DICKENSIAN DIAGNOSES*

BY

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I am honoured by the invitation to deliver the Purvis Oration on this important occasion, the centenary of the West Kent Medico-Chirurgical Society, and so to commemorate both your foundation and your founder. Medical education is, or should be, a lifelong process, and local medical societies play an indispensable part in this, and combine with it the cultivation of friendship between doctors. All your guests unite in congratulating you upon a century of this good work and offer you their good wishes for the next hundred years.

I thought that, on an occasion when we are naturally looking back, we might take a short holiday from the medical world of to-day, with its many problems, and escape into a world created solely by a great imagination. And Kent suggested Dickens, who lived in Kent and loved it so much. This is a Dickens centenary, too, for a hundred years ago this month *Little Dorrit* was published, and there is this link between the two centenaries—that it was the very disease and poverty which Dickens was then describing which had called into being the Royal Kent Dispensary, from which your Society sprang.

Perhaps it is not surprising that disease should play a considerable part in the novels of Dickens. He took pleasure in portraying the bizarre, the grotesque, and, indeed, the horrifying; and, when he lived, the visible effects of disease were much more obvious than they are to-day. This is partly because the progress of medicine has fortunately eliminated many of its grosser manifestations, and partly because in Dickens's day there were few facilities for the segregation of people seriously afflicted in body or mind. What is surprising, however, is that he should have given such detailed and accurate descriptions of the disorders from which his characters suffered. He was not content with vague diagnoses like brain fever, which figure in the works of some of his contemporaries, and even of those who wrote much later. Dickens looked on disease with the observing eye of the expert clinician, and he recorded what he saw, and what the patient told him, so that he often gives us accounts which would do credit to a trained physician.

Head Injuries

Let me first illustrate this by showing how Dickens deals with two cases of head injury. In one he concentrates on the state of consciousness during the period immediately following the injury, and in the other he describes with great precision its persistent focal effects.

The first case is that of Eugene Wrayburn in *Our Mutual Friend*. Wrayburn was the victim of a murderous assault: here is Dickens's description of his condition two days after his injury.

"Sometimes his eyes were open, sometimes closed. When they were open, there was no meaning in their unwinking stare at one spot straight before them, unless for a moment the brow knitted into a faint expression of anger or surprise. Then, Mortimer Lightwood would speak to him and on occasions he would be so far roused as to make an

*The Purvis Oration delivered on the centenary of the West Kent Medico-Chirurgical Society (see *Journal*, December 17, p. 1513).

attempt to pronounce his friend's name. But in an instant consciousness was gone again, and no spirit of Eugene was in Eugene's crushed outer form. . . . Hours and hours, days and nights, he remained in this same condition. There were times when he would calmly speak to his friend after a long period of unconsciousness, and would say he was better, and would ask for something. Before it could be given him, he would be gone again. . . . This frequent rising of a drowning man from the deep, to sink again, was dreadful to the beholders. But gradually the change stole upon him that it became dreadful to himself. His desire to impart something that was on his mind, his unspeakable yearning to have speech with his friend and make a communication to him, so troubled him when he recovered consciousness, that its term was thereby shortened. As the man rising from the deep would disappear the sooner for fighting with the water, so he in his desperate struggle went down again."

This is a remarkable description of the state of fluctuating consciousness which characteristically follows a severe head injury. Eugene Wrayburn recovered, and Dickens, for his own purposes, attributed his recovery to a somewhat sentimental form of psychotherapy, when the little dressmaker encouraged his friend Mortimer Lightwood to mention to him the name of the woman he wanted to marry.

So much for the post-concussional state: now let us hear Dickens's account of focal contusion of the brain. Mrs. Gargery, in *Great Expectations*, was also the victim of a murderous assault, having been "struck with something blunt and heavy, on the head and spine; after the blows were dealt, something heavy had been thrown down at her with considerable violence as she lay on her face." For a long time Mrs. Gargery lay very ill in bed. "Her sight was disturbed, so that she saw objects multiplied, and grasped at visionary teacups and wineglasses instead of the realities; her hearing was greatly impaired; her memory also; and her speech was unintelligible. When, at last, she came round so far as to be helped downstairs, it was still necessary to keep a slate always by her, that she might indicate in writing what she could not indicate in speech. . . . A tremulous uncertainty of the action of all her limbs soon became a part of her regular state." In this case the effects of head injury were deafness, double vision, impairment of memory, general tremulousness, and gross impairment of speech.

Dickens gives a very good account of this aphasic patient's efforts to make herself understood. "Again and again and again, my sister had traced upon the slate a character that looked like a curious T, and then with the utmost eagerness called our attention to it as something she particularly wanted. I had in vain tried everything producible that began with a T, from tar to toast and tub. At length it had come into my head that the sign looked like a hammer, and on my lustily calling that word in my sister's ear she had begun to hammer on the table and had expressed a qualified assent." Various hammers were brought to her, but it turned out that she had used the hammer to signify a man who worked with a hammer as assistant to her blacksmith husband.

Dickens incorporated in this clinical picture one curious and interesting observation: whereas before her injury Mrs. Gargery had been a virago, afterwards, Dickens said, "her temper was greatly improved, and she was patient."

Cerebral Arteriosclerosis

He reported another case of aphasia in the Honourable Mrs. Skewton, the mother of the second Mrs. Dombey, who evidently suffered from cerebral arteriosclerosis, and his account of her illness is remarkable not only for the accuracy of his description of individual symptoms but even more, perhaps, for the skill with which he conveys the relentless progress of the disease, with its insidious onset and catastrophic exacerbations. The first symptom was tremor. She had "a peach-coloured velvet bonnet; the artificial roses in which nodded to uncommon advantage,

as the palsy trifled with them, like a breeze": and, later, "the palsy played among the artificial roses again like an almshouse full of superannuated zephyrs." No other writer exhibits just this combination of grim and gay, this charnel-house humour, so characteristic of Dickens. That evening Mrs. Skewton had a stroke. "There she lay speechless and staring at the ceiling for days; sometimes making inarticulate sounds, in answer to such questions as did she know who were present and the like, sometimes giving no reply either by sign or gesture, or in her unwinking eyes."

"At length she began to recover consciousness and in some degree the power of motion, but not yet of speech. One day the use of her right hand returned; and showing it to her maid who was in attendance upon her, and appearing very uneasy in her mind, she made signs for a pencil and some paper. This the maid immediately provided, thinking she was going to make a will or write some last request, and Mrs. Dombey being from home, the maid awaited the result with solemn feelings.

"After much painful scrawling and erasing, and putting in of wrong characters, which seemed to tumble out of the pencil of their own accord,* the old woman produced this document—'Rose-coloured curtains.' The maid being perfectly transfixed, and with tolerable reason, Cleopatra amended the manuscript by adding two words more, when it stood—'Rose-coloured curtains for doctors.' The maid now perceived remotely that she wished these articles to be provided for the better presentation of her complexion to the faculty."

After this stroke Mrs. Skewton's temperament changed for the worse and she became jealous and exacting. Though she improved for a time, she soon began to deteriorate again. "Without having undergone any decided second attack of her malady, the old woman seemed to have crawled backward in her recovery from her first. She was more lean and shrunken, more uncertain in her imbecility, and made stranger confusions in her mind and memory. Among other symptoms of this last affliction, she fell into the habit of confounding the names of her two sons-in-law, the living and the deceased, and in general called Mrs. Dombey either 'Grangeby' or 'Domber' or indifferently both. . . 'Now my dearest Grangeby,' said Mrs. Skewton, 'You must positively prom'—she cut short some of her words, and cut out others altogether—'Come down very soon.'"

The tremor became worse; she "couldn't help nodding her bonnet over one eye, and rattling her knife and fork upon her plate in using them, as if she were playing castanets." There was a second stroke, "and then a dumb woman lies upon her bed, and she is crooked and shrunken up, and half of her is dead." She did not long survive it.

Besides giving an accurate picture of the course of cerebral arteriosclerosis Dickens shows that he knows that loss of speech is associated with paralysis of the right side of the body, and that in such cases there may also be agraphia. The closeness of his observation is shown by the accuracy of his description of the agraphic patient's attempts to write, and by the amalgamated words "Grangeby" and "Domber" which he puts into Mrs. Skewton's mouth. Hughlings Jackson many years later attributed Spoonerisms to a lack of co-operation between two cerebral hemispheres. An aphasic patient lived at a hostelry called "The Lobster and Crab," which he always called "The Lab and Crobster." It was as though, said Jackson, one half of his brain said "crab and lobster" and the other half "lobster and crab."

There are many other arteriopathies in Dickens. Sir Leicester Dedlock, in *Bleak House*, had a stroke which was precipitated by hearing of Mr. Bucket's suspicion of his wife: "They lay him down upon his bed, and chafe, and rub, and put ice to his head, and try every means of restoration. Howbeit, the day has ebbed away, and it is night in the room, before his stertorous breathing lulls, or

his fixed eyes show any consciousness of the candle that is occasionally passed before them. But when this change begins, it goes on; and by and by he nods, or moves his eyes, or even his hands, in token that he hears and comprehends. . . . But now he can only whisper; and what he whispers sounds like what it is—mere jumble and jargon." Here is an anticipation of the term "jargon aphasia."

Mr. Dorrit, in *Little Dorrit*, died of some cerebral catastrophe which seems likely to have been vascular. One of his earliest symptoms was narcolepsy, and Dickens records that Mr. Dorrit would fall asleep several times during a meal. Not long after this he had a period of mental confusion and disorientation and thought that he was back in the Marshalsea. This was a dramatic touch, and Dickens exploited to the full the incongruity between Dorrit's wealthy surroundings and friends and the distresses of his early days through which he was living again. "They got him up to his room without help, and laid him down in his bed." For ten days he remained in this state of confusion, and then quietly sank into a coma and died.

Though Dickens, when it suited his purpose, used cerebral vascular disease to dispose of his characters with dramatic suddenness, the case of old Mr. Willet in *Barnaby Rudge* shows that he also knew that the prognosis of cerebral vascular lesions was not invariably bad. "Although the doctors all agreed, on his being attacked with symptoms of apoplexy," says Dickens, "that he ought to die, and took it very ill that he did not, he remained alive—possibly on account of his constitutional slowness—for nearly seven years more, when he was one morning found speechless in his bed. He lay in this state, free from all tokens of uneasiness, for a whole week" before he died.

Symptomatic Epilepsy

The death of Anthony Chuzzlewit gave Dickens an opportunity to describe an epileptic fit. There was a strange sound and, "looking round, they saw Anthony Chuzzlewit extended on the floor. . . . He had fallen from his chair in a fit, and lay there battling for each gasp of breath, with every shrivelled vein and sinew starting in its place. . . . It was frightful to see how the principle of life, shut up within his withered frame, fought like a strong devil, mad to be released, and rent its ancient prison-house. A young man in the fullness of his vigour, struggling with so much strength of desperation, would have been a dismal sight, but an old, old, shrunken body, endowed with praeternatural might, and giving the lie in every motion of its limb and joint to its enfeebled aspect, was a hideous spectacle indeed.

"They raised him up and fetched a surgeon with all haste, who bled the patient and applied some remedies; but the fit held him so long that it was past midnight when they got him up, quiet now, but quite unconscious and exhausted, into bed." He remained unconscious all night, but suddenly appeared next morning to Jonas Chuzzlewit and Mr. Pecksniff at breakfast. "He seemed to utter words, but they were such as man had never heard, and this was the most fearful circumstances of all, to see him standing there, gabbling in an unknown tongue." They wheeled him in a chair to the window and there he died.

The medical reader will have no difficulty in recognizing in this case a series of convulsions, resulting perhaps from cerebral arteriosclerosis, and terminating fatally. For the purposes of the plot, however, Jonas Chuzzlewit had to believe that his father had died from poison, which Jonas had put in his cough mixture, though, in fact, the old man had discovered the plot and only pretended he had drunk it. The poison is not stated, but Dickens may have had strychnine in mind. If so, this adds point to his choice of a convulsive disorder as the natural cause of old Anthony's death.

Paraplegia

There are a number of paraplegics in the pages of Dickens. Perhaps the best-documented case history is that of Grandfather Smallweed in *Bleak House*, who is "in a helpless condition as to his lower, and nearly so as to his upper limbs;

*Cf. Dr. Johnson on the effect of his stroke. "My hand, I knew not how nor why, made wrong letters."

but his mind is unimpaired." His legs are described as spindle legs. Grandfather Smallweed is provided with a cushion in order that he may have something to throw at his wife whenever she annoyed him, an act of jaculation which not only knocked Mrs. Smallweed sideways, but caused Grandfather Smallweed to collapse, and necessitated his being "shaken up like a great bottle and poked and punched like a great bolster" by his granddaughter. Mrs. Smallweed suffered from dementia, and I shall have more to say about her later. Mrs. Horace Crewler, the mother-in-law of Tommy Traddles in *David Copperfield*, was also a paraplegic, but there is a good deal of evidence that her paraplegia was hysterical. When Tommy Traddles proposed to Sophy Crewler, her father undertook to obtain his wife's consent. "'They had a dreadful time of it with her,' said Tommy; 'it mounted from her legs into her chest, and then into her head.' 'What mounted?' asked David Copperfield. 'Her grief,' replied Traddles, with a serious look. 'Her feelings generally. As I mentioned on a former occasion, she is a very superior woman, but has lost the use of her limbs. Whatever occurs to harass her, usually settles in her legs; but on this occasion it mounted to her chest, and then the head, and, in short, pervaded the whole system in a most alarming manner. However, they brought her through it by unremitting and affectionate attention.'"

A rather more difficult case for diagnosis is Mrs. Clennam, of *Little Dorrit*. She spent her life on a sofa. "'What with my rheumatic affection, and what with its attendant debility or nervous weakness—names are of no matter now—I have lost the use of my limbs. I never leave my room. I have not been outside this door for—tell him for how long,' she said, speaking over her shoulder. 'A dozen years next Christmas,' returned a cracked voice out of the dimness behind." Mrs. Clennam, however, astonished everybody towards the end of the novel by suddenly getting up and rushing out of the house. This saved her life, for she returned just in time to see the whole house collapse. After this "she never from that hour moved so much as a finger again, or had the power to speak one word. For upwards of three years she reclined in her wheeled chair, looking attentively at those about her and appearing to understand what they said; but the rigid silence she had so long held was ever more enforced upon her and, except that she could move her eyes and faintly express a negative and affirmative with her head, she lived and died a statue." Let me end this account of paraplegia with Dickens's description in *Dombey and Son* of a man with an ataxic gait, Cousin Feenix. Lord Feenix, "meaning to go in a straight line, but turning off sideways by reason of his wilful legs." He makes only one or two brief appearances. Here he is again; "giving his arm to Florence, and, putting the strongest possible constraint upon his wilful legs, which seemed determined to go out into the garden, he led her to the door." And, finally, "Cousin Feenix's legs consented to take him away."

Psychiatric Studies

Dickens's psychiatric studies are as comprehensive and as varied as his observations on organic nervous disease. He reports a considerable number of cases of dementia. Old Chuffey, Anthony Chuzzlewit's clerk in *Martin Chuzzlewit*, presents at first a good picture of senile dementia, but clinical accuracy had to be sacrificed to the needs of the plot, for Chuffey had to rouse himself from his dementia at the end of the story to give important evidence concerning the circumstances of Anthony Chuzzlewit's death. But there is no flaw in the picture of senile dementia which Dickens draws in Mrs. Smallweed, in *Bleak House*. "There has been only one child in the Smallweed family for several generations," wrote Dickens. "Little old men and women there have been, but no child, until Mr. Smallweed's grandmother, now living, became weak in her intellect, and fell (for the first time) into a childish state. With such infantine graces as a total want of observation, memory, understanding, and interest, and an eternal disposition to fall asleep over the fire and into it, Mr. Smallweed's grandmother has

undoubtedly brightened the family." I have already mentioned her paraplegic husband. This was a neuropathic family, for Mrs. Smallweed's brother was Mr. Krook, the alcoholic, who died of spontaneous combustion.

Another strange character was Mr. F's aunt in *Little Dorrit*. "The major characteristics discoverable by the stranger in Mr. F's Aunt were extreme severity and grim taciturnity; sometimes interrupted by a propensity to offer remarks in a deep warning voice, which, being totally un-called for by anything said by anybody, and traceable to no association of ideas, confounded and terrified the mind. Mr. F's Aunt may have thrown in these observations on some system of her own, and it may have been ingenious, or even subtle; but the key to it was wanted."

It is possible that Mr. F's aunt was an elderly schizophrenic. Here is an example of her conversation. "Mr. F's Aunt, after regarding the company for ten minutes with a malevolent gaze, delivered the following fearful remark: 'When we lived at Henley, Barnes's gander was stole by tinkers.'" More appropriate to this evening is her "inexorable and awful statement: 'There's mile-stones on the Dover road!'" She readily became aggressive if replied to, and on one occasion she had to be led from the room, to which she offered no resistance. Dickens describes her as "sitting upright in a cataleptic state since her last public remark."

No better example of chronic hypomania could be found in a textbook of psychiatry than the man in *Nicholas Nickleby* who made advances to Mrs. Nickleby over the garden wall. The appearance of the old gentleman above the wall was preceded by a shower of vegetables. "An old black velvet cap . . . was gradually followed by a very large head, and an old face in which were a pair of most extraordinary grey eyes: very wild, very wide open, and rolling in their sockets, with a dull languishing leering look most ugly to behold.

"'Queen of my soul,' said the stranger, addressing Mrs. Nickleby, 'this goblet sip!' . . . 'I have estates, Ma'am,' said the old gentleman, flourishing his right hand negligently, and speaking very fast; 'jewels, lighthouses, fishponds, a whalery of my own in the North Sea, and several oyster beds of great profit in the Pacific Ocean; my walking-stick is to be seen on application to the Chaplain of the House of Commons, who is strictly forbidden to take any money for showing it. I have enemies about me, Ma'am,' he looked towards his house and spoke very low, 'who attack me on all occasions, and wish to secure my property. If you bless me with your hand and heart, you can apply to the Lord Chancellor or call out the military if necessary—sending my toothpick to the Commander-in-Chief will be sufficient—and so clear the house of them before the ceremony is performed. After that, love, bliss, and rapture; rapture, love and bliss. Be mine, be mine!'" The elation, grandiosity, flight of ideas, amorousness, and loose paranoid delusions are all typical.

Multiple Personality

Perhaps the most remarkable example of Dickens's psychiatric insight is the case of Dr. Manette in *A Tale of Two Cities*. It is remarkable for the accuracy of his account of a case of multiple personality and loss of memory, because it is the most comprehensive of his studies of psychological abnormality, and because it includes an anticipation of psychotherapy. Dr. Manette had been imprisoned for many years without trial in the Bastille during the French Revolution. As a prisoner he had been a shoemaker, and after his release he lived in a garret in Paris and spent his time working at a low bench making shoes. Subsequently he went to London, but had lost his memory for a long period of his life. He said: "My mind is a blank, from some time—I cannot even say what time—when I employed myself, in my captivity, in making shoes, to the time when I found myself living in London with my dear daughter here. She had become familiar to me, when a gracious God restored my faculties; but, I am quite unable even to say how she had become familiar. I have no remembrance of

the process." Dr. Manette had long given up his shoemaking and was practising in London when his daughter's marriage brought about a relapse. No sooner had she gone away with her husband than the doctor was found back at his shoemaking and unable to recognize his friends. He remained in this state for ten days, and then he was found one morning with the shoemaker's bench and tools put aside in his usual morning dress. "He at first supposed that his daughter's marriage had taken place yesterday. An incidental allusion purposely thrown out, to the day of the week, and the day of the month, set him thinking and counting, and evidently made him uneasy."

His friend Mr. Lorry now embarked upon the psychotherapy. He thought it best to present Dr. Manette's case to himself as though it was that of a patient. He described to Dr. Manette someone who had had a great mental shock and who had suffered from a relapse. He led him gradually to the recognition that the case was his own and then asked him "to what would you refer this attack?" "You have no idea," said Dr. Manette, "how such an apprehension weighs on the sufferer's mind, and how difficult—how almost impossible—it is, for him to force himself to utter a word upon the topic that depresses him." "Would he," asked Mr. Lorry, "be sensibly relieved if he could prevail upon himself to impart that secret brooding to anyone, when it is on him?" "I think so. But it is, as I have told you, next to impossible. I even believe it—in some cases—to be quite impossible." But by degrees the resistance is overcome, Dr. Manette's analysis proceeds, and he is led to regard his shoemaker's bench as a symbol both of the past and of his neurosis, and to agree to its destruction. "Very strange," says Dickens, "to see what a struggle there was within him." But although Dr. Manette was relieved he was not cured, and he relapsed again when he failed to rescue Darnay from the guillotine at the trial in Paris. He disappeared, wandered about, and when he came back demanded his shoemaker's bench. He was back in the past. "Time presses: I must finish those shoes." This time the relapse was permanent, and the last we see of Dr. Manette is as a "helpless, inarticulately murmuring, wandering old man."

Dickens's Mental Defectives

The best-described mental defective in Dickens is Barnaby Rudge, round whom the story of that name revolves. Dickens gives us his appearance in some detail. "Startling as his aspect was, the features were good, and there was something even plaintive in his wan and haggard aspect. But, the absence of the soul is far more terrible in the living man than in a dead one; and in this unfortunate being its noblest powers were wanting. . . . The fluttered and confused disposition of all the motley scraps that formed his dress, bespoke, in a scarcely less degree than his eager and unsettled manner, the disorder of his mind, and by a grotesque contrast set off and heightened the more impressive wildness of his face." There are two other striking passages in *Barnaby Rudge*. In one Dickens describes the feelings of the mother of a mentally defective child, and in the other the happiness of which such a child is capable. "Two and twenty years. Her boy's whole life and history. The last time she looked back upon those roofs among the trees, she carried him in her arms an infant. How often since that time had she sat beside him night and day, watching for the dawn of mind that never came; how had she feared, and doubted, and yet hoped, long after conviction forced itself upon her! . . . The slow and gradual breaking out of that one horror, in which, before his birth, his darkened intellect began; how, in the midst of all, she had found some hope and comfort in his being unlike another child, and had gone on almost believing in the slow development of his mind until he grew a man, and then his childhood was complete and lasting."

And here is the second passage. "It is something to look upon enjoyment, so that it be free and wild and in the face of nature, though it is but the enjoyment of an idiot. It is something to know that heaven has left the capacity of gladness in such a creature's breast; it is something to be assured

that, however lightly men may crush that faculty in their fellows, the great Creator of mankind imparts it even to his despised and slighted work. Who would not rather see a poor idiot happy in the sunlight, than a wise man pining in a darkened jail!"

There are other brief sketches of mental defectives in Dickens. I will mention only one—Maggy, Mrs. Bangham's granddaughter in *Little Dorrit*. Maggy had become mentally defective after an acute illness at the age of 10. "When Maggy was 10 years old," said Dorrit, watching her face while she spoke, "she had a bad fever, sir, and she had never grown any older ever since." Maggy was treated for this illness in the hospital which she described as "a Ev'nly place!" Such an illness may well have been some form of meningitis or encephalitis. That might be inferred on general grounds. But listen to Dickens's clinical observations. "She was about eight and twenty, with large bones, large features, large feet and hands, large eyes and no hair. Her large eyes were limpid and almost colourless; they seemed to be very little affected by light, and to stand unnaturally still." Was this the first account of what came to be known as the Argyll Robertson pupil?

There are many more clinical miniatures in Dickens—the fat boy in *Pickwick*, the first recorded instance of the association of narcolepsy with obesity; Major Joey Bagstock, in *Dombey and Son*, the blue-faced Major, with the lobster eyes and horse's cough, panting, blowing, and gasping with his bronchitis and emphysema; and many others. But I have said enough to show that, at a time when medicine itself was only just beginning to recognize the importance of physical signs, the characters in the world of Dickens's imagination are so real that they have recognizable diseases of body and mind, described with the accuracy and insight of a great clinical observer.

RADIOLOGICAL PROTECTION

Sir ERNEST ROCK CARLING took "Radiological Protection" as his subject for the three Harben lectures he delivered before the Royal Institute of Public Health and Hygiene on December 5, 6, and 7. Basing himself on already published work, he reviewed the risks from ionizing radiations to individual and community and the means of combating them. Like other speakers on the role of preventive medicine in an industrial age, Sir Ernest was at pains to stress the responsibility of the individual for his own health. "When every useful protective device is in full operation," he said at the conclusion of the lectures, "safety ultimately depends on conduct." The Harben lectures are addressed primarily to medical officers of health, and the preventive aspect of the subject was well to the fore. The first lecture concerned the damage ionizing radiations can do to man; the second the methods of protecting people from radiation "of an intensity likely to be met with in the age of atomic industry"; and the last some reflections on genetic damage to future generations. From this very broad field only some of the subjects Sir Ernest Rock Carling touched upon can be summarized here.

Nature and Magnitude of Man's Exposure

Some radiation was experienced by everyone, he said, inescapably and continually throughout their lives. This came from outer space, the air, the rocks beneath, and potassium in the body. Others were additionally exposed: from radiological procedures, or occupationally as in research or increasingly now in industry. The explosion of bombs had from time to time raised the peak of background measurements temporarily. In Sweden the total yearly dose from all sources per inhabitant had been calculated. For those occupationally exposed—less than 10,000 of the total population of nearly seven million—it averaged less than 1 r; for the 600,000 submitted to x-ray examination each year, less than 10 r; but for the whole population it averaged less than 0.002 r to the whole body, or less than