MARCH, 1968 VOL. V, NO. 3

PERSUASION®

VIEWS

AMERICA'S FLUORIDATION EXPERIMENT

PART II:

REVIEWS

THE MAKING OF A PESSIMIST

JOAN KENNEDY TAYLOR, editor 50¢

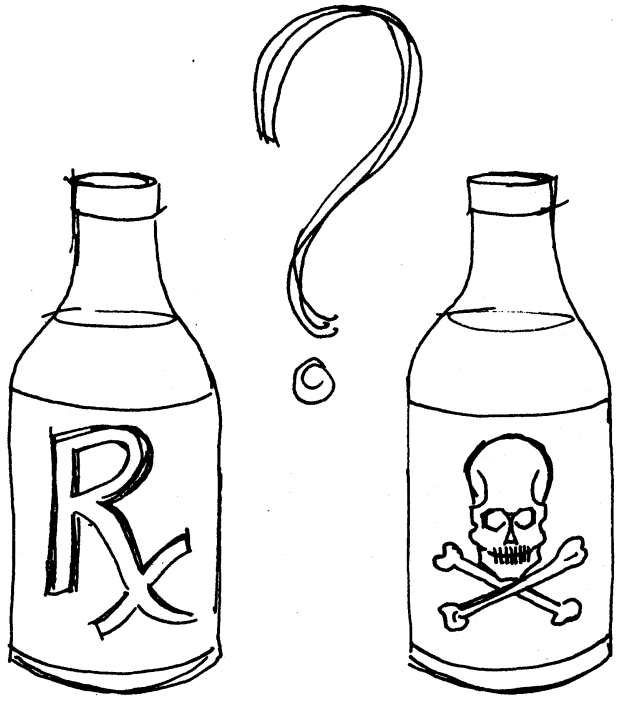
Published monthly by Persuasion, Inc., 260 West 86th Street, New York, N. Y. 10024. Subscription rate: $5.00 per year ($6.00 outside U. S., Canada and Mexico). Canadian residents add 8% foreign exchange.

Please include ZIP code number with your address.

Publisher.....*David J. Dawson*
Editor.....*Joan Kennedy Taylor*
Staff.....*Elenore Boddy*
Avis Brick
Joyce Jones
Lois Roberts

MARCH, 1968 VOL. V, NO. 3

VIEWS



America's Fluoridation Experiment

Part II: Some Men's Poison

In Part I of this article, I ended by noting that, after having insisted for years that fluoridation of the water supply affected no area of the body except the teeth, the American Dental Association (ADA) announced the results of some experiments in 1966 which suggested that fluoridation reduces the incidence of hardening of the arteries in elderly people. I then asked the following question--if they just discovered in 1966, after having endorsed the program for sixteen years, an effect of fluoridation previously unknown, what other effects, unknown or unrecognized, have they yet to discover?

Upon examining the medical evidence concerning fluoride's effect on the living system, one would have to answer the above question by stating: quite a few. Let us look into this evidence.

After fluoride is ingested, a large fraction of it soon finds its way into the bloodstream, especially if it is in solution to begin with, and if elements like calcium are not present. From the bloodstream, much of it is eliminated in the urine by the kidneys, in *most* people. The variations found here due to disease of the kidneys, simple aging, or unknown factors, are enormous. For instance, I. R. Campbell, a fluoridationist, summarizes one experiment this way, ". . . analyses of the blood of different persons . . . assumed to have had approximately the same fluoride intake, showed a wide spread of analytical results: the highest values were at least twenty-five times higher than the lowest values...." (Campbell, p. 3)

Most of the remaining fluoride accumulates in the cells of the body. It is stored in bone structures mainly, especially in the developing bones of young children, but a large portion is also

stored in the aorta, the main artery of the heart. Smaller portions are stored in the thyroid, lungs, kidneys, muscles, and other organs. The fact that fluoride from fluoridated water progressively accumulates in the body throughout a lifetime is very important--it shows that chronic long-range effects are distinctly possible even if acute poisoning were non-existent.

The Danish scientist, Kaj Roholm, published a monumental study, *Fluorine Intoxication*, in 1937 on everything known about fluorine intoxication to that day, and proved that fluoride can cause an amazingly large variety of symptoms and diseases. It does this in the same manner that other poisons do, by interfering with many separate bodily processes simultaneously. Before and since then, much work has been done on the biological effects of large doses of fluoride taken for short periods, but little is known, even today, of its long-range effects.

Some of the symptoms that have been attributed to acute, incipient poisoning by fluoride in hypersensitive individuals are: stomach cramps, spastic bowels, persistent headaches, localized rheumatic pains, nausea, loss of muscular control, incoherency of thought, loss of appetite and general wasting away, constant thirst due to dry throat accompanied by excessive urination, shortness of breath, and mottling of teeth and nails. Also, small doses of fluoride have been clinically proven to cause retinitis of the eye, ulcers, hemorrhages, and dermatitic skin eruptions. All these symptoms have appeared at a wide range of dosages, including the milligram per day level. It is precisely this complex non-uniformity in fluoride's effects that has made many scientists shy away from the field. Also, it could explain why so few physicians are familiar with the symptoms of fluorosis (chronic

poisoning from fluoride) and, therefore, the scarcity of reports on cases of fluoride poisoning in fluoridated cities.

One physician who has not shied away from this field, and who is the leading investigator in this country of the toxic effects of trace quantities of fluoride, is Dr. George Waldbott of Detroit. In his book, *A Struggle with Titans*, he details many cases of fluoride poisoning or allergy that he has personally investigated which show most of the above symptoms and which arise from fluoridation. Usually other doctors referred these cases to him, knowing that he was interested and fearful of being embroiled in this controversial issue themselves. He found that upon removal of the fluoridated water the symptoms cleared up, usually in a matter of weeks.

For example, the city of Windsor, across the river from Detroit, started fluoridation without the knowledge of its citizens on September 11, 1962. At the same time, a thirteen-year-old schoolgirl developed increasingly severe migraine headaches, numbness alternating with pain in her arms and legs, and a deterioration of mental alertness. She became too ill to attend school. Specialists checked her, and tests were performed, but to no avail. Then she was advised to stop drinking Windsor's water. Upon her doing so, the symptoms cleared up completely in ten days; but they recurred whenever she absentmindedly quenched her thirst with tap water. Tests were performed by Dr. Waldbott and a disinterested physician which proved conclusively that it was the one part-per-million (1 ppm) of fluoride in the water that caused all her symptoms.

Fluoride in the bloodstream has been shown to complex with various elements, and to deposit out with

calcium in bone tissue. The calcium ion is essential for the proper functioning of muscles and nerves. These facts have led some scientists to suggest that the convulsions sometimes accompanying fluoride poisoning are tetaniform in nature (tetany results from reduction of blood calcium levels). Despite the opinion of the ADA, experiments have shown a connection between hardening of the arteries (arteriosclerosis) in elderly people and fluoride ingestion which is not beneficial. Arteriosclerosis results from accumulations building up on the inside walls of arteries, causing them to constrict and pass less blood. Since it is known that fluoride deposits in the walls of blood vessels, it would not be too surprising to find out that it carried blood calcium with it and thus hastened the calcification of these arteries. The heart, brain and kidneys are the organs most adversely affected by arteriosclerosis because 1) they need a great deal of blood supplied to them, and 2) they have a very poor ability to develop new collateral blood vessels when old ones constrict. Diseases of these organs have been connected with a lifetime intake of small doses of fluoride.

In 1958, the suggestion was made by J. G. Kerwin in an article in *Dental Digest* that fluoridated water would affect the strontium to calcium ratio in bone tissues. By itself, this fact would be of little significance. But when added to the fact that strontium 90, a radioactive isotope, is now a contaminant of the food we eat (especially milk) due to nuclear testing, it takes on awesome proportions. If the aforementioned ratio is increased by the presence of fluoride in the blood, then strontium 90, which causes cancer, would become a more lethal agent in fluoridated areas. Despite the labeling of this hypothesis as "vacuous" by the authors of *Fluorine Chemistry*, no clear

substantiation has been offered one way or the other.

Because of fluoride's reactions with calcium under biological conditions, one of the most dramatic effects of fluoride is its ability to make teeth and and bones more dense. After prolonged ingestion of fluoride, bone structures become fragile and joints thicken, swell, and become stiff. In those areas of the world where fluorosis is endemic (inhabitants ingest more than 20 milligrams of fluoride per day, according to fluoridationists), crippling fluorosis does not appear till the victims are thirty to fifty years of age. By then the damage is irreparable: their backs ache and stiffen, they are forced to stoop, and eventually they become completely immobilized. They die in this state, and, on autopsy, bone ash concentrations of fluoride are approximately from 1,000 to 10,000 ppm. The symptoms of the disease resemble some forms of rheumatism and arthritis, and it is sometimes difficult to distinguish fluorosis from these diseases --or vice versa. Whether these same symptoms can be produced in some individuals at lower levels of fluoride intake has not been agreed upon, although many such possible cases are reported in Waldbott's book.

Mottling of teeth is caused by trace amounts of fluoride in drinking water. Wide ranges of mottling have been reported. A survey of a certain area of Israel, reported by Rosensweig and Abkewitz in the January 1963 issue of *Public Health Reports*, for instance, showed a 50 per cent incidence of dental fluorosis (mottling) in the children examined, yet the fluoride level of the water ranged from 0.35 to 0.95 ppm, averaging 0.7 ppm. Many investigations, including some reported in India in 1964, have shown a positive correlation between fluoride and dental decay; that is, they have shown that fluoride *promotes* decay.

Fluoride ion has an amazingly powerful enzyme inhibitory property. In a test tube, fluoride at 1 ppm concentration interferes with the activity of some enzymes essential to health. In the body, fluoride has been shown to retain this property, though conflicting reports have been published. Enzymes are the indispensable catalysts governing all the metabolic activities occurring in living organisms. Indeed, the vast range of fluoride's biological effects has been explained as due to its effects on a variety of enzymes which in turn regulate many different bodily functions.

Abnormalities in white blood cells have been caused by fluoridated water in laboratory experiments on animals, and have been noted in human beings drinking water-borne fluoride. These abnormalities have been attributed to an irritation of the bone marrow by the fluoride.

Fluoride is known to pass the placental barrier in gestating human beings, and has been shown to harm the unborn of animals and humans in this way. For example, a study has been published in France definately connecting trace quantities of fluoride in the water supply with an increased rate of the birth defect, mongolism, using epidemiological methods. By means of these same methods, it has been shown by Dr. Waldbott that death rates from heart disease, cancer, brain diseases, diabetes, and hardening of the arteries have gone up 25 per cent to 50 per cent in some cities after fluoridation was begun. This increase, however, is not shown in the "retabulated" and "standardized" death rates put out by the health authorities.

Experiments have shown a connection between fluoridated water and diseased gums, and also enlarged thyroid glands. Continued ingestion of air-borne fluoride over many years has been linked by Dr. R. A.

Call to kidney disease.

Dr. Waldbott tells of several deaths that were most probably caused by fluoride in the water supply. For instance, in 1959 he examined a man extensively and proved him to be unusually intolerant to fluoride. After using distilled water for three years, the man (who lived in fluoridated Highland Park, Michigan) switched over to a filter which was later shown to be ineffective. Several weeks later he died from mysterious causes. The death, as is usual in such cases, was officially listed as heart disease--though no evidence of heart disease was found.

Contrary to the absurd claims of its proponents, fluoridation does not result in everyone obtaining a controlled dosage of 1 to 1.5 milligrams of fluoride per day. First of all, there are other sources of fluoride, all of which can vary the total daily intake of any one person by large amounts. Certain coals, ores, and chemical processes release fluoride into the air near factories, and the inhabitants living nearby as well as the people working in the factories might breathe 1 to 2 milligrams of fluoride every working day. Hydrogen fluoride is the second most important contaminant of the air in some industrial cities. Foods, like tea and seafood, contain much more fluoride than 1 ppm, as do some medicines. Fluoridated toothpastes are widely used. A recent study of fluoride consumption in fluoridated communites, published by the *Journal of Food Science* in 1966, confirmed these suspicions--it indicated that,on the average, an adult ingests at least 2 to 5 milligrams of fluoride per day from all sources combined.

Secondly, fluoridation is an unprecedented medical procedure in that it is a medicine being recommended in a certain *concentration*, not dosage. Since flu-

oride in solution is usually completely absorbed by the body after ingestion, its dosage must be determined by concentration *times* volume. But people drink anywhere from a few ounces to several gallons a day of tap water, depending on such factors as natural preferences, climate, loss of water through sweating, and any disease affecting urination rate. (It is noteworthy that some kidney diseases, which cause excessive thirst and inefficient fluoride elimination, are believed to be aggravated by fluoride; therefore a vicious circle would develop in contracting such a disease in a fluoridated area.) Thus, in fluoridation, fluoride is being administered indiscriminately.

Thirdly, water is used for many other purposes, besides simple quenching of thirst, where fluoridation might do more harm. Certain industrial processes need fluoride-free water, and certain plants and animals are unusually susceptible to fluoride intoxication. Food cooked in water might absorb its fluoride; and boiled water, of course, is more concentrated in fluoride than that from the tap.

A shocking example of this unknown factor was revealed in the literature recently. Hemodialysis, a widely used treatment for kidney disease, is a process whereby the blood of a patient is circulated past a semipermeable membrane, on the other side of which is flowing water. After many hours, the toxic waste products of the patient's blood all pass through the membrane and into the water. In 1962, a series of fourteen such treatments were performed over a period of eight months on a forty-one-year-old nurse. Dr. D. R. Taves and collaborators reported that while the toxic materials were being removed from her blood, fluoride from Rochester's water was entering it. After a few months, after each such treatment, she would develop headaches, confusion, nausea, muscular fibrillation, and con-

vulsions. In the eighth month, during one of these convulsions, she expired. An autopsy revealed destructive changes in her bones accompanied by an unusually high (5,500 ppm) fluoride accumulation.

Fourthly, and most important of all, intake, concentration in the blood, distribution in the body, and efficiency of excretion of fluoride, as well as susceptibility to fluoride intoxication, varies greatly from individual to individual. Fluorosis is affected by such diverse factors as calcium intake, nutritional state, state of health, rate of metabolism, age, sex, and even race (elderly, women, and Negroes are apt to suffer more than youngsters, men, and Caucasians). Even if fluoridation could deliver fluoride at a "standard dosage" to all people, it still could not take into account these differences between people. As a matter of fact, the very concept of a "standard dosage" for any drug is alien to modern therapeutic theories of medicine. Diseases and syndromes can be caused by a great many factors, for the human body is a fantastically complex mechanism. In different individuals, different causes could be operative, and to different degrees. Thus, a modern medical theory states, "Treat the patient, not the disease." But this theory is being undermined, as it had to be, in order for fluoridationist orthodoxy to spread throughout the medical profession. As this theory disappears, so with it will go the medical premises upon which it was based --that there are many causes of a disease and the purpose of medicine is to try to unravel those causes and then to attack them. But if doctors do not have to worry about the patient's case individually, then they do not have to worry about the causes of his disease, which means, they do not have to worry about *curing the patient*.

As the proverb says, "One man's meat is another man's poison," and fluoride at 1 ppm concentration

in the public water supply is definitely some men's poison. One day we will know just how many that "some" includes--after the damage is done.

To sum up this medical evidence, I would like to quote Dr. Frederick B. Exner: "No doctor in his right mind hands out a potent drug and says: 'Take as much as you like; you are sure to get the right amount.' Neither does he give it to a whole family because one or two need it, nor make you take it the rest of your life because you needed it when young. Fluoridation is simply medical insanity." (*National Health Federation Bulletin*, March, 1963)

But does fluoridation at least reduce tooth decay in young people? The sad fact is that, despite the investment of millions of research dollars by the government, the anti-caries benefit of fluoridation has yet to be demonstrated. This is due to the one track approach that characterizes this "research," and to the small but distinct possibility that fluoridation, indeed, does not reduce the incidence of tooth decay on a lifetime basis.

An excellent example of the set experiment fluoridationists perform over and over again to prove the anti-caries benefit of fluoridation is the recently completed research in Evanston, Illinois, directed by Drs. J. R. Blayney and Iden N. Hill. Evanston started artificial fluoridation in 1947, one of the first cities to do so. Blayney started his caries research one year earlier (and was later joined by Dr. Hill). By 1951 he was being pressured to report findings favorable to fluoridation. Not only did he *not* do this, but in that same year he testified *against* fluoridation before a congressional committee. For this he was excoriated unmercifully by many United States Public Health Service (UPHS) officials. It seems that since then he has changed his mind, and in January 1967, a report of his find-

ings was published in an issue of the *Journal of the American Dental Association* devoted exclusively to it.

F. A. Arnold, Chief Dental Officer of the USPHS, states in the introduction to this special edition of the journal that Blayney's study "is a classic in [its] field," and that it "is virtually a textbook for use in further research." Amazingly, he admits that no previous study "truly presented the detailed data which could be analyzed in depth," but Blayney's study finally fills the bill.

This "classic" concludes with the following remark: "It is to the credit of the Evanston City Council that they did not consider water fluoridation as a political issue requiring a popular vote, but as a public health measure and therefore their responsibility." One doubts if Blayney would have agreed with this bit of hindsight in 1951.

Blayney's study is essentially epidemiological. Because of large USPHS funding, he was able to conduct detailed clinical and radiographic examinations on thousands of children every two years over a period of fifteen years. Most of the results were reported as Decayed-Missing-Filled (DMF) rates, and, as was shown in my previous article, the DMF rate is unreliable. This showed up in his results wherein random fluctuations of ±20 per cent are common. Averages are used exclusively, and not even standard deviations are mentioned, much less the effect of fluoridation on individuals.

The results of the tests show a dramatic reduction (50 per cent to 75 per cent) in tooth decay in Evanston as compared with 1946 baseline figures for prefluoridated Evanston, and 1947 and 1956 figures for neighboring non-fluoridated Oak Park. Blayney assumes that fluoridation must be the cause

of this reduction, but is there another explanation? When a child finds himself in an impressive, long-term test, and is informed of the importance of dental health, as was done in this investigation, he is apt to be more conscientious in taking care of his teeth and in the food he eats. And we know for sure that proper dental care and nourishment can cause much greater reductions in tooth decay than 75 per cent.

Fluoridation has been known to produce crooked or malpositioned teeth. For instance, a USPHS sponsored study of Colorado Springs (2.5 ppm of fluoride naturally) and Boulder, Colorado (no fluoride), reports figures which show that 19 times more third molars were lost because of malposition at Colorado Springs than at Boulder. Yet Blayney's study, which includes figures on chipped and hypocalcified teeth, makes no mention of malpositioned teeth. Moreover, the report explains this by stating, "Those teeth extracted for orthodontic reasons--usually bicuspids [the same teeth that experienced the most dental fluorosis]--were not counted as extracted because of caries; neither were they included in the number exposed to the risk of caries attack," and, I might add, neither were they referred to throughout the rest of the report.

According to this report, about 7 per cent of the twelve-to-fourteen age group in 1961 had "very mild" fluoride mottling, whereas about 0.5 per cent had mottling in this age group in the control. Blayney claims, "no community need fear an undesirable esthetic effect" from this mottling. Number one, it is not the community's "fears" that should be of concern here, but those of the individuals affected. Number two, it is a well-known fact that fluorosed teeth get worse, turn darker and, in some cases, become black after adolescence; and sometimes fluorosis does not even begin to appear till then.

Number three, external mottling is a sign of internal distress. What will happen to the mottled teeth of this 7 per cent twenty years hence? We do not know. These tests were done on no one above the age of fourteen.

Most doctors take statistical studies at their word and believe that the data presented show that fluoridation does appreciably reduce the number of cavities a person experiences throughout his lifetime. However, after analyzing earlier tests of this kind run by the USPHS on children six through sixteen years old, K. K. Pauleev concluded that fluoridation merely effected a one- to three-year delay in the onset and/or detection of decay among the young people involved, without any long-term reduction. It is difficult to make such an analysis in Blayney's test, one reason being that only isolated age groups (6-8 and 12-14) have been studied, and the rates for the ages in between are not given. Nevertheless, let us take a brief look at his figures.

Evanston, DMF rate of permanent teeth per 100 children

Age	12	13	14
1946 (non-fluoridated)	763	1010	1166
1961 (fluoridated 14 yrs)	328	472	595

In comparing the fluoridated and non-fluoridated groups by age, he derived from the above figures a 57 per cent reduction in cavities for twelve-year-olds, a 53.3 per cent reduction in cavities for thirteen-year-olds, and a 49 per cent reduction in cavities for fourteen-year-olds.

Usually, dental decay is most prevalent in childhood and adolescence and subsides in incidence with

age. Extrapolating from Dr. Blayney's own figures, we can see that there was in non-fluoridated Evanston an increase in tooth decay of 32.3 per cent in children from the ages of twelve and thirteen; and one of 15.4 per cent between the ages of thirteen and fourteen. However, in fluoridated Evanston, the increase in decay was 43.6 per cent from twelve to thirteen and 26.1 per cent from thirteen to fourteen.

These are sparse figures, to be sure, yet they show that while fluoridation caused an apparently large reduction in tooth decay, the percentage increase of DMF teeth per year at ages twelve to fourteen is much higher in fluoridated Evanston than in non-fluoridated Evanston, suggesting that the fluoridated rate might someday catch up with the non-fluoridated rate. Logically, the indication of such a trend would call for the examination of people older than fourteen. This was not done. Blayney made other observations on the difficulty of detecting cavities after fluoridation which would further support Pauleev's hypothesis.

Statistically, the report leaves something to be desired. The sampling technique used was not specified. At one point, Blayney calculates six-year increments in the number of DMF teeth, then divides by six to get a "mean increment per year." But the DMF rate is a mean value itself. What we have here, then, is the mean of a mean--which, paradoxically, makes it all pretty meaningless. Also, expressing DMF rate per hundred *teeth* exposed would be preferable, since one child can have many more permanent teeth susceptible to decay than another.

Dental decay has been called a "national calamity" with "devastating results" by fluoridationists. Yet, looking at the graphs of DMF teeth,published in the Blayney and Hill report for Oak Park, the non-fluoridated control, one observes about a 6 per cent rise over a nine-year period, hardly enough to call

for emergency measures.

Finally, and most importantly, if fluoride can be a dangerous chronic poison in 1 ppm concentration for some people and can cause some of the acute effects mentioned previously, then any reduction in tooth decay caused by fluoridation, whether it is true or not, becomes irrelevant; the method should not even be contemplated. Tests such as Blayney's, no matter how detailed, add nothing to our knowledge of fluoridation in this respect.

Unlike other advances in therapeutics, fluoridation has never been given an open and free hearing at meetings and in journals under scientific auspices, so that both its pros and cons could be evenly weighted, Instead, carefully guided committees of scientists and laymen have approved it, with the only large-scale debates on the issue taking place in the political arena, forced there by the tactics and character of the movement for fluoridation.

Those tactics and that character will be examined in a future article.

--David Solan

Bibliography

The bibliography appears in the order in which the references are first mentioned in the text.

Campbell, I. R., *The Role of Fluoride in Public Health*, The Kettering Laboratory, 1963.
Roholm, K., *Fluorine Intoxication*, Arnold Busck, 1937.

Feltman, R., and G. Kosel, *Journal of Dental Medicine*, 16 (4), pp. 190-199.
Waldbott, G. L., *A Struggle with Titans*, Carlton Press, 1965.
Call, R. A. *et al.*, *Public Health Reports*, 80 (6), pp. 534-36 (June, 1965).
Kerwin, J. G., *Dental Digest*, 64, pp. 58-61 (1958).
Hodge, H. C., and F. A. Smith, *Fluorine Chemistry*, vol. 4 (ed. J. H. Simons), Academic Press, 1965, p. 524.
Rozenzweig and Abkewitz, *Public Health Reports*, 78 (1), pp. 77-86 (January, 1963).
Anand, D. *et al.*, *Indian Journal of Medical Research*, 52 (1), pp. 117-23 (January, 1964).
Journal of Food Science, 31 (6), pp. 941-46 (November-December, 1966).
Taves, D. R. *et al.*, *Archives of Internal Medicine*, 115 (2), pp. 167-72 (February, 1965).
Kretchmar, L. H. *et al.*, *Journal of the American Medical Association*, 184 (13), pp. 1030-31 (June 29, 1963).
Exner, F. B., *National Health Federation Bulletin*, March, 1963.
Exner, F. B., and G. L. Waldbott, *The American Fluoridation Experiment*, Devin-Adair, 1957.
Blayney, J. R., and I. N. Hill, *Journal of the American Dental Association*, 74 (2), p. 245 and p. 276 (January, 1967).
Russell, A. L., and E. Elvove, *Public Health Reports*, 66 (43), p. 1398 (October, 1951).

REVIEWS

The Making of a Pessimist

Slide Rule by Nevil Shute
Ballantine Books, Inc., New York, 1964

Many readers know Nevil Shute only as the author of the best-selling *On the Beach*, a frightening novel about the last days of the survivors of an atomic war, as they wait in southern Australia for the prevailing winds to bring the fallout that will end man's life on earth. Such readers might assume that the author of such a book must have what Ludwig von Mises called "the anti-capitalist mentality" --an attitude that inventors and entrepreneurs will destroy us unless they are carefully controlled.

Yet Nevil Shute is also the author of many, lesser-known novels which give the entrepreneur, the businessman, and the innovator a central position that he rarely holds in contemporary literature. In *Kindling*, one of his earliest novels, a financier finds a new interest in life when he decides to revivify a dying town during the Depression by reopening the shipyard which had been its main industry.

In *The Legacy*, a girl who survives a Japanese death march in World War II decides to spend an unexpected inheritance on the transformation of a small Australian town into a place she would like to live in, by investing in or starting several small businesses. In *No Highway*, a research scientist, after trying vainly to get the authorities to ground an airplane which he has deduced is suffering from metal fatigue, takes it upon himself to disable the craft so it cannot proceed in its flight. In a traditional, long-winded, English story-telling style, Nevil Shute constantly writes about non-

traditional characters who stake their future on their own judgment and are successful at it.

Who was Nevil Shute? How did he come to have such an interest in the entrepreneurial life, and yet have the pessimism displayed in *On the Beach*? His autobiography, *Slide Rule*, provides an answer, and at the same time gives the reader a very unusual glimpse of some of the ways that government control and government help can take the heart out of the businessman. For *Slide Rule* is not an autobiography in the usual sense. Rather, it is an account by Nevil Shute of the business life he led under his full name, Nevil Shute Norway--when he was an aviation engineer and designer who founded his own aircraft company, and when writing novels was a recreational activity that he did in the evenings to rest him from his real work.

Nevil Shute Norway was born in 1899, spent his boyhood in England and Ireland before World War II, and was a stretcher bearer for an ambulance during the Easter Rebellion of 1916 in Dublin. His elder brother died of wounds in France in 1915--after that, he says, "I don't think I had the slightest interest in a career or any adult life; I was born to one end, which was to go into the army and do the best I could before being killed." At a time when the average life of a pilot on the Western Front was three weeks, he wanted to be an aviator. However, a stammer kept him from getting into the Royal Air Force, and he enlisted instead in the infantry in August of 1918. After the war ended the following November, he went to Oxford, where, he says, only his vacations were memorable.

For during his Oxford vactions, he worked, without pay, in an airplane factory, Airco, where Captain Geoffrey de Havilland was the chief designer. When de Havilland Aircraft was founded in 1921, they were also glad to have young Mr. Norway as an appren-

tice; in January, 1923, he started regular work at de Havillands, on salary. During his apprentice years he had learned all sides of the business, and in the spring of 1923 he learned to fly and lived near the aerodrome, spending two or three evenings a week writing. He finished one novel in 1923, another in 1924 (neither of which was accepted for publication). He left de Havillands in 1924 to work for Vickers, Ltd., on the design of a large airship, at a time when many people thought that the coming long-distance aircraft would be the airship, not the airplane.

Eighty-one pages of this 224-page book are devoted to the story of the airship he worked on, and the conclusions about government and industry to which it led him. Airship design in England had begun during World War I. Although some aerodynamic research on stresses did exist, it was still extremely experimental. Vickers, a private company, had used the best aerodynamic data available in the R.80, a ship built at the conclusion of the war. Most of the other ships were built by "a staff of government officials attached to the Air Ministry," and were crude copies of downed German airships. The last of these, R.38, broke in half on her fourth flight, at a cost of forty-four lives. In 1923, despite this disaster, Vickers, Ltd., proposed to the government that they would build six commercial airships and set up a company to operate them internationally. But this was just at the time that the first Labour Government came in ,and it was committed to state enterprise. It finally decided that a laboratory experiment would be set up. Shute describes the experiment as follows:

> The Cabinet Committee heard all the evidence, and had difficulty in making up their minds. Finally, in effect, they said, "The Air Ministry at Cardington shall build an airship of a certain size, load-carrying capacity, and speed, and Vickers, Ltd., shall build another

> one to the same contract specification. By this ingenious device we really shall find out which is the better principle, capitalism or state enterprise." I joined the capitalist team.

It will perhaps not surprise readers of *Persuasion* that the capitalist team soon found that they were at a great disadvantage, but that in spite of it they did build a successful ship. What may be surprising, however, is the extent of the incompetence of their opposition.

The first step taken by Nevil Shute Norway, as Chief Calculator, was to try to ascertain the causes of previous accidents, in order to prevent their reoccurrence. He writes:

> ...when I came on the report of the R.38 accident enquiry I sat stunned, unable to believe the words that I was reading. I had come from the hard commercial school of de Havillands where competence was the key to survival and a disaster might have meant the end of the company and unemployment for every one concerned with it. It was inexpressibly shocking to me to find that before building the vast and costly structure of R.38 the civil servants concerned had made no attempt to calculate the aerodynamic forces acting on the ship, and I remember going to one of my chiefs with the report in my hand to ask him if this could possibly be true. Not only did he confirm it but he pointed out that no one had been sacked over it, nor even suffered any censure. Indeed, he said, the same team of men had been entrusted with the construction of another airship, the R.101, which was to be built by the Air Ministry in competition with our own ship, the R.100.

For five years the two teams labored, each of them designing and building an airship more than twice the size of any that had flown before, which meant

that the proven German Zeppelin design had to be abandoned and something new put in its place. Each team had its own disadvantages. The Vickers team was working to fulfill a fixed-price contract, and it was apparent quite early that the airship would be an enormous loss. They had to economize on everything, including tools. The shed they worked in couldn't be heated; there was no available housing for transient skilled labor, and so they had to try to use as many local unskilled workers as possible. They improvised; they learned on the job. But they were able to discard past mistakes when they discovered better solutions.

The Air Ministry team, on the other hand, had unlimited funds at their disposal. They were able to build an entire section of the airship for experimental purposes and then scrap it--at a cost of £40,000. Any preliminary research that they needed, they got. On the other hand, the government press department was constantly pressing them for announcements. And once a decision had been announced, it became harder and harder to change it. Unwise construction and design decisions were made, and then could not be reversed.

But the disadvantages of competing with the government are more than those contained in the unequal funding of the ventures. The aircraft industry is a regulated industry, which sets standards for safety. Who in England inspects and decides on these standards? Why, the Air Ministry. What experts could they call upon? Their own experts, who were building a competing ship. The Vickers team only heard rumors about the progress of the government airship; the Air Ministry in its official capacity knew everything that was happening at Vickers. It was not only the competitor of the Vickers team, but its judge.

One might surmise that the advantage that the Air Ministry team thus had about the problems and so-

lutions at Vickers, even when joined to their inexhaustible research funds, would not enable them to produce a better ship. Nor could they. Although the Vickers men had discovered that either ship could be steered by hand without a servo motor, the Air Ministry ship, R.101, installed servo motors at a great cost in weight. Vickers built engines that could reverse for the necessary maneuvering to the mooring mast; the Air Ministry had to abandon the attempt and install an extra motor, backwards--at an additional cost in weight. "Details of her weights gradually leaked out to us: she had a gross lift of only 148 tons and a tare weight of 113 tons, so that she had only 35 tons' useful load as compared with our 54 tons....An airship is safe in proportion to its useful lift, in proportion to the weights it can jettison in an emergency, and by that standard, R.101 was definitely dangerous. In our view, also, she was considerably underpowered."

Then came the flight trials. The Vickers airship, R.100, was brought to the Air Ministry shed at Cardington for its trials, which went off well. It was discovered that she was a good ten miles an hour faster than her sister ship. Norway, now Deputy Chief Engineer, went along on the fifty-four hour acceptance trail, and later on her demonstration flight to Canada. (R.101 was to fly to India for her demonstration flight.) The flight to Canada was uneventful, but as Shute writes, "...there is no doubt that our Atlantic crossing was dictated by political motives alone, as in the case of the Indian flight of R.101. It is doubtful if any responsible technician would assert that a large and totally experimental aircraft is fit to cross the Atlantic on its eighth flight; the most that he could say would be, as I said, that he knew of nothing that would prevent it doing so in safety."

Mr. Shute is convinced that it was the fact of this flight which led directly to the disastrous crash

of R.101 on its way to India, killing forty-eight people. For R.101 was not as good a ship, and was not ready for her flight, but no one connected with it dared admit it. The year was 1930, the Depression had hit England, and it was clear that there would be orders for only one design team in the future. Whichever ship did best would win future work for its designers and builders.

The Air Ministry team was therefore willing, when Lord Thomson, the Secretary of State for Air, decided that political reasons required that he fly in R.101 to India at the end of September, 1930. This was despite the fact that they had discovered defects in the cover material, resulting from a chemical reaction between the silver dope that coated the entire ship and a rubber adhesive used to stick on strengthening tapes. For political reasons, the government now decided to abandon government safety regulations. The ship was not retested after having been cut in half to insert an extra bay. It flew without a true certificate of airworthiness, as two university professors who were reporting on the safety of the ship after the addition of the new bay had not yet finished their report. A forty-eight hour flight trial with six hours at full power (which had been required for R.100) was abandoned. "The international agreement on the safety of aircraft, however, had to be complied with so a certificate of airworthiness was written out in the Air Ministry and handed to the captain of R.101 just before the start of the last flight, as soon as the inspectors were satisfied with the physical condition of the ship. It stands to the credit of the French government that after the disaster on French soil they did not make an issue of this matter; between friends some things are better forgotten." In spite of all these short cuts, Lord Thomson was delayed--the last flight of R.101 did not begin until the evening of Saturday, October 4, 1930. The weather was bad, and about seven and a half hours after take-off, while over

France, the ship went into a dive and then burst into flames. Of the fifty-four people on board, six survived. "All the officers of the ship, and all the officials, and all the passengers perished in the fire, including Lord Thomson."

Many of Shute's friends were members of the crew, and the disaster made a profound impression on him. He decided that the responsibility for the accident really rested with the executives at the Air Ministry, who must have known that unjustifiable risks were being taken, but who wouldn't stop them by resigning in protest. "It may be," he writes, "that under modern conditions of life in England it is unfair to expect a man who has spent his life in government service and is unfitted for any other occupation to place his duty to the State before his job. But if that be so, it should be clearly recognized that in certain circumstances these high civil servants will not do their duty, though all the honours in the book be showered on them by the Crown."

The disaster meant the end of all airship construction in England. Young Mr. Norway, who had written two more more books and had gotten them both published during his experiences at Vickers, and who had also gotten himself engaged to be married to a young doctor on the staff of York Hospital, was out of a job. He decided to try to start a small airplane manufacturing company with a former de Havillands designer, Hessell Tiltman. The two of them got several other qualified people interested, including a well-known professional aviator, Sir Alan Cobham. In the summer of 1931, Norway finished writing another book, and then gave up writing entirely for five years, as he considered it potentially unfair to those who were investing in his venture.

The company thus formed was called Airspeed, Ltd., and it ultimately produced the Airspeed Oxford, the airplane which "was to become the standard twin-engined training aircraft of the British Commonwealth

during the war." However, the company never became really financially successful before World War II--it was just that, as World War II approached, it became a national asset. The ins and outs of small business and the constant operation at a loss were still challenging to Mr. Norway, but the inevitable association of the aircraft industry with the government did nothing to change his opinion of civil servants. As the market for planes moved steadily away from the small pleasure craft owner to the military, he found himself making more and more observations about the stultifying effect of government policies on all levels of business.

He noticed, in the R.101 disaster and later when he served during World War II in the Royal Navy, that the only officers who were willing to make quick decisions were those who could afford to resign from government service because they had private means. "I think," he said, "this is an aspect of inherited incomes which deserves greater attention than it has had up to now. If the effect of excessive taxation and death duties in a country is to make all high officials dependent on their pay and pensions, then the standard of administration will decline and that country will get into greater difficulties than ever."

Norway also found that risk capital did not come from banks or insurance companies when the venture was truly risky, and that its best source was from those who had made an unexpected windfall. His observations led him to conclude that the best source of risk capital was profits from the sale of land, and he speculated that "the industries of an industrial city may have been capitalized in the past largely from the profit made out of the sale of the land on which the city stands. If this be true, any restriction on the sale of land for profit which may be imposed by a government will have the effect of cutting off the flow of risk capital and development

capital from the industries of that country, and should be approached with the utmost caution." Here again, he saw government taxation policies stultifying the development of new industry.

As the possibility of large military orders for Airspeed increased, his difficulties with civil servants increased with his contacts with them. Verbal assurances of such orders from the Air Ministry were not followed by confirmation in time to prevent a costly reorganization of the factory to build small parts rather than the complete planes which had not yet been ordered. Six months later, the orders were at last placed, and the new installations had to be ripped out and replaced.

But the final straw was the official Air Ministry form called I.T.P., or Instructions to Proceed. After a manufacturer had quoted a fixed price to the Air Ministry, an order was sent to him to start work. "This document said, in effect, that he might start work and would be paid something someday, when the Government accountants had had time to investigate his business. His quoted fixed price would be taken as a maximum, more than which he could not be paid; he would probably be paid a good deal less. Government accountants were to have full access to all the costs of his business and would make their own estimate at his overheads properly chargeable to the contract, and would then announce the price which they would pay." This was the procedure which was current in 1937, as civil work was coming to an end, and military work was all there was in the forseeable future. Shute summarizes the results of I.T.P.:

> From this production there was not even the incentive of profit, for essentially the I.T.P. system boiled down to work upon a cost-plus basis with a small margin of profit on whatever the costs happened to be. Ahead of the managing director of Airspeed, Ltd. stretched an unknown

> number of years to be spent in restraining men from spending too much time in the lavatories in order that the aeroplanes might cost the taxpayer less, with the reflection that every hour so saved reduced the profit ultimately payable to the company.

In April, 1938, Nevil Shute Norway left Airspeed and sold his interest in it for a handsome settlement. His love for airplanes ("aeroplanes have been the best part of my life") was not able to keep him a part of the military assembly line. He had seen a business that he loved change from an exciting, experimental field into a regimented one--"there was nothing to start any more," he writes. Partly this was due to the change in direction of the entire industry away from the two- or four-seater plane to the huge liner, but partly it was due to the civil servants he had grown to despise.

And so, Nevil Shute Norway became Nevil Shute, the novelist. It was his second choice, and it left him profoundly pessimistic. Because, during the period of his business life, he saw, not only his industry, but England itself being taken over and destroyed by the ideas and practices he had identified as wrong. He never said so. He merely decided that a quotation from Robert Louis Stevenson was the most appropriate motto for his autobiography: "To travel hopefully is a better thing than to arrive, and the true success is to labour."

And he left England, and went to live in Australia.

--Joan Kennedy Taylor