Figs. 8 and 7. CENTRAL AND DISTAL ENDS OF FIBRES FROM A NERVE CUT 48 HR. PREVIOUSLY.

interprets this effect as due to the exhaustion of a supply of material normally diffusing from the cell body.

Hardy^{13,16} suggested that organization within a cell might depend on an ordered arrangement of molecules originating at an interface and transmitted through quite large distances. Danielli¹⁷ has a similar thought, that in muscle fibres the resting potential may orientate the outer molecules of the fibres, which in turn orientate those within. A similar relation might well obtain in nerve fibres, and would be consistent with the contraction and spiralling which are here discussed. However, since we know that the resting potential is maintained, at least for a time, in an isolated stretch of nerve, it cannot be regarded as an influence emanating directly from the cell body. The turgor pressure seems to be the only such influence for which there is some evidence, and it therefore merits serious consideration as the agent responsible for maintaining the organization.

It is even possible to suggest how the nucleus plays a part in maintaining this pressure. Gersh and Bodian¹⁸ have confirmed the view of Caspersson¹⁹ that the basophil Nissl granules contain nucleotides. After the application of ribonuclease, nerve cells lose the characteristic nucleic acid ultra-violet absorption band at 2600 Å. Moreover, this band also becomes much less marked in cells undergoing the 'chromatolysis' which follows section of their axon. Gersh and Bodian suggest that after severance of the axon the intra-cellular ribonuclease breaks up the nucleotides, allowing the nucleoproteins of the Nissl substance to depolymerize and hence to produce the increased intra-cellular osmotic pressure which gives the turgid appearance to these cells and leads to the lateral displacement of the nucleus. It may be suggested

Fig. 9. DIAGRAM TO SHOW APPEARANCES IN CENTRAL AND DISTAL PORTIONS OF A NERVE FIBRE DURING THE DAYS FOLLOWING SECTION.

that normally some such process goes on continually, and that it is the 'function' of the Nissl substance to provide the material the break-up of which increases the intra-cellular pressure necessary to maintain the organization of such long cells. This would explain the occurrence of such large amounts of extra-nuclear nucleo-proteins in these very large cells. It has often been suggested that after chromatolysis the Nissl substance is re-formed from the nucleus, and this has been confirmed by Hyden²⁰. Possibly in this way the nucleus maintains a pressure within all cell, and hence perhaps the orientation of a 'cytoskeleton' of proteins. There have been many indications in recent years of the importance of such a 'cytoskeleton'^{21,22,23}, but we lack definite information about its connexion with either metabolism or the control exercised by the nucleus over the cell.

No doubt these relations will prove to be much more complex than are here suggested. But at least we have two significant and probably connected facts (summarized in Fig. 9): (1) there is a tur-

gor pressure transmitted from the nerve cell body, and (2) degeneration of severed parts is accompanied by the disorientation of a protein framework.

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OBITUARIES

Dr. F. D. Chattaway, F.R.S.

THE death of Dr. F. D. Chattaway, which took place at Torquay on January 26, severs another of the few remaining links between organic chemistry in Great Britain and the great school of the subject built up by von Baeyer at Munich.

Frederick Daniel Chattaway was born on November 9, 1860, at Foleshill, Warwickshire, and was the eldest of the five children of Daniel Clarke Chattaway and Eliza Ann Adcock. His father was a ribbon and trimming manufacturer in Coventry, and the collapse of this trade which followed the treaty with France in 1870 caused the family a very severe loss of income. As a consequence, Chattaway's scientific education was achieved almost entirely by means of scholarships; while as a further consequence he thereby gained an experience of universities and colleges wider than falls to the lot of most men. He received his early education at a school kept by a Nonconformist Minister, the Rev. J. L. Withers, who fostered his taste for natural science—a taste which had already been stimulated by his grandfather. His scientific education proper began at Mason College, Birmingham, where he was a pupil of Sir William Tilden. From there he went to University College, Aberystwyth, for two years, and then won a scholarship to Christ Church, Oxford, where his tutor was A. G. Vernon Harcourt. He took his degree with first-

class honours in chemistry in 1891, and then proceeded to Munich to work under von Baeyer and Bamberger.

On his return to England, Chattaway became a demonstrator in the Chemical Department of St. Bartholomew's Hospital Medical School, being appointed head of the Department when Dr. Russell retired. He left St. Bartholomew's in 1905 and again went abroad, this time to Heidelberg, where he studied under Bredig, and to Utrecht to work with Ernst Cohen. During this period, while he was in Holland, he was elected into the Royal Society.

Back in England he settled in Oxford, where in 1909 he took over from Cronshaw the chemistry teaching at Queen's, of which Collège he became in due course fellow, tutor and praelector in chemistry. He retired from teaching in 1935, remaining, however, a supernumerary fellow of Queen's until his death.

Chattaway was once described by an Oxford colleague as a "true-blue organic chemist", and the description fitted. Although his sojourn on the Continent from 1905 onwards was the result of his desire to acquaint himself with the then new subject of physical chemistry, he never really took to, or sympathized with, physical methods as applied to organic chemistry, preferring always the "beautiful crystalline body" which could be handled and investigated directly, and so with a greater feeling of reality. It was, in fact, in the production of such materials that a large part of his practical skill lay: few men excelled him in the ability to produce pure crystals from the most unpromising tars.

Within the realm of organic chemistry as he understood it, all was grist to his mill. Always his interest was in the way substances reacted together, and in the elucidation of the constitution of any hitherto undescribed products of a reaction. Here again lay one of his gifts; for he had a knack of choosing the correct alternative for synthesis, where doubt was still possible after degradation experiments, in a way reminiscent of Medicus's famous pronouncements on the purines. But he was no mere 'paper chemist': in the laboratory his industry was prodigious and his enthusiasm unbounded and infectious.

Chattaway's earliest work was done with Bamberger at Munich, and resulted in the determination of the constitution of a number of polynuclear hydrocarbons which occur in minute quantity in the highest boiling fractions of coal tar. His patience and tenacity were early shown in this work, which was both laborious and difficult, by reason of the intractable nature of the materials concerned and the very small quantities available. Later, his interest was caught by nitrogen iodide, and a series of thorough investigations enabled him to settle several hitherto doubtful points in its chemistry. He later prepared and examined exhaustively the properties of a very large number of N-substituted halogen derivatives of acylanilides, and championed with great vigour the view that the change which occurs when they are treated with acids is an intra- and not an inter-molecular change. He then became interested in organic perhalides, particularly those of the diazonium compounds, and in all aspects of the chemistry of hydrazines and hydrazones. He also investigated the nitration of benzil, condensation reactions of azides, many cases of polymorphism, and the stereoisomerism of thioparachloral derivatives, while his most recent work on condensation products of chloral and related compounds revealed a ready means of making derivatives of the benzodioxin ring system.

Chattaway's delight in the *practice* of organic

chemistry was never dimmed and he only gave up the long hours of work in the laboratory (and then grudgingly and regretfully) when advancing age and circumstances left him no alternative. A small army of pupils owes to him a training in the methods of organic chemistry which could not have been excelled.

Dr. Chattaway married in 1894 Elizabeth Bettney, second daughter of Thomas Bettney, of Handsworth, Birmingham, who, with a daughter, now survives him. Their only son, a scholar both of Eton and of Christ Church, was killed at Thiepval in 1916.

G. D. PARKES.

Prof. Alfred Stansfield

THE announcement of the death on February 5 at the age of seventy-two of Prof. Alfred Stansfield, for thirty-five years Birks professor of metallurgy at McGill University, Montreal, has recalled to many of his friends and associates the outstanding contributions made by him to the progress of physical metallurgy in Great Britain while collaborating with Sir William Chandler Roberts-Austen at the Royal Mint and also at the Royal School of Mines.

To Stansfield was due in no small measure the actual experimental work and the improved means of pyrometric measurement (including the 'null' and 'differential' methods) which constituted such remarkable features of the Third, Fourth and Fifth Reports made by Robert-Austen to the Alloys Research Committee of the Institution of Mechanical Engineers, in 1895, 1897 and 1899 respectively. An important appendix to the Third Report, on "The Pyrometric Examination of Alloys of Copper and Tin", appeared under Stansfield's name. Its importance at that time can scarcely be over-estimated. Not only did it represent the first recorded attempt to give as 'freezing-point curves' an explanation of the copper-tin series as a whole, but it also marks the beginning of all investigations which have since been made in correlating the physical and mechanical properties of alloys with their equilibrium curves. Stansfield, in fact, a few years later, himself suggested the adoption of the term 'equilibrium curve' for metallic alloys, a term which had hitherto been restricted to the consideration of fused salts and saline solutions.

Stansfield's most striking and convincing contributions to physical metallurgy, however, were those by which he participated in the discussions in the late 90's on the "Solution Theory of Carburised Iron". Of the two papers by him which appear in the *Journal of the Iron and Steel Institute*, 1899 and 1900, it can well be said that these constituted a remarkably clear enunciation of the problems involved in a proper understanding of the relations between carbon and iron within the ranges covered by steel and cast iron. The latter of these two papers was presented and discussed jointly with the well-known contribution by Bakhuis-Roozeboom on "Iron and Steel from the point of view of the Phase Doctrine". Stansfield expressly set out to dispel the tendency to regard the solution theory as being, in a sense, opposed to, or as supplanting, the older allotropic theory. His paper, he hoped, would effectually dissipate such an error by showing how entirely the solution theory of the relations of carbon and iron involves the allotropic changes with which the distinguished name of Osmond is inseparably connected. Roberts Austen, who was at that time president of the Iron