the pain was nothing like ulcer pain ; it had no periodicity (it had been caused by the duodenum being stretched across the lumbar spine). Also, the history of the crush injury was elicited ; until then it had not been discovered. The surgeon concluded : "The moral is that one ought to take a history before the operation rather than after it."

You will agree that this second version is live ; the first was dead. The first was chronological and factual, yet was tidied up so much that there was no interest left : it had the dullness of a sieved diet.

May I mention a recently published case of my own, "A Woman with the Stiff-man Syndrome"? Here I wrote the account of events not in chronological order but in logical order, starting with my reading an annotation on this syndrome, then my realizing I had seen a case of it ten years previously, then a search for the lady, followed by a review of the notes, and finally a description of her behaviour at a clinical meeting. I thought this would make the article more alive. This device of telling a story by starting in the present and darting to the past and back is far from original, yet to my surprise I received a large number of approving letters and telephone calls praising the way the article was written. I did not know so many people minded about presentation. The amount of comment produced when trouble was taken to make the presentation as interesting as possible suggests that the average contribution may be rather dull in presentation and that a lively contribution shines like a good deed in a naughty world. I am sure many people writing for medical journals would take more trouble if they knew how much difference it made.

To refer to an article of my own in the above paragraph may suggest I am immodest. That is a risk of using the first person. Yet avoiding "I" by impersonality and circumlocution leads to dullness, and I would rather be thought conceited than dull. Articles are written to interest the reader, not to make him admire the author. Over-consciousness of anonymity can be overdone, as in the article by two authors which had a footnote, "Since this article was written, unfortunately one of us has died."

An important factor in presentation is the use of diagrams, charts, tables, and so on. I often find that I cannot understand diagrams in medical journals even when I try very hard. I take several minutes identifying the ordinates and sorting out the different types of hatching and shading and their interpretation. Then I usually find I have been looking at Fig. 1 instead of Fig. 2. A diagram should be used only if it makes something easier to understand. The purpose of a diagram is not to crowd as many facts as possible into the smallest space.

Style

Style is what matters most ; grammar, syntax, spelling, and punctuation are only useful conventions ; they matter very little, nor need we disapprove strongly about improper unions between Greek and Latin or we would have to say dicycle instead of bicycle. What *does* matter is when doctors write what Ivor Brown calls "pudder" and Sir Ernest Gowers calls "gobbledygook." They clog their meaning with muddy words and pompous prolixity ; they spend little time in seeking the shortest, neatest, and plainest way of putting down their meaning. Quiller-Couch, A. P. Herbert, Ivor Brown, and Sir Ernest Gowers have done a great deal to encourage good writing, but I think Sir Ernest Gowers's *Plain Words* is the best of all. Unfortunately those who need it most read it least, because anyone taking trouble to buy a book about using English will probably take trouble in writing it : style is largely a matter of taking trouble, though many people wrongly regard it as a gift. The people who write badly do not seem to realize they do, and so do not buy this admirable book.

Here is a sentence from a medical journal : "Experiments are described which demonstrate that in normal individuals the lowest concentration in which sucrose can be detected by means of gustation differs from the lowest con-

centration in which sucrose (in the amount employed) has to be ingested in order to produce a demonstrable decrease in olfactory acuity and a noteworthy conversion of sensations interpreted as a satiety associated with ingestion of food." All the author meant was : Experiments are described which show that normal people can taste sugar in water in quantities not strong enough to interfere with their sense of smell or take away their appetite.

Lastly, length. Medical articles should, like after-dinner speeches, finish before the audience's interest has started to wane. I finish now, pointing out that this paper, like the talk on which it is based, is only intended to provoke discussion. It solves no problems ; it only poses them. It is incomplete, inaccurate, and probably irritating ; but I hope—and I have spent many hours trying to achieve that end—that it is not dull.

STOOL-GAZING

BY

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Jack Sprat could eat no fat.—Nursery rhyme.

This cryptic line gives us no reason for Jack's inability to eat fat. In tracing the origin of this ditty, however, we learn that the term "Jack Sprat" was used in the sixteenth and seventeenth centuries to denote a dwarf. Could it be that some prophetic individual had anticipated Samuel Gee (1888), and had unwittingly described coeliac dwarfism ? Did a high-fat diet upset Jack Sprat's bowel habits ? Did it cause diarrhoea ?

The stools are like the skin, being readily visible, frequently examined, accessible to study and scrutiny, subject to loathsome and malodorous diseases, and filling the subject and onlookers with horror and disgust.

A Disappearing Art

To a discerning physician it is clear that the art of stool-gazing is rapidly passing into oblivion. Indeed, the last half-century has seen a phase of stool scrutiny in clinical and social paediatrics the magnitude of which should not permit of its passing without notice and without epitaph. Until very recently infants' stools had been studied with a devotion paralleled only by the passionate zeal with which the Babylonians studied the liver and divined the future therefrom. The ancients cast an inquiring glance even at the stools. Aristotle, for example, held that meconium (Gr. *mekon*—poppy) was the substance responsible for keeping the infant asleep *in utero*. Throughout history various preparations of stools have been used for medicinal purposes (*Drekapotheke*). But it is only in the last fifty to seventy years that divination by stool has become widespread in the medical fraternity. "In no branch of pediatrics," writes Fischer (1928), "has so much progress been made in recent years as in the study and interpretation of infant feces."

In the autumn of 1950, during my first house job in paediatrics, I was introduced to the art of stool-gazing. Every Friday morning the medical staff congregated in the sluice-room, where a stool specimen in a labelled diaper was placed before us by the nurse in charge. All the infants were represented by their stools. These were solemnly studied, spread out with a spatula, colour, curds, and consistency noted, and a decision was made regarding a change in the infant's diet. Perhaps the sugar content of the feed was reduced, the water concentration altered, the protein changed, and the formula was thus "tailored" to fit each particular infant. Thus were digestive difficulties

dealt with. In the words of Southworth (1907): "When difficulties arise, a trial is made of a new mixture, which is poured in at one end of the infant's digestive tract, to be submitted to the mysterious alchemy of complex and dimly outlined digestive processes, and the outcome is anxiously awaited at the other end to spell success or failure."

The first timid and tentative steps in stool-gazing were taken in Europe some 70 years ago when Biedert began to take notice of feeds and faeces, the "intake-output complex." In the 1910's and 1920's the cult, then graced by the term "clinical coprology," reached its zenith, particularly on the Continent. There was preoccupation with the stools almost to the exclusion of the infant who passed them. Truby King (1918), for example, agreed with the dictum that "the first question in almost every disease in children should be, 'What are the motions like?'" Indeed, he agrees that "if we could keep the motions always normal, we should have very few or no delicate children."

To-day the threescore years and ten of the stool-gazing fraternity is all but over. It is the end of an era, but not quite the end. Many nurses, for example, are still much concerned with the condition of the stools, and even intelligent mothers are terrified of "green diarrhoea," and change an infant's feed at the slightest sign of a green stool. Some unfortunate infants are fed on black tea or glucose-water for days on end, for no other reason than that their stools are greenish or loose. Mothers not only believe that their offspring must have satisfactory daily evacuations, but the popular press, intent on selling various nostrums, fosters this delusion. "Don't forget," warns an official Canadian Government booklet, "that a baby's bowels need regular attention" (Couture, 1950). Rather like the regular lubrication needed by an automobile engine. "The poor intestines," wails Bergen Evans (1947), "victims of a thousand theories, are convulsed by poisonous drugs, drenched with mineral oils, and lacerated by roughage until they frequently abandon all effort to function." Truby King insisted on a daily bowel movement with a fervour so intense that its necessity might have been inscribed on the very Tablets of the Law handed down on Sinai. Hill (1922) was prepared to allow an infant a latitude of 48 hours. To-day the public still has difficulty in understanding a doctor who evinces little interest in a baby's stools.

Philipp Biedert (1847-1916) was the first to study milk in relation to infant nutrition. He gave great impetus to consideration of the food-faeces relationship, the "intake-output complex." Presently the various dyspepsias, indigestions, intolerances, and intoxications held sway throughout the paediatric world. Biedert believed that the casein of cow's milk was largely indigestible and gave rise to casein curds in the stools of infants who were not thriving. He therefore developed "rhamgemente" (cream mixture) in 1883, this substance having but 1% protein.

Minor Shrines

Further observations on stools indicated that "casein curds" were in fact made of fat rather than protein. Early in the 1900's Czerny and Keller confirmed this, and blamed the indigestibility of fat for "Milchnährschaden" (milk injury). An enormous clinical edifice was erected based on the alleged menace of fat, this citadel all but tottering to-day. At various times excess of carbohydrate, salts, and protein were also held as being deleterious to infants and being responsible for various types of indigestion and dyspepsia. Many physicians worshipped at these minor shrines. The laity still fear sugar in an infant's diet, somehow linking it with diarrhoeal stools. Sugar dyspepsia has been thought to give rise to loose, frothy, sour-smelling stools. Firm remnants of such conceptions are still to be found in many paediatric textbooks. A recent popular textbook for students (Sheldon, 1955) has five pages devoted to an account of carbohydrate, protein, and fat indigestion and their characteristic stools, these factors being dealt with in such a convincing manner that one is almost tempted to believe that such pathological conditions exist.

While excess of protein has been thought to occasion constipated stools, excess of fat has sown confusion in the clinical ranks. Some authorities blame it for causing both diarrhoea and constipation—and this, moreover, in the very same breath, the very same paragraph. In this category there are, for example, Brennemann (1923, p. 639), Morse (1926, p. 158), Cautley and Paterson (1929, p. 40), and the official publication of the Ministry of National Health and Welfare of Canada (Couture, 1950, p. 149). Paterson and Newns (1955) have the good grace to uphold one view on page 70, and to assert the contrary view on another (p. 113).

Modern views in fact stress the opposite of that believed by earlier generations of paediatricians. Trouble occurs, not from having too much of any particular constituent, but too little. The whole concept of "tolerance" for food is based on very shaky foundations, as is evidenced by the perfect ease with which most infants deal with "solid food" even when but a few weeks old. When intolerance does occur in the infant, as likely as not it will be due to a specific sensitivity to a protein, such as lactoglobulin (Davidson and Burnstine, 1957).

Changing Views

An account of changing views on the oral management of diarrhoea has been dealt with in another paper (Levin, 1958). The study of the physical state of diarrhoeal stools (clinical coprology) held many of the earlier paediatricians in thrall. In the presence of diarrhoea, endless discussions revolved about what exactly in the diet was excessive, irritating the gut, and could thus not be tolerated by the infant. As an example of all-embracing obfuscation, the following extract (Fischer, 1928) would be hard to beat: "A new conception of the various food elements shows that the opinion of ten years ago regarding the dangers of high fat has been modified, and the possibility of a protein or casein element being the disturbing factor suggested. Modern science has proved beyond a doubt that one reason why the fat or casein disagrees is due to the presence of milk sugar; hence we to-day regard the carbohydrate and salt as the disturbing element in many cases, rather than the fat or casein." With such confusion about the noxious element in milk, it is not surprising that all constituents were often restricted in the treatment of loose stools, and infants were starved (indeed, still are) sometimes for days on end. Moreover, insult was added to injury by the common administration of a cathartic; and enemas to help clean out the poisonous stools were also given, thus exposing the infant to collapse from electrolyte imbalances.

Yet even from the beginning some hardy and sceptical souls raised objections to clinical coprology, to the prognostications based on stool-gazing, and to the methods of treatment based on the appearance of the stool.

As early as 1917, Grulee averred that he did not give castor oil for diarrhoea. Morse (1926), in all fairness, thought it only right to mention that some paediatricians regarded clinical coprology as a waste of time. Edwards A. Park (1923) decried the practice of starving infants merely because of loose stools; so did Hess (1930); and also Jeans and Marriott (1947), who wrote: "When attention is focused on the digestibility of the food and character of stools the energy needs are often overlooked." Wright (1934) stated: "The overemphasis on the study of the stools is a myopic method of estimating disturbances of nutrition in infancy."

The earlier views of Finkelstein (1910's) indicted carbohydrate and salts as causing dyspepsia in infants. He therefore devised a (protein) milk in which the concentration of these two constituents was greatly reduced. By decreasing the concentration of soluble salts (sodium and potassium) he hoped that the relatively higher proportion of insoluble salts of calcium and magnesium would combine with fat to make firm insoluble soaps and thus give bulk to the stool. Of course, the low concentrations of sodium and potassium did not do much to help sick infants who were already lacking these ions following on loss via vomiting

and diarrhoea. Moreover, one lesson has still not been learnt by the "low-fat feeders," and it is this: the consistency of stools is largely dependent on saponification of fat and production of insoluble soaps, and that one cannot make soap without fat any more than one can make bricks without straw (Goldbloom, 1957).

Conclusion

The final crushing blow to clinical coprology is the undoubted fact that the study of stools is now largely in the realm of laboratory investigation. The textbook by Moncrieff and Evans (1953), for example, has two pages devoted to "Faeces in Children"; they are not to be found in the chapter on feeding, however, but under the heading of "Clinical Pathology." So that clinical stool-gazing has now left the province of the paediatrician and has entered the domain of the biochemist and bacteriologist.

It is altogether fitting and proper that we should recognize the end of the allotted span of threescore years and ten to the clinical cult of coprology; and that we should dispatch the remains of this cult to the limbo of forgotten things. The era of the stool-gazers and stool-diviners is past.

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EFFECTS OF ATOMIC RADIATION

UNITED NATIONS REPORT

In a leading article last week (p. 433) we commented on the recently issued Report of the United Nations Scientific Committee on the Effects of Atomic Radiation. We print below a brief summary of this report and of a statement about it published by the Medical Research Council.

When the United Nations committee was set up in 1956 it decided to examine the matters falling within its field of competence under the following five main headings: (a) genetics, (b) the effects of irradiation by internally absorbed isotopes and the effects of external radiation, (c) natural radiation levels, (d) exposures during medical procedures and occupational exposures, and (e) environmental contamination. After describing the basic physical concepts—types of radiation and units of measurement—and basic biological concepts—including the somatic and genetic effects of radiation—the report examines the natural and man-made sources of radiation. As to the latter, more than 80% of the genetically significant dose from diagnostic x-ray exposure is contributed by six or seven procedures (those involving the region of the lower abdomen and pelvis), but these procedures constitute only about 10% of all examinations. "For countries with an extensive use of x rays, the average annual marrow dose of the population can be estimated to range beyond 100 mrem per person. This figure is very close to the *per capita* marrow dose from natural radiation. . . . A reduction in dose might be achieved

by a further consideration by the medical profession of the circumstances in which x-ray diagnosis is appropriate. This could be facilitated by statistical information on the importance of each examination chosen for the reduction of any specific morbidity. Administrative co-ordination between authorities who require that certain examinations be made in the routine health surveillance of whole populations or special groups, such as schoolchildren, students, employees, could well be improved."

Contamination of the environment by radioactive fall-out as a result of nuclear explosions is examined in detail. Extensive information on the strontium-90 and caesium-137 concentrations in soil, plants, animal and human foods, and in human beings was received by the committee, which concluded that there were no practical methods of preventing the entry of these radioisotopes into the human body once they had been released into the environment.

Radiobiology

On the subject of fundamental radiobiology the report states that "the succession of events which take place between the time of irradiation and the appearance of recognizable effects is very intricate. . . . The lack of fundamental knowledge of normal cell structure and function is in our opinion the major factor limiting progress in radiobiology." The major problems on which radiobiological research is needed include: (1) the nature of the primary damage to cellular structures and the pathways of expression of this damage; (2) the dose-effects relationships at low dosages; and the mechanisms of chemical protection and recovery.

The chapter on the somatic effects of radiation covers physical factors, general pathology and special pathology, including such possible delayed effects as shortening of the life-span and the production of cancer. "Clinical and experimental evidence show that where the total body is irradiated, leukaemia is the most probable end-result among the various forms of malignant disease." After calling for continuing research in all aspects of radiation, the report states: "At the present time, due to the fact that delayed somatic effects of radiation are not exactly known, it must be recognized that the exposure of human populations to increasing levels of ionizing radiation may cause considerable and widespread somatic damage."

The genetic effects of radiation are considered in a short chapter, backed up by a much longer technical appendix. A dose of between 10 and 100 rads per generation would probably be required to double the natural mutation rate in human populations. "About 4% of all births are affected with hereditary disorders, some one-quarter of which appear to be at least largely determined by single gene differences. On this basis, an increase in the mutation rate would eventually result in a directly proportional increase in a part of this 4%, amounting to more than one-quarter, but less than the whole of it."

From world-wide averages the committee has computed the estimated dose from different radioactive sources under two headings—genetically significant dose and *per capita* mean marrow dose. Varying figures are given for environmental contamination depending on if and when weapon tests cease.

In its general conclusions the committee states that all applications of x rays and radioactive isotopes used in medicine for diagnostic purposes and for radiation therapy are for the benefit of mankind and can be controlled. Radioactive contamination of the environment resulting from explosions of nuclear weapons constitutes a growing increment to world-wide radiation levels. This involves new and largely unknown hazards to present and future populations; these hazards, by their very nature, are beyond the control of the exposed persons. The committee concludes that all steps designed to minimize irradiation of human populations will act to the benefit of human health. In an attempt to assess the possible effect of natural and of fall-out radiation in causing leukaemia, tumours of bone, and major genetic effects, the committee has prepared the accompanying table. After describing the wide gaps in knowledge about the biological effects of radiation, the