Experiments on Animals[*]

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> …most experiments are not worth doing and the data obtained are not worth publishing.
> —Prof. H. F. Harlow *(Journal of Comparative and Physiological Psychology,* 1962.)

In August 1970 Her Majesty's Stationery Office printed the Home Office "Return of Experiments performed under the Cruelty to Animals Act 1876 during 1969." It was recorded that 5,418,929 experiments were performed in that year. Of these, 4,743,609 were carried out without anaesthesia. Of the experiments performed with anaesthesia, 500,335 allowed recovery from the influence of the anaesthetic. There were 14,684 experiments performed on cats, and 17,160 on dogs. These experiments were performed by 9,252 out of a total of 13,791 licenses.

Over 900,000 experiments were performed on behalf of Government bodies, such as the Medical Research Council and the Ministry of Defence. Nearly a million and a half experiments were mandatory tests of drugs under the Diseases of Animals Act 1950 and the Therapeutic Substances Act 1956.

There are 605 places registered in Britain for the performance of experiments on living animals, calculated to cause pain. Registered laboratories were visited 2,850 times during the year by thirteen Home Office Inspectors. Twenty-three irregularities were reported.

In practice the Home Office considers the number of animals used may reasonably be assumed to be no more than the number of experiments returned. There is however no absolute rule on this issue.

The table below shows the rapid growth in the numbers of experiments performed since 1885.

Year	*Total Experiments*	*Number of Inspectors*
1885	*797*	1
1910	95,731	2
1920	70,367	3
1930	450,822	2
1939	954,691	3
1950	1,779,215	4
1960	3,701,184	5
1963	4,196,566	6
1967	4,755,680	8
1968	5,212,215	10
1969	5,418,929	13

Note:
It can be seen from figures that the Cruelty to Animals Act of 1876 was framed to control fewer than 800 experiments in a year, and the same unaltered Act is intended to control nearly 7,000 times that number of experiments today. Over the two years, 1967-1969, the number of experiments has increased at the average rate of 331,624

[*] 'Experiments on Animals', in S. & R. GODLOVITCH & J. HARRIS (eds.), *Animals, Men and Morals*, New York: Taplinger, 1972.

experiments per year.

In 1885 the ratio of Inspectors to the number of experiments was approximately 1 to 800. In 1969 the ratio was 1 to 416,000. The ratio of Inspectors' visits to the number of experiments performed is approximately 1 to 2,000.

These figures for the United Kingdom are given in detail because of their alleged accuracy. Few other countries publish official statistics on his issue. Estimates of the number of animal lives sacrificed annually in the laboratories of the USA range widely between 20,000,000 and 200,000,000. A report published in the *Journal of Surgical Research* June, 1967) estimated an annual turnover for American laboratories of approximately 250,000 monkeys, 100,000 cats and 250,000 dogs. (If, therefore, the ratio of dogs used to the total number of experiments is similar in the USA to that in the UK, then the American total for all animals used annually would be in the region of 80,000,000.)

The number of primates used is increasing so rapidly that at least line Asian and eight African primate species are considered to be threatened with extinction (International Union for the Conservation >f Nature Bulletin Vol. XII, p. 120). It is estimated that between four and nine chimpanzees are killed for every individual captured for research *(New Scientist,* April 23, 1970, p. 167). The Board of Trade reports that in 1966, 22,308 licences were issued for the importation of primates into the UK for experimental purposes (House of Commons, May 31, 1967) and it is recorded that the USA imported 1,500,000 rhesus monkeys in a period of only six years. It is calculated, therefore, that as men use not less than 250,000 monkeys and apes annually for biomedical research, a threat exists for the rarer species *(Biologist,* Vol. XVII, Jan. 1970).

Only approximately one quarter of active licensees publish the results of their experiments. The majority of experiments are unpublished apparently because the results are "inconclusive" or "insufficiently important." (Littlewood Report, p. 53, p. 166.)

Of those experiments performed by Government Departments in 1969, 148,848 were carried out at the Microbiological Research and Chemical Defence Establishment at Porton, Wiltshire, under the control of the Ministry of Defence.

Behind the Statistics

Although purely academic establishments probably do not account for as many experiments as do commercial enterprises, there is a tendency for an increasing number of different university departments to incorporate research on animals. Not only may there be animals kept in departments of Anatomy, Pathology, Pharmacology, Biochemistry, Physiology, Medicine and Veterinary Studies, but also, nowadays, in departments of Psychology, Zoology, Ecology, Forestry, and Agriculture.

In the field of Psychology the number of experiments is very large and many of these are of a disturbing sort. For example the papers published dealing with experiments on the brains of living animals (including cutting, coagulating, vacuum removal of brain tissue, electrical and chemical stimulation) reported in the international journal, *Psychological Abstracts,* now numbers about 700 in one year. As very few of these papers report on the use of less than ten animals and as it is known (in the UK) that only about one experiment in four is published it can be seen that the number of psychological experiments involving living brain operations is now very many each year.

Although an increasing number of monkeys are being used, it is the unfortunate and friendless laboratory rat which has been the psychologist's main victim. Professor P. L. Broadhurst

illustrates this when he reports that psychologists have blinded rats, then deafened them and finally eliminated their sense of smell in order to observe how they learn in a maze; "it was found that rats deprived in this way showed very little ability to learn." Broadhurst also reports that male rats were forced into homosexual behaviour with other rats "by keeping them on an electric grid and shocking them through the feet." (P. L. Broadhurst, *The Science of Animal Behaviour,* Penguin, 1963.)

Very many psychological experiments involve "punishment" of animals. As Dr. Keller Breland describes it, "the typical laboratory experiment involving punishment or threat of punishment is conducted in a very restricted area—a closed box or small pen. Sometimes the animal is even strapped down. A light or buzzer signals the onset of a shock— the most common 'punishment' in such experiments. When the shock is applied, the animal tries to escape, but if he is boxed in or tied down, he cannot do so." (Breland and Breland, *Animal Behaviour,* p. 63.)

In the majority of accounts there is no report of what happened to the animals after the experimental procedures were completed. Some papers use the word "sacrificed" sanctimoniously, others optimistically say "killed painlessly"—but just how painless is it to receive three or four blows of the head on the edge of a workbench, or an injection into the heart? (An eyewitness recently told me that in one Oxford laboratory rats were killed "humanely" by being swiftly disembowelled.)

Similarly misleading may be the claims that procedures are carried out under anaesthesia. Restraining devices and paralysing drugs can today be so effective that an anaesthetic is often unnecessary from the purely practical point of view. The risk of giving a dose too large and thereby losing an expensive chimpanzee, for example, may often tempt a scientist or technician, inexperienced with sophisticated anaesthetic techniques, to give a dose too small, from which the animal quickly recovers—but not of course until after it has been strapped securely to the operating table. Recent research suggests that human surgical patients, even when apparently completely anaesthetised, have power to recall some of the events during anaesthesia (Hetherington, B.P.S. Conference, 1970) and it is hard to believe that anaesthesia in animal experiments, only rarely expertly induced, is always entirely successful in maintaining levels of total unconsciousness.

It can be seen from the Home Office returns that only 15 per cent of British experiments involve anaesthesia. It should not be imagined that all the remaining procedures involve drastic operations causing intense pain. They do, however, include practically all tests of poisons, chemical and biological weapons, the use of electric shock in behavioural studies, the cultivation of tumours and the deliberate infection with diseases; these experiments often involve considerable suffering which is rarely, if ever, mitigated by analgesia or anaesthesia.

Over 25 per cent of all British experiments are *mandatory* tests of drugs (such as ordinary cold pills, sedatives, sleeping tablets, laxatives etc.) under the Therapeutic Substances Act of 1956 and the Diseases of Animals Act 1950. This figure does not include the testing of new foodstuffs and food additives, which are extensively tested on a voluntary basis in order to ensure that they contain "nothing injurious to health" as laid down under the Food and Drugs Act 1955. Cosmetics and toiletries may also be tested for toxicity, and the Medicines Act 1968 gives the government the power to actually require such testing. Indeed this Act (when finally implemented) may have the effect of greatly increasing the already very considerable amount of mandatory testing with animals.

The classical toxicity test for all such substances has been the LDso. This crude and cruel procedure consists in determining the dosage level at which 50 per cent of the test animals survive and 50 per cent die. Almost by definition one is establishing a level of dosage at which the animals will be made ill, most of them lingering near death before succumbing or surviving.

Where not very poisonous substances are tested, enormous dosages are forced into the animals so that as Professor A. C. Frazer points out:

> In some cases death in animals was caused merely by the physical properties (osmotic and pH effects, for example) of the large volumes or high concentrations that were given to them; these properties had no relevance to the low concentrations used in food technology.

It takes little imagination to see that suffering must be involved in, for example, the mandatory forced feeding of dogs with huge and lethal quantities of new medicinal stomach powders or breath sweeteners.

Differences in reaction to toxic substances vary considerably between species so that the value of these tests remains doubtful. Although thalidomide was extensively tested on animals in several countries, its terrible properties were not discovered. Conversely, penicillin, the greatest medical discovery of the century, was not extensively tested on animals before its miraculous therapeutic qualities were demonstrated in human patients. If it had been fully tested on animals its high toxicity for guinea pigs would have almost certainly prevented its clinical use.

The LD_{50} is carried out upon several different species at a time. The traditional choice of species is the rat, mouse, rabbit, dog (usually beagles) and the monkey. Prolonged toxicity studies consist of multiple doses spread over weeks or years. As Dr. S. B. Baker has written—"these from time immemorial have been the mainstay of the pharmacologists' studies of toxicity. In practice, they are of little use and are expensive in animals."

Substances intended for export are often tested in Britain in order to conform with the laws of the importing country, which are sometimes even more stringent and comprehensive (and cruel) than the British law.

So many experiments are performed that only a small percentage of them need to be cruel for the numbers to still remain very considerable. *If,* for instance, only one per cent of British experiments every year (and this must be far short of the actual number) intentionally cause pain, then that means that 50,000 animals suffer. Furthermore it seems likely that there are just as many cases where suffering is caused accidentally, through carelessness or lack of sensitivity on the part of the technician or experimenter.

However, let us proceed with some examples of experiments, not chosen for their exceptional cruelty, but for the representative nature of the various ways in which suffering can occur in a laboratory.

Examples of Experiments on Animals

1. Despite the fact that it is well known that seat belts cause foetal deaths in pregnant women it is reported that tests will be undertaken at the University of Oklahoma Medical Centre using pregnant baboons. Dr. Warren M. Crosby has received $103,800 under contract from the US Dept of Transportation for this project. These animals, in the third trimester of pregnancy will be placed on impact sleds and subjected to crash experiments at Holloman Air Force Base, New Mexico. *(Med. Trib.,* September 5,1968.)

2. Researchers for Technology Inc., San Antonio, Texas constructed a pneumatically driven piston to impact an anvil attached to a special helmet called HAD I producing impact to the heads of 13 monkeys. But they found the blows were insufficient to cause concussion, so they made a more powerful device called HAD II which they used on the same 13 monkeys and found

that it caused cardiac damage, haemorrhages and brain damage from protrusion of plastic rings which they had implanted under the monkeys' skulls.

Monkey number 49-2 was again subjected to HAD II six days later, then 38 days later was struck multiple blows until she died.

Some of the animals who temporarily survived suffered subsequent fits and the researchers were impressed to find that after the experiments the monkeys' behaviour "was distinctly abnormal. The usual post-acceleration behaviour in the cage was that of hanging upside down cowering in a corner."

3. Dr. L. M. Potash of the Department of Psychology, University of Alberta, Edmonton, Canada, elicited vocalisation from 16 Japanese quails by gradually lowering a concentric stainless steel electrode into their brains in 0.3 to 0.4 mm steps and electrically stimulating with an amperage of 300 n. He notes that "electrical brain stimulation has elicited vocalisation in a number of avian species (crow, Adams 1965; parrot, Adams 1965; pigeon, Akerman, 1965; chicken, Adams, 1965; Murphay and Phillips, 1967; Putkommen, 1966, 1967; von Hoist and St. Paul, 1963)." *(Behaviour,* 36, 1970.)

4. K. H. Kurtz and J. Pearl of the University of Buffalo report that: "recent studies (Baron, Brookshire and Littman, 1957, Levine, Chevalier and Korchin, 1956) have obtained results suggesting that experiences of intense fear predispose an organism to react with increased fear in subsequent situations employing aversive stimulation, i.e. to be generally more fearful."

In their own study they subjected 30 female hooded rats to intense electric shocks at irregular intervals without warning. They note that such treatment "evoked squealing, defecation and vigorous attempts to jump out of the compartment." *(Journal of Comparative and Physiological Psychology,* 1960.)

5. R. W. Sperry of the California Institute of Technology is well-known for his "split-brain" experiments in which he divided the brains of living animals into two entirely separate yet functioning pieces.

In one such experiment he "split" brains of seven rhesus monkeys and confirmed R. E. Myer's finding with chimpanzees that there is no transfer of skills from one hand to the other. It is rather as if there were two animals with the same body. *(Journal of Comparative and Physiological Psychology,* 1960.)

6. N. J. Carlson gave electric shocks to sixteen dogs and found that his "high-shock group" acquired "anxiety" faster. *(Journal of Comparative and Physiological Psychology,* 1960.)

7. J. S. Schwartzbaum from Hartford, Connecticut, points out that monkeys which have had a part of their brain cut out (which is called the amygdola) will sometimes eat faeces. In this study he used eight pre-adolescent rhesus monkeys. After opening their skulls under anaesthesia he removed their amygdolas "using a small-gauge sucker" in order to observe "these dietary changes." *(Journal of Comparative and Physiological Psychology,* 1960.)

8. H. F. and Margaret Harlow of the University of Wisconsin separated sixty-three rhesus monkeys from their mothers five to nine hours after birth and housed them in individual wire-mesh cages measuring fifteen inches by eighteen inches by twenty-four inches. *(Journal of Comparative and Physiological Psychology,* 1960.)

This is part of a long term study of the effects of maternal deprivation in rhesus monkeys.

9. K. R. Henry of Wisconsin University placed 571 hybrid mice in a large chromatography jar and sounded a five inch electric bell generating 102 decibels of noise for 90 seconds. "Records were made of the incidence of wild running, tonic, clonic and lethal seizures." 181 of the mice died. *(Journal of Comparative and Physiological Psychology,* 1969.)

10. O. S. Ray and R. J. Barrett of 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 pressure spring clips attached to their ears. Unfortunately some of the mice who "successfully completed Day One training were found sick or dead prior to testing on Day Two." *(Journal of Comparative and Physiological Psychology,* 1969.)

11. A. R. Caggiula and R. Eiberger of the universities of Pittsburgh and Michigan describe the "Copulation of Virgin Male Rats Evoked by Painful Peripheral Stimulation."

They prevented the animals from biting at the electrodes delivering the shock by surrounding them by other electrified wires—"several contacts with the protective wire were sufficient to discourage future attempts." *(Journal of Comparative and Physiological Psychology,* 1969.)

12. Mrs P. Y. Berry of Kuala Lumpur killed 91 toads and examined stomach contents demonstrating that the "Bufo asper species feeds exclusively on the ground and that its feeding, like that of many amphibians, seems to depend on the abundance and availability of food." *(Zoological Journal of the Linnean Society,* 49,1970.)

13. E. H. Stidier, J. W. Procter and D. J. Howell starved bats to death and concluded that "the tolerance of these species of Myosis are not remarkable in respect to weight-loss tolerance of other mammals." *(Journal of Mammalogy,* 51,1970.)

14. Researchers sponsored by the National Institute of Health report on the experimental induction of heart attacks in dogs. *(Medical Tribune,* 1968.)

15. Other NIH workers have given thalidomide to monkeys, rabbits and rats producing deformed offspring. (/. *Pharmacol. Exper. Therapeut.,* 160, 1968.) (This research was performed after, not before, it had been discovered that thalidomide caused deformities in human babies.)

16. J. V. Brady placed monkeys in restraining devices and gave them electric shocks every twenty seconds during six hour experimental periods. After twenty-three days monkeys began to die suddenly of stomach ulcers. *(Scientific American,* 1958.)

17. R. G. Braun of Holloman Air Force Base noted that "six monkeys in restraint chairs for thirty days developed oedema and psoriasis of the feet and legs, and decubital ulcers in and around their ischial callosites." Nevertheless he concluded that "long-term behavioural studies requiring continuously restrained primates are feasible." *(Journal of Experimental Animal Behaviour,* 1968,11, (I).)

18. I. T. Kurtsin of Leningrad reports that "healing of burns on the skin proceeded substantially more slowly in dogs with experimental neurosis (106 to 133 days after the burn)." Similarly, healing of lacerations took forty to sixty days—"the process of healing in the neurotic subjects was protracted, as bleeding and granulation developed followed by slow epithelialisation." He has also exposed neurotic dogs to high levels of radiation. He found that 70% of dogs "with a weak nervous system" died as a result of radiation sickness. (M. W. Fox and W. B. Sauders, eds., *Abnormal Behaviour in Animals,* 1968, Chapter 6).

19. At the Tasman Vaccine Laboratory, New Zealand, cats were killed by infection. "On arrival, the cats were identified, bled by cardiac puncture and immediately force-fed with 15 ml of a 20% suspension of virulent paneucopenia virus-infected kitten intestine. These animals were observed several times daily and post-mortem examinations were made on those found dead or destroyed in extremis." *(Veterinary, Record,* December 1968.)

20. Indian scientists paralysed monkeys by giving lumbar injections of pure OX-Dapro—"the three monkeys with flaccid areflexic paraplegia showed no response to either stamping on the tail or pin-prick applied to the lower-limbs." *(Nature,* May 6, 1967.)

21. K. M. Bykov and I. T. Kurtsin of Leningrad using dogs observed the "effects of various pathological processes such as experimental gastritis and gastric ulcer, luteritis and proctitis, cystitis, and cholecystitis, fractures of the long bones, injuries to the soft tissues, experimental osseous tuberculosis and application of a tourniquet to a limb." *(Medzig,* Moscow, 1960.)

22. A. N. Worden reports on an~experiment performed by G. Pam-piglione on fifty-seven puppies born of starved mothers. Twenty-eight of those pups died soon after birth and the survivors showed abnormalities such as "atheroid movements of the head and neck and ataxic gait • . . one animal died during an epileptiform fit and two others were found dead or injured in circumstances also suggestive of fits." Others "often ran in narrow circles." (M. W. Fox, W. B. Saunders, *op. cit.* Chapter 16.)

23. Dr. R. White of Case Western Reserve School of Medicine reports that he has transplanted the brains of small dogs into the necks of large dogs.

24. On July 1, 1946 the world's fourth atomic bomb was dropped on a target of seventy-five ships containing 4,500 experimental animals. *(The Star,* July 3,1946.)

25. W. R. Adey of the University of California prepared monkeys caught in the jungles of Thailand by placing them in neck restraint devices, cutting off their tails and extracting their canine teeth. Electrodes were implanted deep in their brains. Catheters were implanted in bladders for urine collection into main blood vessels and into the heart. After behavioural training some of these monkeys were fired into space. *(New York Post,* July 8, 1969.) One of these monkeys, Bonny, died unexpectedly after an eight and a half day flight.

26. W. R. Thompson and R. Melzak kept puppies isolated individually in small boxes for nine months and thus "denied them any experience with the outside world." Tubes were placed on their limbs and a collar around their neck to prevent tactile contact with their own body. The effects of this deprivation were studied. *(Scientific American,* 1956.)

27. Licklider kept animals awake by placing them in rotating drums. Those animals which survived were highly irritable and aggressive after thirty days without sleep. *(Journal of Comparative and Physiological Psychology,* 1950.)

28. Curt P. Richter of John Hopkins Medical School, Baltimore, investigated the phenomenon of sudden death in animals and men. He did this by dropping rats into specially designed cylindrical tanks filled with water and noting how long it took them to drown. The rats either died promptly from "hopelessness"—"they seem literally to 'give up' " —or swam for up to sixty hours before finally drowning. Among the variables tested, it was concluded that trimming their whiskers, "destroying possibly their most important means of contact with the outside world," resulted in more sudden deaths. (Chapter 16 in *Psychopathol-ogy,* ed. Reed, Alexander & Tomkins, 1958.)

Some British Experiments

1. D. I. H. Simpson, I. Zlotnik, D. A. Rutter, researchers at the Microbiological Research Establishment, Porton, Salisbury, injected guinea-pigs, rhesus and vervet monkeys with Vervet Monkey Disease.

The animals developed a febrile illness lasting six-days—"during this period the animals ate and drank very little, lost weight and remained hunched up and immobile in their cages." In the monkeys "the febrile stage continued until immediately before death which occurred six to nine days after infection."

Those animals surviving the illness were killed with ether or injections of nembutal into the heart.

Pathological study revealed the spleen of the guinea pigs was "sometimes three times its normal size" and "brains were congested." *(British Journal of Experimental Pathology,* 1968.)

2. R. Kumar at University College, London studied the "effects of fear on exploratory behaviour in rats" and concluded that "inescapable aversive stimulation, in this case electric shocks to rats' feet, consistently resulted in subsequent avoidance of the environment in which the shocks had been given." *(Quarterly Journal of Experimental Psychology,* 1970.)

3. Researchers fed 113 puppies on excessive doses of irradiated ergosterol—"Pup No. 1 suffered rapid loss of weight, vomiting, diarrhoea, conjunctivitis which kept the lids almost completely closed, until death occurred on the eleventh day." *(British Journal of Experimental Pathology,* 1932.)

4. Ophthalmologists at Oxford studied the effect of ten eye irritants on unanaesthetised rabbits—"the oedema of the cornea may assume fantastic proportions, the cornea being sometimes swollen to nearly twenty times the normal thickness." In some cases the eyes "disintegrate and deliquesce within a few days." *(British Journal of Ophthalmology,* 1948 Monograph.)

5. E. Weston Hurst and J. L. Pawan of the Lister Institute in London injected substances into the brain of monkeys and observed that "violent muscular spasms, occasionally sufficient to throw the animal bodily across cage occurred, and gradually passed into a state of general weakness ending in death." Some animals "bit themselves severely, two chewing off the end of a finger, and one, the whole skin of the forearm, exposing the muscles from the elbow to the wrist." *(The Lancet,* September 19,1931.)

6. N. K. Humphrey and L. Wejskrantz at Cambridge made surgical lesions on the brains of monkeys and observed that subsequently the animals "stumbled around their cages, bumping into the walls and hitting their heads on protruding objects. If they had to steady themselves by catching hold of the wire, they reached too short, too far, or in the wrong direction, missed their target and fell; they appeared quite insensitive to hard pinches on one or both sides of their bodies and often let their limbs droop lifeless; they made no attempt to reach for food and showed no interest in it if it was put into their hands, although they took it greedily if it was pressed against their lips." *(Quarterly Journal of Experimental Psychology,* 1969.)

7. R. J. Neale and G. Wiseman at Sheffield University studied some of the effects of "semi-starvation and complete starvation" of rats. *(Journal of Physiology,* October, 1968.)

8. D. Lamb and L. Reid exposed rats to tobacco smoke over a period of six weeks. The animals were placed in aluminium cabinets fed with smoke by a Wright Auto-Smoker set to smoke one cigarette in six to ten minutes. *(British Medical Journal,* January 4,1969.)

9. At the National Institute for Medical Research, Mill Hill, London, W. Feldberg and S. L. Sherwood injected chemicals into the brains of cats—"with a number of widely different substances, recurrent patterns of reaction were obtained. Retching, vomiting, defaecation, increased salivation and greatly accelerated respiration leading to panting were common features." They report that an injection of acetylcholine either "produces a peculiar high-pitched cry or the cat retches a few times or does both." They found that "the intraventricular injection of ban thine in the unanaesthetised cat causes profound motor impairment." The injection into the brain of a large dose of Tubocurarine caused the cat to jump "from the table to the floor and then straight into its cage, where it started calling more and more noisily whilst moving about restlessly and jerkily . .. during the next four minutes the movements became wilder . . . finally the cat fell with legs and neck flexed, jerking in rapid clonic movements, the condition being that of a major (epileptic) convulsion . . . within a few seconds the cat got up, ran for a few yards at high speed and fell in another fit. The whole process was repeated several times within the next ten minutes, during which the cat lost faeces and foamed at the mouth." This animal finally died thirty-five minutes after the brain injection. *(Journal of Physiology,* 1954,123.)

10. At the Royal College of Surgeons, London, albino guinea-pigs were fed a scorbutogenic diet so that after six weeks they "developed overt scurvy with typical loss of hair and petechial haemorrhages on pressure points." The typical symptoms of scurvy include bleeding from the mucous membranes of noses, eyes and alimentary or respiratory tracts, and extensive ulceration. *(The Lancet,* March 4,1967.)

11. Recordings were made by T. Biscoe and M. Purves from the stripped sinus nerves of "anaesthetised" cats whose hindlegs were strapped to a bicycle pedal and rotated at up to 100 revs per minute. However it was noted that "the anaesthesia was not deep enough to abolish the reflexes and, in the experiments, the movements imposed on the hind limbs met with some resistance." *(Journal of Physiology,* 1967.)

12. At the Department of Human Anatomy at Oxford mice had their thymus glands removed, were given total body irradiation, and then infected with leprosy. These experiments were performed by R. Rees, A. G. Weddell, M. F. Walters and E. Palmer. *(Nature,* August 5, 1967.)

13. S. Zuckerman (formerly Chief Scientific Adviser to HM Government) studied the effects of high explosive blast on monkeys, cats, rabbits, guinea-pigs, rats, mice and pigeons. *(Lancet,* August 24,1940.)

14. G. Duncan and A. Blalock anaesthetised dogs and then experimentally crushed their legs for five hours. Only one dog survived this treatment—the rest died of shock. *(Lancet,* October 10,1942.)

15. G. R. Hervey, a Medical Research Council scientist at Cambridge, surgically joined rats together in pairs of artificial Siamese twins and found that 33 per cent died either during operation or shortly afterwards. Those which survived underwent brain surgery. *(Journal of Physiology,* March 1959.)

16. A pathologist in Glasgow infected kittens with lung-worm. Experimental forms of treatment killed the majority of animals—"and death was preceded by excessive salivation, impairment of locomotion and vision, muscular twitchings, panting, respiratory distress and convulsions." *(The Veterinary Record,* December 28, 1968.)

17. J. Hopewell and E. A. Wright of St. Mary's Hospital Medical School, London, had the left halves of the brains of seven-day-old rats irradiated with X-rays, whilst they were breathing varying concentrations of oxygen. After a few weeks the animals were killed and the irradiated and non-irradiated halves of their brains were compared in weight. The authors say that

"compared with the adult rat [the brain] of the young nestling rat is very sensitive to radiation damage." *(International Journal of Radiation Biology,* 1909.)

18. E. G. Jones and T. P. S. Powell of the Department of Human Anatomy in Oxford in a series of experiments using more than twenty animals at a time, made lesions in the brains of Rhesus Monkeys as Part of an anatomical study of sensory pathways in the brain. *(Brain,* Vol. 93,1970.)

19. T. Adamson, R. Boyd, J. Hill, I. Normand, E. Reynolds and L. Strang of University College Hospital Medical School, London, asphyxiated foetal lambs, which had been removed by caesarian section from their mothers. *(Journal of Physiology,* April 1970.)

20. L. W. Duchen and Sabina Strich of the Institute of Psychiatry, De Crespigny Park, and the Maudsley Hospital, London, injected botulinus toxin into the legs of mice, causing local paralysis and atrophy. *(Quarterly Journal of Experimental Physiology,* January 1968.)

21. D. P. Cuthbertson and W. J. Tilstone of the University of Glasgow and Glasgow Royal Infirmary broke the limbs of rats to find the effect this had on mineral metabolism. *(Quarterly Journal of Experimental Physiology,* October 1968.)

22. M. Malik of Queens University in Belfast devised a "new 'burning iron' device for the experimental production of contact burns on laboratory animals' skin." This, he suggests, might be used to replace old methods, which include "use of naked flame, dipping the animal into hot water, contact with hot plates and irradiation and flash burns." *(Laboratory Animals,* October 1970.)

Life in the Laboratory

This sample of experiments gives some idea of the sorts of procedures used daily in laboratories throughout the world. Often before and occasionally after these experiences (if they survive them, that is to say) the research animals are kept in the laboratories for months and even years. Sometimes captured from the great arboreal freedom of their jungle homes, monkeys are closely confined in cages only three or four feet square. Usually they receive no variety of diet but only approved proprietary pellets. They may see no other living creatures except a white-coated technician on a brief daily visit. Very often the animal-room is without windows, being artificially ventilated by a machine which produces a constant unvarying drone. In order to facilitate cleaning, the animals live upon wire-mesh. They can never sit or lie down on a flat, soft or yielding surface. Little wonder that by the time they are needed for the knife or the needle they are so crazed or inert that they are no longer representative examples of animal life. Psychologists who study the behaviour of thousands of such creatures annually, rarely make allowances for the fact that their pathetic subjects have been so deprived that they have become more like monsters than animals. Many people who have experienced close affectionate relationships with individuals of other species testify to the considerable potential for emotional and intellectual development that animals have. When properly cared for a pet dog or cat can develop great subtleties of behaviour that the laboratory animal never shows. Those who have been fortunate enough to closely observe unfrightened animals living in the wild are often struck by the complexity and richness of the life they lead. These positive pleasures the laboratory animal never knows; for him the same four white walls and the smell of disinfectant. As Professor Broadhurst enthusiastically describes it—"It is now possible to rear and breed many smaller laboratory animals solely on a diet of tap-water and compressed food, not unlike dog biscuits or cattle cake. Some laboratories have automatic devices for delivering this food and water to the animals in their cages; sanitary arrangements may also be automatic. The animals have suitably sized wire-mesh floors in their cages so that droppings and urine pass straight through and are washed away from time to time. . . . And so the laboratory animal is raised in these optimum conditions until it is needed for experimental puposes." *(The Science of Animal Behaviour,* pp. 49, 50.)

Such "optimum conditions" are reminiscent of factory farms and seem to inspire similar arguments in support of them. Referring to the size of the cage the animals are kept in, Broadhurst comments, "It is often thought to be too small, but with nocturnal animals such as the rat or mouse, which spend most of the day asleep—since it is their 'night'—the size of the cage is immaterial after a certain point." (ibid., p. 48.)

These excerpts from a laboratory manual published by a well-known American university give some idea what day to day life is like for many laboratory animals:

> There are two ways a frightened cat can be removed from a cage. One is with a snare. Hold the snare in your right hand and pull the cord tight. There will be coughing and fierce struggling. Try to keep the cat from choking to death as you pull the cat out by a snare. Always keep a safe distance between it and yourself.

The manual further advises, with complete composure:

> After feeding all the dogs in your area remove any dead dogs from the cages. Put the carcasses in the cold room then wash your hands.

This bland callousness is one of the most disturbing qualities of some experimenters. They accept, almost without thought, that their murderous activities are perfectly ordinary. In the statistical sense they are unfortunately correct, for as we know, over 5 million laboratory animals are used every year in just one country.