed both elephants every
day for two months and observed their behavior. High doses of the hallucinogen caused the female to fall down on her side, trembling and barely breathing, for one hour. The high doses caused the bull elephant to become aggressive and charge Siegel, who described such repeated aggressive behavior as "inappropriate."[95]

My final episode in this grim tale of drug experimentation does, at least, have a happy ending. Researchers at Cornell University Medical College fed large doses of barbiturates to cats by means of tubes surgically implanted in their stomachs. They then abruptly stopped the barbiturates. Here is their description of the withdrawal symptoms:

Some were unable to stand.… The "spread eagle posture" was seen in animals displaying the most severe abstinence signs and the most frequent grand mal type convulsions. Almost all of these animals died during or soon after periods of continuous convulsive activity.… Rapid or labored respiration was often noted when other abstinence signs were most intense.… Hypothermia was noted when animals were weakest, especially after persistent seizures and when near death.[96]

These experiments began in 1975. Although barbiturate abuse had been a serious problem a few years earlier, by that time the use of barbiturates was severely restricted, and abuse had declined. It has continued to do so since. Nevertheless, the cat experiments at Cornell continued for fourteen years. Then, in

1987, Trans-Species Unlimited, a Pennsylvania-based animal rights group, compiled all the available information they could find about the experiments and began to campaign to stop them. For four months, concerned people picketed the laboratory at which the cat studies were being conducted and wrote letters to the funding agencies, the press, the university, and legislators. After defending the experiments for a long time, late in 1988 Cornell and Michiko Okamoto, the researcher carrying out the experiments, wrote to the funding body, the National Institute on Drug Abuse, to say they would forfeit a new $530,000 research grant that would have paid for three more years of experiments.[97]

How can these things happen? How can people who are not sadists spend their working days driving monkeys into lifelong depression, heating dogs to death, or turning cats into drug addicts? How can they then remove their white coats, wash their hands, and go home to dinner with their families? How can taxpayers allow their money to be used to support these experiments? How did students carry on protests against injustice, discrimination, and oppression of all kinds, no matter how far from home, while ignoring the cruelties that were—and still are—being carried out on their own campuses?

The answer to these questions lies in the unquestioned acceptance of speciesism. We tolerate cruelties inflicted on members of other species that would outrage us if performed on members of our own species. Speciesism allows researchers to regard the animals they experiment on as items of equipment, laboratory tools rather than living, suffering creatures. In fact, on grant applications to government

funding agencies, animals are listed as "supplies" alongside test tubes and recording instruments.

In addition to the general attitude of speciesism that experimenters share with other citizens, some special factors also help to make possible the experiments I have described. Foremost among these is the immense respect that people still have for scientists. Although the advent of nuclear weapons and environmental pollution has made us realize that science and technology are not as beneficial as they might appear at first glance, most people still tend to be in awe of anyone who wears a white coat and has a Ph.D. In a well-known series of experiments Stanley Milgram, a Harvard psychologist, demonstrated that ordinary people will obey the directions of a white-coated researcher to administer what appears to be (but in fact is not) electric shock to a human subject as "punishment" for failing to answer questions correctly, and they will continue to do this even when the human subject cries out and pretends to be in great pain.[98] If this can happen when the participants believe they are inflicting pain on a human being, how much easier is it for students to push aside their initial qualms when their professors instruct them to perform experiments on animals? What Alice Heim has rightly called the "indoctrination" of the student is a gradual process, beginning with the dissection of frogs in school biology classes. When the future medical students, psychology students, or veterinarians reach the university and find that to complete the course of studies on which they have set their hearts they must experiment on living animals, it is difficult for them to refuse to do so, especially since they know that what they are being asked to do is standard practice. Those students who have refused to engage in such

studies have found themselves failing their courses and are often forced to leave their chosen field of study.

The pressure to conform does not let up when students receive their degrees. If they go on to graduate degrees in fields in which experiments on animals are usual, they will be encouraged to devise their own experiments and write them up for their Ph.D. dissertations. Naturally, if this is how students are educated they will tend to continue in the same manner when they become professors, and they will, in turn, train their own students in the same manner.

Here the testimony of Roger Ulrich, a former experimenter who escaped from his conditioning and now acknowledges that he inflicted "years of torture" on animals from rats to monkeys, is particularly revealing. In 1977 the magazine *Monitor*, published by the American Psychological Association, reported that experiments on aggression carried out by Ulrich had been singled out before a congressional subcommittee as an example of inhumane research. To the surprise of the antivivisectionists who had criticized him, and no doubt to the editor of the *Monitor* as well, Ulrich wrote back to say that he was "heartened" by the criticism, and added:

Initially my research was prompted by the desire to understand and help solve the problem of human aggression, but I later discovered that the results of my work did not seem to justify its continuance. Instead I began to wonder if perhaps financial rewards, professional prestige, the opportunity to travel, etc. were the maintaining factors, and if we of the scientific community (supported by our

bureaucratic and legislative system) were actually a part of the problem.[99]

Don Barnes, who as we saw had a similar change of mind about his work irradiating trained monkeys for the U.S. Air Force, calls the process Ulrich describes "conditioned ethical blindness." In other words, just as a rat can be conditioned to press a lever in return for a reward of food, so a human being can be conditioned by professional rewards to ignore the ethical issues raised by animal experiments. As Barnes says:

I represented a classic example of what I choose to call "conditioned ethical blindness." My entire life had consisted of being rewarded for using animals, treating them as sources of human improvement or amusement.… During my sixteen years in the laboratory the morality and ethics of using laboratory animals were never broached in either formal or informal meetings prior to my raising the issues during the waning days of my tenure as a vivisector.[100]

It is not only the experimenters themselves who suffer from conditioned ethical blindness. Research institutions sometimes answer critics by telling them that they employ a veterinarian to look after the animals. Such statements are supposed to provide reassurance, because of the widespread belief that all veterinarians are people who care about animals and would never let them suffer unnecessarily. Regrettably, this is not the case. No doubt many veterinarians did go into the field because they cared about animals, but it is difficult for people who really care about animals to go through a course of study in veterinary medicine without having their sensitivity to animal suffering blunted. Those who care most

may not be able to complete their studies. One former veterinary student wrote to an animal welfare organization:

My life-long dream and ambition to become a veterinarian dissipated following several traumatic experiences involving standard experimental procedures utilized by the dispassionate instructors of the Pre-Vet school at my state university. They felt it was perfectly acceptable to experiment with and then terminate the lives of all the animals they utilized, which I found revoltingly unacceptable to my own moral code. After numerous confrontations with these heartless vivisectionists, I painfully decided to pursue a different career.[101]

In 1966, when moves were being made to pass legislation to protect laboratory animals, the American Veterinary Medical Association testified to congressional committees that while it favored legislation to stop the stealing of pets for subsequent sale to laboratories, it was opposed to the licensing and regulation of research facilities, since this could interfere with research. The basic attitude of the profession was, as an article in the *Journal of the American Veterinary Medical Association* put it, that "the raison d'être of the veterinary profession is the over-all well-being of man—not lower animals."[102] Once the implications of this fine example of speciesism have been grasped, it should surprise no one to learn that veterinarians were part of the experimental teams that performed many of the experiments listed in this chapter. For just one example, look back to the description on p. 27 of the Primate Equilibrium Platform experiment involving exposure to the nerve gas agent, soman. The report from which this description is drawn states: "Routine care of the

animals was provided by the Veterinary Sciences Division, USAF School of Aerospace Medicine."

Throughout America, veterinarians are standing by providing "routine care" for animals who are being needlessly abused. Is this what the veterinary profession stands for? (There is some hope for the vets, however, because a new organization of veterinarians has been established to provide support for practitioners and students with ethical concerns about the treatment of nonhuman animals.[103])

Once a pattern of animal experimentation becomes the accepted mode of research in a particular field, the process is self-reinforcing and difficult to break out of. Not only publications and promotions but also the awards and grants that finance research become geared to animal experiments. A proposal for a new experiment with animals is something that the administrators of research funds will be ready to support, if they have in the past supported other experiments on animals. New methods that do not make use of animals will seem less familiar and will be less likely to receive support.

All this helps to explain why it is not always easy for people outside the universities to understand the rationale for the research
carried out under university auspices. Originally, perhaps, scholars and researchers just set out to solve the most important problems and did not allow themselves to be influenced by other considerations. No doubt some are still motivated by these concerns. Too often, though, academic research gets bogged down in petty and insignificant details because the big questions have been studied already and they have either been solved or proven too difficult. So the

researchers turn away from the well-plowed fields in search of new territory where whatever they find will be new, although the connection with a major problem may be remote. It is not uncommon, as we have seen, for experimenters to admit that similar experiments have been done many times before, but without this or that minor variation; and the most common ending to a scientific publication is "further research is necessary."

When we read reports of experiments that cause pain and are apparently not even intended to produce results of real significance, we are at first inclined to think that there must be more to what is being done than we can understand—that the scientists must have some better reason for what they are doing than their reports indicate. When I describe such experiments to people or quote directly from the researchers' own published reports, the most common reaction I get is puzzlement and skepticism. When we go more deeply into the subject, however, we find that what appears trivial on the surface very often really is trivial. Experimenters themselves often unofficially admit this. H. F. Harlow, whose experiments we encountered at the beginning of this chapter, was for twelve years the editor of the *Journal of Comparative and Physiological Psychology*, a journal that has published more reports of painful experiments on animals than almost any other. At the end of this period, in which Harlow estimated he reviewed about 2,500 manuscripts submitted for publication, he wrote, in a semihumorous farewell note, that "most experiments are not worth doing and the data attained are not worth publishing."[104]

We shouldn't be surprised by this. Researchers, even those in psychology, medicine, and the biological sciences, are human

beings and are susceptible to the same influences as any other human beings. They like to get on in their careers, to be promoted, and to have their work read and discussed by their colleagues
. Publishing papers in the appropriate journals is an important element in the rise up the ladder of promotion and increased prestige. This happens in every field, in philosophy or history as much as in psychology or medicine, and it is entirely understandable and in itself hardly worth criticizing. The philosophers and historians who publish to improve their career prospects do little harm beyond wasting paper and boring their colleagues; those whose work involves experimenting on animals, however, can cause severe pain or prolonged suffering. Their work should therefore be subject to much stricter standards of necessity.

The government agencies in the United States, Britain, and elsewhere that promote research in the biological sciences have become the major backers of experiments on animals. Indeed, public funds, derived from taxation, have paid for the vast majority of the experiments described in this chapter. Many of these agencies are paying for experiments that have only the remotest connections with the purposes for which the agencies were set up. In the preceding pages I have described experiments that were funded by the United States National Institutes of Health, the Alcohol, Drug Abuse and Mental Health Administration, the Federal Aviation Administration, the Defense Department, the National Science Foundation, the National Aeronautics and Space Administration, and others. It is not easy to understand why the U.S. Army should be paying for a study of the urine spreading patterns of heated, drugged rats or why the U.S. Public Health Service

should wish to give out money so that elephants can be given LSD.

Since these experiments are paid for by government agencies, it is hardly necessary to add that there is no law that prevents the scientist from carrying them out. There are laws that prevent ordinary people from beating their dogs to death, but in the United States scientists can do the same thing with impunity, and with no one to check whether their doing so is likely to lead to benefits that would not occur from an ordinary beating. The reason for this is that the strength and prestige of the scientific establishment, supported by the various interest groups—including those
who breed animals for sale to laboratories—have been sufficient to stop attempts at effective legal control.

Robert J. White of the Cleveland Metropolitan General Hospital is an experimenter who has specialized in transplanting the heads of monkeys and keeping these monkey heads alive in fluid after they have been totally detached from their bodies. He is a perfect example of the scientist who thinks of a laboratory animal as a "tool for research"—in fact he has himself said that the main purpose of his work on decapitated monkey heads is "to offer a living laboratory tool" for research on the brain. The reporter to whom he made this statement found the visit to White's laboratory "a rare and chilling glimpse into the cold, clinical world of the scientist, where the life of an animal has no meaning beyond the immediate purpose of experimentation."[105]

In White's view, "the inclusion of animals in our ethical system is philosophically meaningless and operationally

impossible."[106] In other words, White sees himself as under no ethical constraints in regard to what he does to animals. Hence it is not surprising that another reporter interviewing him should have found that White "chafes at regulations, whether from hospital administrators or insurers. 'I'm an elitist,' he says. He believes doctors should be governed by their peers."[107]

Another active opponent of government regulations is David Baltimore, a professor at Massachusetts Institute of Technology and a Nobel laureate. In a recent address to the national meeting of the American Association for the Advancement of Science he referred to the "long hours" that he and his colleagues had spent fighting regulation of their research.[108] The basis for Baltimore's opposition to such regulation was made clear some years earlier, when he appeared on a television program with Harvard philosopher Robert Nozick and other scientists. Nozick asked the scientists whether the fact that an experiment will kill hundreds of animals is ever regarded, by scientists, as a reason for not performing it. One of the scientists answered: "Not that I know of." Nozick pressed his question: "Don't the animals count at all?" A scientist countered: "Why should they?" At this point Baltimore interjected that he did not think that experimenting on animals raised a moral issue at all.[109]

Men like White and Baltimore may be brilliant scientists, but their utterances on animals show that they are philosophical ignoramuses. I know of not a single professional philosopher writing today who would agree that it is "meaningless" or "impossible" to include animals in our ethical system or that experimenting on animals raises no moral issue. Such

statements are, in philosophy, comparable to maintaining that the earth is flat.

American scientists have, so far, been extraordinarily intransigent about public oversight of what they do to animals. They have been successful in squelching even minimal regulations to protect animals from suffering in experiments. In the United States, the only federal law on the matter is the Animal Welfare Act. The law sets the standards for the transportation, housing, and handling of animals sold as pets, exhibited, or intended for use in research. So far as actual experimentation is concerned, however, it allows the researchers to do exactly as they please. This is quite deliberate: the reason given by the U.S. Congress Conference Committee when the act was passed was

to provide protection for the researcher in this matter by exempting from regulations all animals during actual research or experimentation.… It is not the intention of the committee to interfere in any way with research or experimentation.[110]

One section of the law requires that those private businesses and other organizations that register under the act (neither government agencies doing research nor many smaller facilities have to register) must file a report stating that when painful experiments were performed without the use of pain-relieving drugs, this was necessary to achieve the objectives of the research project. No attempt is made to assess whether these "objectives" are sufficiently important to justify inflicting pain. Under these circumstances the requirement does no more than make additional paperwork, and this is a major complaint among experimenters. They can't, of course, give dogs the continual electric shocks that will produce a

state of helplessness if they anesthetize them at the same time; nor can they produce depression in monkeys while keeping them happy or oblivious with drugs. So in such cases they can truthfully state that the objectives of the experiment cannot be achieved if pain-relieving drugs are used, and then go on with the experiment as they would have done before the act came into existence.

So we should not be surprised that, for instance, the report of the Primate Equilibrium Platform experiment with soman should be prefaced with the following statement:

The animals involved in this study were procured, maintained, and used in accordance with the Animal Welfare Act and the "Guide for the Care and Use of Laboratory Animals" prepared by the Institute of Laboratory Animal Resources-National Research Council.

In fact the same statement appears on the Brooks Air Force Base Training manual for the Primate Equilibrium Platform, on the report of the Armed Forces Radiobiology Research Institute's "primate activity wheel" experiment, and on many other recent American publications from which I have quoted. The statement tells us nothing at all about how much the animals suffered, nor about how trivial the purpose for which they suffered may have been; but it tells us a great deal about the value of the Animal Welfare Act and of the "Guide for the Care and Use of Laboratory Animals" prepared by the National Research Council's Institute of Laboratory Animal Resources.

The complete absence of effective regulation in the United States is in sharp contrast to the situation in many other

developed nations. In Britain, for example, no experiment can be conducted without a license granted by the secretary of state for home affairs, and the Animals (Scientific Procedures) Act, 1986, expressly directs that in determining whether to grant a license for an experimental project, "the Secretary of State shall weigh the likely adverse effects on the animals concerned against the benefit likely to accrue." In Australia, the Code of Practice developed by the leading governmental scientific bodies (equivalent to the National Institutes of Health in the United States) requires that all experiments must be approved by an Animal Experimentation Ethics Committee. These committees must include a person with an interest in animal welfare who is not employed by the institution conducting the experiment, and an additional independent person not involved in animal experimentation. The
committee must apply a detailed set of principles and conditions that include an instruction to weigh the scientific or educational value of the experiment against the potential effects on the welfare of animals. In addition, anesthesia must be used if the experiment "may cause pain of a kind and degree for which anesthesia would normally be used in medical or veterinary practice." The Australian Code of Practice applies to all researchers obtaining government grants, and under state law is binding on all experimenters in Victoria, New South Wales, and South Australia.[111] Sweden also requires experiments to be approved by committees that include lay members. In 1986, after surveying the laws in Australia, Canada, Japan, Denmark, Germany, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom, the U.S. Congress Office of Technology Assessment concluded:

Most of the countries examined for this assessment have laws far more protective of experimental animals than those in the United States. Despite these protections, animal welfare advocates have been applying considerable pressure for even stronger laws, and many countries, including Australia, Switzerland, West Germany, and the United Kingdom, are considering major changes.[112]

Stronger laws have in fact already been passed in Australia and the United Kingdom since that statement was made.

I hope this comparison will not be misunderstood. It is not intended to show that all is well with animal experimentation in countries like the United Kingdom and Australia. That would be far from the truth. In those countries the "balancing" of potential benefits against harm to the animals is still carried out within the assumption of a speciesist attitude to animals, thus rendering it impossible for the interests of animals to be given equal consideration with similar interests of humans. I have compared the situation in the United States with that in other countries only in order to show that American standards in this matter are abysmal, not just by the standards of animal liberationists, but by those accepted by the scientific communities of other major developed nations. It would be salutary for United States scientists to see themselves as their colleagues in other countries see them.

At medical and scientific conferences I attend in Europe and Australia, I am frequently taken aside by scientists who tell me that they may not agree with all my views about animal experimentation, but … and then they tell me, with genuine horror in their voice, about something they saw during their last trip to the United States. No wonder that in the respected

British science magazine *New Scientist*, a writer recently described the United States as "a country which, as reflected in its legislation to protect animals, seems to be a nation of barbarians."[113] As the United States lagged behind the civilized world in outlawing human slavery, so the United States now lags behind in softening the unrestrained brutalities of animal slavery.

Minor amendments to the United States Animal Welfare Act in 1985 improved exercise requirements for dogs and housing for primates, but failed to deal with the real issue of control over what happens during an experiment. The amendments set up institutional animal committees, but in keeping with the unchanged exemption from interference given to the experiments themselves, these committees have no authority over what goes on in the experiments.[114]

In any case, despite the fact that the Animal Welfare Act was passed more than twenty years ago, its enforcement is virtually nil. For a start, the secretary of agriculture has never even issued regulations extending the act's provisions to mice, rats, birds, and farm animals used in research. Presumably this is because the Department of Agriculture does not even have enough inspectors to check on the conditions of such animals as dogs, cats, and monkeys, let alone birds, rats, mice, and farm animals. As the Office of Technology Assessment said, "funds and personnel for enforcement have never lived up to the expectations of those who believe the primary mission of the existing law to be the prevention or alleviation of experimental animal suffering." OTA staff checked one list of 112 testing facilities, and found that 39 percent were not even registered with the branch of the Department of Agriculture that inspects laboratories.

Moreover, the OTA report states that this is probably a conservative estimate of the real number of unregistered, and hence totally uninspected and uncontrolled, animal laboratories.[115]

The United States regulation of animal experimentation is now a continuing farce: there is a law that on its face applies to
all warm-blooded laboratory animals, but it can be put into effect only by regulations that, in the words of the Office of Technology Assessment, "probably do not affect a substantial percentage of animals used for experimental purposes." The OTA went on to say that this exclusion of many species from the protection of the act "appears to frustrate the intent of Congress and to be beyond the Secretary of Agriculture's statutory authority."[116] These are strong words for the usually restrained OTA—but three years later, nothing at all has been done to change the situation. Indeed, a 1988 report by a blue ribbon panel of American scientists considered, but rejected, a recommendation that the regulations be extended to cover all warmblooded animals. No reason was given for this rejection: it stands as another example of the obstructionist attitude of United States scientists to the most elementary improvements in the conditions of the animals they use.[117]

So the farce shows no sign of coming to an end. The trouble is that it is decidedly unfunny. There is no reason to believe that rats and mice are less sensitive to pain and suffering, or less in need of minimum standards for housing and transport, than guinea pigs, hamsters, rabbits, or many other animals.

In descriptions of experiments in this chapter up to now, I have limited myself to summarizing the reports written by the

experimenters themselves and published in the scientific journals. That evidence cannot be accused of being exaggerated. But because of the total lack of any adequate inspection or scrutiny of what happens in experiments, the reality is often much worse than the published account. This became clear in 1984 in the case of experiments conducted by Thomas Gennarelli at the University of Pennsylvania. The aim of the experiments was to inflict head injuries on monkeys, and then examine the nature of the damage to the brain. According to the official grant documents the monkeys were to be anesthetized before receiving the head injury. Thus it would seem that the experiments involved no suffering. But members of a group called the Animal Liberation Front had other information. They had also learned that Gennarelli videotaped his experiments. They broke into the laboratory and stole
the tapes. When they viewed them, they saw conscious, unanesthetized baboons struggling as they were being strapped down before the head injuries were inflicted. They saw animals writhing, apparently coming out of anesthesia, as surgeons were operating on their exposed brains. They also heard the experimenters mocking and laughing at frightened, suffering animals. The videotapes were so damning that—though it took more than a year of hard work by the Washington-based group People for the Ethical Treatment of Animals and hundreds of animal activists—the secretary of health and human services stopped Gennarelli's funding.[118]
Since then, other examples have come to light, based usually on information provided by someone working in the laboratory who has blown the whistle, at the cost of his or her job. In 1986, for instance, Leslie Fain, an animal care technician at Gillette's testing laboratory in Rockville, Maryland, resigned her job and gave Animal Liberationists

photos she had taken inside the laboratory. The photos showed Gillette testing new formulations of pink and brown inks for its Paper Mate pens by putting them in the eyes of conscious rabbits. The inks turned out to be extremely irritating, and caused a bloody discharge from the eye in some rabbits.[119] One can only guess at how many laboratories there are in which the abuse of animals is just as bad, but no one has been courageous enough to do anything about it.

When are experiments on animals justifiable? Upon learning of the nature of many of the experiments carried out, some people react by saying that all experiments on animals should be prohibited immediately. But if we make our demands as absolute as this, the experimenters have a ready reply: Would we be prepared to let thousands of humans die if they could be saved by a single experiment on a single animal?

This question is, of course, purely hypothetical. There has never been and never could be a single experiment that saved thousands of lives. The way to reply to this hypothetical question is to pose another: Would the experimenters be prepared to carry out their experiment on a human orphan under six months old if that were the only way to save thousands of lives?

If the experimenters would not be prepared to use a human infant then their readiness to use nonhuman animals reveals an unjustifiable form of discrimination on the basis of species, since
adult apes, monkeys, dogs, cats, rats, and other animals are more aware of what is happening to them, more self-directing, and, so far as we can tell, at least as sensitive to pain as a human infant. (I have specified that the human

infant be an orphan, to avoid the complications of the feelings of parents. Specifying the case in this way is, if anything, overgenerous to those defending the use of nonhuman animals in experiments, since mammals intended for experimental use are usually separated from their mothers at an early age, when the separation causes distress for both mother and young.)

So far as we know, human infants possess no morally relevant characteristic to a higher degree than adult nonhuman animals, unless we are to count the infants' potential as a characteristic that makes it wrong to experiment on them. Whether this characteristic should count is controversial—if we count it, we shall have to condemn abortion along with experiments on infants, since the potential of the infant and the fetus is the same. To avoid the complexities of this issue, however, we can alter our original question a little and assume that the infant is one with irreversible brain damage so severe as to rule out any mental development beyond the level of a six-month-old infant. There are, unfortunately, many such human beings, locked away in special wards throughout the country, some of them long since abandoned by their parents and other relatives, and, sadly, sometimes unloved by anyone else. Despite their mental deficiencies, the anatomy and physiology of these infants are in nearly all respects identical with those of normal humans. If, therefore, we were to force-feed them with large quantities of floor polish or drip concentrated solutions of cosmetics into their eyes, we would have a much more reliable indication of the safety of these products for humans than we now get by attempting to extrapolate the results of tests on a variety of other species. The LD50 tests, the Draize eye tests, the radiation experiments, the heatstroke experiments, and many

others described earlier in this chapter could have told us more about human reactions to the experimental situation if they had been carried out on severely brain-damaged humans instead of dogs or rabbits.

So whenever experimenters claim that their experiments are important enough to justify the use of animals, we should ask them whether they would be prepared to use a brain-damaged human being at a similar mental level to the animals they are planning to use. I cannot imagine that anyone would seriously propose carrying out the experiments described in this chapter on brain-damaged human beings. Occasionally it has become known that medical experiments have been performed on human beings without their consent; one case did concern institutionalized intellectually disabled children, who were given hepatitis.[120] When such harmful experiments on human beings become known, they usually lead to an outcry against the experimenters, and rightly so. They are, very often, a further example of the arrogance of the research worker who justifies everything on the grounds of increasing knowledge. But if the experimenter claims that the experiment is important enough to justify inflicting suffering on animals, why is it not important enough to justify inflicting suffering on humans at the same mental level? What difference is there between the two? Only that one is a member of our species and the other is not? But to appeal to that difference is to reveal a bias no more defensible than racism or any other form of arbitrary discrimination.

The analogy between speciesism and racism applies in practice as well as in theory in the area of experimentation. Blatant speciesism leads to painful experiments on other species, defended on the grounds of their contribution to

knowledge and possible usefulness for our species. Blatant racism has led to painful experiments on other races, defended on the grounds of their contribution to knowledge and possible usefulness for the experimenting race. Under the Nazi regime in Germany, nearly two hundred doctors, some of them eminent in the world of medicine, took part in experiments on Jews and Russian and Polish prisoners. Thousands of other physicians knew of these experiments, some of which were the subject of lectures at medical academies. Yet the records show that the doctors sat through verbal reports by doctors on how horrible injuries were inflicted on these "lesser races," and then proceeded to discuss the medical lessons to be learned from them, without anyone making even a mild protest about the nature of the experiments. The parallels between this attitude and that of experimenters today toward animals are striking. Then, as now, subjects were frozen, heated, and put in decompression chambers. Then, as now, these events were written up in dispassionate scientific jargon. The following
paragraph is taken from a report by a Nazi scientist of an experiment on a human being, placed in a decompression chamber:

After five minutes spasms appeared; between the sixth and tenth minute respiration increased in frequency, the TP [test person] losing consciousness. From the eleventh to the thirtieth minute respiration slowed down to three inhalations per minute, only to cease entirely at the end of that period.… About half an hour after breathing ceased, an autopsy was begun.[121]

Decompression chamber experimentation did not stop with the defeat of the Nazis. It shifted to nonhuman animals. At the

University of Newcastle on Tyne, in England, for instance, scientists used pigs. The pigs were subjected to up to eighty-one periods of decompression over a period of nine months. All suffered attacks of decompression sickness, and some died from these attacks.[122] The example illustrates only too well what the great Jewish writer Isaac Bashevis Singer has written: "In their behavior towards creatures, all men [are] Nazis."[123]

Experimentation on subjects outside the experimenters' own group is a story that constantly repeats itself with different victims. In the United States the most notorious twentieth-century instance of human experimentation was the deliberate nontreatment of syphilis patients at Tuskegee, Alabama, so that the natural course of the disease could be observed. This was continued long after penicillin was shown to be an effective treatment for syphilis. The untreated victims of the experiment were, of course, blacks.[124] Perhaps the major international human experimentation scandal of the past decade came to light in New Zealand in 1987. A respected doctor at a leading Auckland hospital decided not to treat patients with early signs of cancer. He was trying to prove his unorthodox theory that this form of cancer would not develop, but he did not tell the patients that they were part of an experiment. His theory was wrong, and twenty-seven of his patients died. This time the victims were women.[125]

When such events come to light, the public reaction makes it clear that our sphere of moral concern is wider than that of the Nazis, and we are no longer prepared to countenance a lesser degree of concern for other human beings; but there are still many sentient beings for whom we appear to have no real concern at all.

We have still not answered the question of when an experiment might be justifiable. It will not do to say "Never!" Putting morality in such black-and-white terms is appealing, because it eliminates the need to think about particular cases; but in extreme circumstances, such absolutist answers always break down. Torturing a human being is almost always wrong, but it is not absolutely wrong. If torture were the only way in which we could discover the location of a nuclear bomb hidden in a New York City basement and timed to go off within the hour, then torture would be justifiable. Similarly, if a single experiment could cure a disease like leukemia, that experiment would be justifiable. But in actual life the benefits are always more remote, and more often than not they are nonexistent. So how do we decide when an experiment is justifiable?

We have seen that experimenters reveal a bias in favor of their own species whenever they carry out experiments on nonhumans for purposes that they would not think justified them in using human beings, even brain-damaged ones. This principle gives us a guide toward an answer to our question. Since a speciesist bias, like a racist bias, is unjustifiable, an experiment cannot be justifiable unless the experiment is so important that the use of a brain-damaged human would also be justifiable.

This is not an absolutist principle. I do not believe that it could never be justifiable to experiment on a brain-damaged human. If it really were possible to save several lives by an experiment that would take just one life, and there were no other way those lives could be saved, it would be right to do the experiment. But this would be an extremely rare case. Certainly none of the experiments described in this chapter

could pass this test. Admittedly, as with any dividing line, there would be a gray area where it was difficult to decide if an experiment could be justified. But we need not get distracted by such considerations now. As this chapter has shown, we are in the midst of an emergency in which appalling suffering is being inflicted on millions of animals for purposes that on any impartial view are obviously inadequate to justify the suffering. When we have ceased to carry out all those experiments, then there will be time enough to discuss what to do about the remaining ones which are claimed to be essential to save lives or prevent greater suffering.

In the United States, where the present lack of control over experimentation allows the kinds of experiments described in the preceeding pages, a minimal first step would be a requirement that no experiment be conducted without prior approval from an ethics committee that includes animal welfare representatives and is authorized to refuse approval to experiments when it does not consider that the potential benefits outweigh the harm to the animals. As we have seen, systems of this kind already exist in countries such as Australia and Sweden and are accepted as fair and reasonable by the scientific community there. On the basis of the ethical arguments in this book, such a system falls far short of the ideal. The animal welfare representatives on such committees come from groups that hold a spectrum of views, but, for obvious reasons, those who receive and accept invitations to join animal experimentation ethics committees tend to come from the less radical groups within the movement. They may not themselves regard the interests of nonhuman animals as entitled to equal consideration with the interests of humans; or if they do hold such a position, they may find it impossible

to put it into practice when judging applications to perform animal experiments, because they would be unable to persuade other members of the committee. Instead, they are likely to insist on proper consideration of alternatives, genuine efforts to minimize pain, and a clear demonstration of significant potential benefits, sufficiently important to outweigh any pain or suffering that cannot be eliminated from the experiment. An animal experimentation ethics committee operating today would almost inevitably apply these standards in a speciesist manner, weighing animal suffering more lightly than potential comparable human benefit; even so, an emphasis on such standards would eliminate many painful experiments now permitted and would reduce the suffering caused by others.

In a society that is fundamentally speciesist, there is no quick solution to such difficulties with ethics committees. For this reason some Animal Liberationists will have nothing to do with them. Instead they demand the total and immediate elimination of all animal experimentation. Such demands have been put forward many times during the last century and a half of antivivisection
activity, but they have shown no sign of winning over the majority of voters in any country. Meanwhile the number of animals suffering in laboratories continued to grow, until the recent breakthroughs described earlier in this chapter. These breakthroughs resulted from the work of people who found a way around the “all or nothing” mentality that had effectively meant “nothing” as far as the animals were concerned.

One reason the demand for immediate abolition of animal experimentation has failed to persuade the public is that experimenters respond that to accept this demand is to give up

the prospect of finding a cure for major diseases that still kill us and our children. In the United States, where experimenters can do virtually as they please with animals, one way of making progress might be to ask those who use this argument to defend the need for animal experiments whether they would be prepared to accept the verdict of an ethics committee that, like those in many other countries, includes animal welfare representatives and is entitled to weigh the costs to the animals against the possible benefits of the research. If the answer is no, the defense of animal experimentation by reference to the need to cure major diseases has been proved to be simply a deceitful distraction that serves to mislead the public about what the experimenters want: permission to do whatever they like with animals. For otherwise why would the experimenter not be prepared to leave the decision on carrying out the experiment to an ethics committee, which would surely be as keen to see major diseases ended as the rest of the community? If the answer is yes, the experimenter should be asked to sign a statement asking for the creation of such an ethics committee.

Suppose that we were able to go beyond minimal reforms of the sort that already exist in the more enlightened nations. Suppose we could reach a point at which the interests of animals really were given equal consideration with the similar interests of human beings. That would mean the end of the vast industry of animal experimentation as we know it today. Around the world, cages would empty and laboratories would close down. It should not be thought, though, that medical research would grind to a
halt or that a flood of untested products would come on to the market. So far as new products are concerned it is true, as I have already said, that we would have to make do with fewer

of them, using ingredients already known to be safe. That does not seem to be any great loss. But for testing really essential products, as well as for other kinds of research, alternative methods not requiring animals can and would be found.

In the first edition of this book I wrote that "scientists do not look for alternatives simply because they do not care enough about the animals they are using." Then I made a prediction: "Considering how little effort has been put into this field, the early results promise much greater progress if the effort is stepped up." In the past decade, both these statements have proved true. We have already seen that in product testing there has been a huge increase in the amount of effort put into looking for alternatives to animal experiments—not because scientists have suddenly started to care more about animals, but as a result of hard-fought campaigns by Animal Liberationists. The same thing could happen in many other fields of animal experimentation.

Although tens of thousands of animals have been forced to inhale tobacco smoke for months and even years, the proof of the connection between tobacco use and lung cancer was based on data from clinical observations in human beings.[126] The United States government continues to pour billions of dollars into research on cancer, while it also subsidizes the tobacco industry. Much of the research money goes toward animal experiments, many of them only remotely connected with fighting cancer—experimenters have been known to relabel their work "cancer research" when they found they could get more money for it that way than under some other label. Meanwhile we are continuing to lose the fight against most forms of cancer. Figures released in 1988 by the United

States National Cancer Institute show that the overall rate of cancer, even when adjusted for the increasing age of the population, has been rising at about 1 percent per year for thirty years. Recent reports of a decline in lung cancer rates among younger Americans may be the first sign of a reversal in this trend, since lung cancer causes more deaths than any other form of cancer. If lung cancer is declining, however, this welcome news is not the result of any improvement in treatment but of
younger people, especially white males, smoking less. Lung cancer survival rates have scarcely changed.[127] We know that smoking causes between 80 and 85 percent of all lung cancer cases. We must ask ourselves: Can we justify forcing thousands of animals to inhale cigarette smoke so that they develop lung cancer, when we know we could virtually wipe out the disease by eliminating the use of tobacco? If people decide to continue to smoke, knowing that by doing so they risk lung cancer, is it right to make animals suffer the cost of this decision?

Our poor record in the treatment of lung cancer is matched in cancer treatment more generally. Although there have been successes in treating some specific cancers, since 1974 the number of people surviving for five years or more after cancer has been diagnosed has increased by less than 1 percent.[128] Prevention, particularly through educating people to lead healthier lives, is a more promising approach.

More and more scientists are now appreciating that animal experimentation often actually hinders the advance of our understanding of diseases in humans and their cure. For example, researchers at the National Institute of Environmental Health Sciences, in North Carolina, recently

warned that animal tests may fail to pick up chemicals that cause cancer in people. Exposure to arsenic seems to increase the risk that a person will develop cancer, but it does not have this effect in laboratory tests on animals.[129] A malaria vaccine developed in the United States in 1985 at the prestigious Walter Reed Army Institute of Research worked in animals, but proved largely ineffective in humans; a vaccine developed by Colombian scientists working with human volunteers has proven more effective.[130] Nowadays defenders of animal research often talk about the importance of finding a cure for AIDS; but Robert Gallo, the first American to isolate HIV (the AIDS virus), has said that a potential vaccine developed by the French researcher Daniel Zagury had shown itself to be more effective in stimulating HIV antibody production in human beings than in animals; and he added: "The results in chimps haven't been too exciting.… Maybe we should go into testing in man more aggressively."[131] Significantly, people with AIDS have endorsed this call: "Let us be your guinea pigs," pleaded gay activist Larry Kramer.[132] Obviously this plea makes sense. A cure will be found faster if experimentation is done directly on human volunteers; and because of
the nature of the disease, and the strong bonds between many members of the gay community, there is no shortage of volunteers. Care needs to be taken, of course, that those volunteering genuinely understand what they are doing and are under no pressure or coercion to take part in an experiment. But it would not be unreasonable to give such consent. Why should people be dying from an invariably fatal disease while a potential cure is tested on animals who do not normally develop AIDS anyway?

The defenders of animal experimentation are fond of telling us that animal experimentation has greatly increased our life expectancy. In the midst of the debate over reform of the British law on animal experimentation, for example, the Association of the British Pharmaceutical Industry ran a full-page advertisement in the *Guardian* under the headline "They say life begins at forty. Not so long ago, that's about when it ended." The advertisement went on to say that it is now considered to be a tragedy if a man dies in his forties, whereas in the nineteenth century it was commonplace to attend the funeral of a man in his forties, for the average life expectancy was only forty-two. The advertisement stated that "it is thanks largely to the breakthroughs that have been made through research which requires animals that most of us are able to live into our seventies."

Such claims are simply false. In fact, this particular advertisement was so blatantly misleading that a specialist in community medicine, Dr. David St. George, wrote to *The Lancet* saying "the advertisement is good teaching material, since it illustrates two major errors in the interpretation of statistics." He also referred to Thomas McKeown's influential book *The Role of Medicine*, published in 1976,[133] which set off a debate about the relative contributions of social and environmental changes, as compared with medical intervention, in improvements in mortality since the mid-nineteenth century; and he added:

This debate has been resolved, and it is now widely accepted that medical interventions had only a marginal effect on population mortality and mainly at a very late stage, after death rates had already fallen strikingly.[134]

J. B. and S. M. McKinley reached a similar conclusion in a study of the decline of ten major infectious diseases in the United
States. They showed that in every case except poliomyelitis the death rate had already fallen dramatically (presumably because of improved sanitation and diet) before any new form of medical treatment was introduced. Concentrating on the 40 percent fall in crude mortality in the United States between 1910 and 1984, they estimated "conservatively" that

perhaps 3.5 percent of the fall in the overall death rate can be explained through medical interventions for the major infectious diseases. Indeed, given that it is precisely for these diseases that medicine claims most success in lowering mortality, 3.5 percent probably represents a reasonable upper-limit estimate of the total contribution of medical measures to the decline in infectious disease mortality in the United States.[135]

Remember that this 3.5 percent is a figure for all medical intervention. The contribution of animal experimentation itself can be, at most, only a fraction of this tiny contribution to the decline in mortality.

No doubt there are some fields of scientific research that will be hampered by any genuine consideration of the interests of animals used in experimentation. No doubt there have been some advances in knowledge which would not have been attained as easily without using animals. Examples of important discoveries often mentioned by those defending animal experimentation go back as far as Harvey's work on the circulation of blood. They include Banting and Best's discovery of insulin and its role in diabetes; the recognition of

poliomyelitis as a virus and the development of a vaccine for it; several discoveries that served to make open heart surgery and coronary artery bypass graft surgery possible; and the understanding of our immune system and ways to overcome rejection of transplanted organs.[136] The claim that animal experimentation was essential in making these discoveries has been denied by some opponents of experimentation.[137] I do not intend to go into the controversy here. We have just seen that any knowledge gained from animal experimentation has made at best a very small contribution to our increased lifespan; its contribution to improving the quality of life is more difficult to estimate. In a more fundamental sense, the controversy over the benefits derived from animal experimentation is essentially unresolvable
, because even if valuable discoveries were made using animals, we cannot say how successful medical research would have been if it had been compelled, from the outset, to develop alternative methods of investigation. Some discoveries would probably have been delayed, or perhaps not made at all; but many false leads would also not have been pursued, and it is possible that medicine would have developed in a very different and more efficacious direction, emphasizing healthy living rather than cure.

In any case, the ethical question of the justifiability of animal experimentation cannot be settled by pointing to its benefits for us, no matter how persuasive the evidence in favor of such benefits may be. The ethical principle of equal consideration of interests will rule out some means of obtaining knowledge. There is nothing sacred about the right to pursue knowledge. We already accept many restrictions on scientific enterprise. We do not believe that scientists have a general right to perform painful or lethal experiments on human beings

without their consent, although there are many cases in which such experiments would advance knowledge far more rapidly than any other method. Now we need to broaden the scope of this existing restriction on scientific research.

Finally, it is important to realize that the major health problems of the world largely continue to exist, not because we do not know how to prevent disease and keep people healthy, but because no one is putting enough effort and money into doing what we already know how to do. The diseases that ravage Asia, Africa, Latin America, and the pockets of poverty in the industrialized West are diseases that, by and large, we know how to cure. They have been eliminated in communities that have adequate nutrition, sanitation, and health care. It has been estimated that 250,000 children die each week around the world, and that one quarter of these deaths are by dehydration caused by diarrhea. A simple treatment, already known and needing no animal experimentation, could prevent the deaths of these children.[138] Those who are genuinely concerned about improving health care would probably make a more effective contribution to human health if they left the laboratories and saw to it that our existing stock of medical knowledge reached those who need it most.

When all this has been said, there still remains the practical question: What can be done to change the widespread practice of
experimenting on animals? Undoubtedly, some action that will change government policies is needed, but what action precisely? What can the ordinary citizen do to help bring about change?

Legislators tend to ignore protests about animal experimentation from their constituents, because they are overly influenced by scientific, medical, and veterinary groups. In the United States, these groups maintain registered political lobbies in Washington, and they lobby hard against proposals to restrict experimentation. Since legislators do not have the time to acquire expertise in these fields, they rely on what the "experts" tell them. But this is a moral question, not a scientific one, and the "experts" usually have an interest in the continuation of experimentation or else are so imbued with the ethic of furthering knowledge that they cannot detach themselves from this stance and make a critical examination of what their colleagues do. Moreover, professional public relations organizations have now emerged, such as the National Association for Biomedical Research, whose sole purpose is to improve the image of animal research with the public and with legislators. The association has published books, produced videotapes, and conducted workshops on how researchers should defend experimentation. Along with a number of similar organizations, it has prospered as more people have become concerned about the experimentation issue. We have already seen, in the case of another lobby group, the Association of the British Pharmaceutical Industry, how such groups can mislead the public. Legislators must learn that when discussing animal experimentation they have to treat these organizations, and also the medical, veterinary, psychological, and biological associations, as they would treat General Motors and Ford when discussing air pollution.

Nor is the task of reform made any easier by the large companies involved in the profitable businesses of breeding or trapping animals and selling them, or manufacturing and marketing the cages for them to live in, the food used to feed

them, and the equipment used to experiment on them. These companies are prepared to spend huge amounts of money to oppose legislation that will deprive them of their profitable markets. With financial interests like these allied to the prestige of medicine and science the struggle to end speciesism in the laboratory is bound to be difficult and protracted. What is the best way to make progress?

It does not seem likely that any major Western democracy is going to abolish all animal experimentation at a stroke. Governments just do not work like that. Animal experimentation will only be ended when a series of piecemeal reforms have reduced its importance, led to its replacement in many fields, and largely changed the public attitude to animals. The immediate task, then, is to work for these partial goals, which can be seen as milestones on the long march to the elimination of all exploitation of sentient animals. All concerned to end animal suffering can try to make known what is happening at universities and commercial laboratories in their own communities. Consumers can refuse to purchase products that have been tested on animals—especially in cosmetics, alternatives are now available. Students should decline to carry out experiments they consider unethical. Anyone can study the academic journals to find out where painful experiments are being carried out, and then find some way of making the public aware of what is happening.

It is also necessary to make the issue political. As we have already seen, legislators receive huge numbers of letters about animal experiments. But it has taken many years of hard work to make animal experimentation a political issue. Fortunately this has now started to happen in several countries. In Europe and Australia animal experimentation is being addressed

seriously by the political parties, especially those closer to the Green end of the political spectrum. In the 1988 United States presidential election, the Republican party platform said that the process of certifying alternatives to animal testing of drugs and cosmetics should be made simpler and quicker.

The exploitation of laboratory animals is part of the larger problem of speciesism and it is unlikely to be eliminated altogether until speciesism itself is eliminated. Surely one day, though, our children's children, reading about what was done in laboratories in the twentieth century, will feel the same sense of horror and incredulity at what otherwise civilized people could do that we now feel when we read about the atrocities of the Roman gladiatorial arenas or the eighteenth-century slave trade.