An Address ON REST, WORK, AND PLAY IN HEALTH AND DISEASE.*

BY

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WHEN our President honoured me with an invitation to address you to-day, I did my best to visualize the conditions under which I should have to carry out my task, and came to the conclusion that work and play would be appropriate subjects for discussion at this meeting, and that rest on this, the last day, would not be without its seductive appeal to some of us. Questions in regard to indulgence in work, play, and rest are so often put before us in our professional capacity, and are so often answered with more respect to tradition than to experience, that they deserve the reconsideration due to all possible factors in the production or maintenance of health and disease. While it is true that play and rest are generally, and indeed not unpopularity, recognized as prophylactic and remedial agents of no mean value, the position of work is more precarious in the minds of the profession and of the public, and it may be that it has earned a reputation for etiological mischief based on somewhat slender evidence. It is not surprising—it is only in accord with human nature—that when the cause of an illness is in doubt, over-indulgence in work is a more acceptable verdict than over-indulgence in other things, such as food, drink, or tobacco. But a verdict which is most welcome is not always the best founded, and the medical profession, bearing in mind the well-recognized good health and longevity of its members, should surely hesitate to agree that over-working can be held responsible for disease or death, without a careful examination of the testimony supporting that doctrine.

It might at first sight be presumed that our knowledge of the physiology of the nervous system provides us with principles sufficiently reliable to guide us in prescribing work, rest, or play; but, helpful as such knowledge is, it is not yet equal to solving all the problems with which we are confronted, and we must still look to clinical experience for light and learning.

On the other hand, clinical experience is of little value unless it is subjected at every step to careful analysis and the *post hoc propter hoc* process of reasoning used with critical economy. If this rule were as conscientiously observed as it should be by all who have had the advantage of a scientific training, the value of time, the lapse of time, as an important ingredient of treatment, would not be so often overlooked. And giving credit to time is, after all, only an alternative to paying the tribute due to nature's share in repairing structure and restoring function. This sounds like a platitude when addressed to those who have wrestled successfully with the courses and inquisitions of the medical curriculum; but if the critical faculty inculcated by the latter survived more generally for a few years the ordeals of practice, we should dispense with at least one-half of the therapeutic measures and concoctions which are prescribed from time to time at the dictates of a prevailing fashion or of an enterprising firm. Is it not true to say that while the time factor is usually estimated at its proper value in relation to certain morbid conditions, the length of which is more or less defined, such as a specific fever or a bony fracture, it is undeservedly neglected in relation to other common disorders whose course is less easily foretold, such as an attack of sciatica or a broken heart? I need only remind you of the craze for rest cures as the universal remedy for all psychoneuroses thirty years ago in order to illustrate the dominating influence of fashion on medical practice. The employment of rest in the treatment of an anxiety neurosis, as in the treatment of a damaged joint, has indeed undergone a revolutionary revision in recent

years. My chief object to-day is to examine our established practice in regard to the prescription of work, rest, and play, and to question some of the principles which govern it. As the nervous system is more concerned with these matters than any other my illustrations will be largely drawn from its functional and organic disorders, and particularly from those which call for specific advice in the regulation of mental and physical activity.

THE PRESCRIBING OF WORK.

Epilepsy is one of the commonest disorders of the nervous system, and one which every practitioner is called upon to treat. I expect that we shall all agree that the following story is typical of many presented to us. A boy of 14 years of age, with a previous history of average good health, and with apparently good prospects, has a fit, followed a few months later by another. Perhaps the first has been disregarded, or attributed to some quite inadequate cause, but the second has created alarm, and awakened the parents' minds to the possibility that their son's whole future career is jeopardized. In this atmosphere of panic it is not unnatural, and certainly not unusual, to find that some drastic alteration in the patient's life is advocated. He is to be taken away from school, his brain must be freed from all the strain of lessons, and he is to be allowed to run wild for a year in the open air. The chief advantage of such advice is that it sounds eminently sensible, and yet experience teaches us that it may have disastrous results from more than one point of view. In the first place, there is no justification for believing that it will diminish the liability to recurrent attacks; in the second place, it interferes with and interrupts the normal progress of intellectual and moral development and discipline; and thirdly, it suggests to the patient's mind that he is not as other boys are, with the result that a sense of inferiority is easily acquired. Even these disadvantages might be worth incurring if we did not know that, speaking generally, an epileptic subject is less liable to fits when his attention and interest are fully occupied than when his thoughts are allowed to run loose. I have known so many children of both sexes overcome the liability to fits when their ordinary educational career is proceeded with that I am convinced that work can rarely exercise any prejudicial effect. In other words, regular and moderate hours of work and play may safely be regarded as an essential part of the treatment, and if, when combined with medicinal therapy, they are unsuccessful, the outlook is certainly grave. Perhaps a general recognition of this truth might influence more schoolmasters to co-operate in rescuing boys and girls from the menace of a very terrible affliction. Undoubtedly, not a few regard the epileptic brain as an organ which should not be allowed to exercise its normal functions, an opinion to which I can give no support. Our ignorance of the pathology of the epileptic habit is so profound that we are obliged to seek elsewhere for guidance in preventing its establishment, and I feel convinced that much depends, in a great many cases, on the way the patient is handled when the first symptoms of this nervous disorder make their appearance. While it is one of the few diseases in which the influence of drugs, properly administered, is of paramount importance, success in treatment is enormously favoured by interfering as little as possible with the normal routine of cerebral activity—in other words, with the ordinary ration of work.

Let me turn to another common disease of the nervous system, of which the pathogenesis is still not established. A young woman, between 20 and 30 years of age, engaged in teaching, develops diplopia and a disability of one limb, leading to a diagnosis of disseminated sclerosis. Vision returns to normal and the defective limb recovers its function in the course of a few months, but the diagnosis has been made, and the patient's relations know that a threat of recurrent disabilities overhangs the girl's future. The doctor is asked what steps can be taken to prevent relapses, and in many cases he will advise the relinquishment of her work and the avoidance of all mental and physical exertion. Again the advice sounds all right, but can it be justified by any reliable evidence? My clinical experience leads me to believe that we are without any satisfactory

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knowledge as to what factors are responsible for the appearance of fresh plaques in this disease, that relapses may be delayed for five, ten, or fifteen years, and that they are as likely to appear at the end of a long restful holiday as in the middle of a strenuous term's work. If this is the case, are we justified in asking our patient to give up her career, her interest, and her chief source of happiness in life? I can recall so many patients who, in spite of carrying the label of disseminated sclerosis, have led active and useful lives over a number of years, that I should always hesitate to advocate one of idleness. I cannot believe that normal activity or even normal fatigue of the nervous system has any prejudicial influence in such cases, and I am sure that the patient's interests are best served by the encouragement to resume her normal occupation and habits. One particular incident which has always been fixed in my memory is worth recording in this connexion. A young woman, who had suffered from symptoms of disseminated sclerosis and had temporarily recovered, was employed in a large shop or store. The building in which she worked caught fire. She escaped with difficulty, although several of her companions lost their lives. In spite of this emotional experience, followed by months of particularly hard work, she remained quite well, and it was not until a year or two later, while spending her summer holiday at the seaside, that she developed further symptoms of her disease. Before leaving the subject of disseminated sclerosis I must make it clear that I do not advocate activity during the acute phases of the disease. On the contrary, rest must be regarded as a first essential in favouring the complete or partial restoration of function in damaged parts of the nervous system, a process which may be safely entrusted to time and nature, at any rate in cases of recent origin.

Paralysis agitans, or Parkinson's disease, affords another example of organic disorder of the nervous system in the handling of which the question of work and rest has often to be answered. Here we have to deal with a chronic progressive defect of function of a part of the central nervous system, the cause of which is unknown and the course of which we are entirely unable to influence by any method of treatment. A man of 50 engaged in business, and blessed with other interests and hobbies, develops the characteristic facies and tremor of the disease, and quite naturally asks whether he should give up his work and lead a more restful and sedentary life. In my opinion the answer should be definitely and firmly in the negative. The devotion of time and money to the many curative treatments which will be pressed upon his notice can only lead to a long series of disappointments, and the more leisure he has at his disposal the more will he become preoccupied with his affliction. If he is well advised he will carry on with his work and his play regardless of the fact that he is slower and less active, and as far as possible refuse to recognize his limitations. Only by taking, and persevering in, such a line of action will his life be made tolerable, and we have no right to suggest that by sacrificing his work or his recreations he may expect to render his disabilities less irksome. There is nothing more pathetic or tragic in medicine than the sight of a patient suffering from paralysis agitans who has given up his lifelong interests in the vain pursuit of a cure, and it is difficult to exaggerate the importance of giving the right advice in these cases. There is nothing easier for the medical attendant to advocate than avoidance of mental and physical activity, the very attributes which it is most desirable his patient should foster and preserve.

The observations I have offered on epilepsy, disseminated sclerosis, and paralysis agitans may be applied with discriminating modifications to many other organic disorders of the nervous system. They uphold the principle that work, the normal activity of the nervous system, is not contraindicated even when parts of it are damaged or out of order, so long as the latter are not subjected to an unreasonable amount of strain. They are opposed to the tradition that because a patient is suffering from a disease of the nervous system all the multitudinous functions of the brain should be put in irons and allowed to rot. After all, we encourage other organs to carry out their functions even when they are damaged by disease. Work is a physio-

logical, not a pathological, process, and its output is not only valuable in itself, but carries with it a psychological influence of paramount importance to the patient's insight, his outlook on life, and his general welfare.

REST IN THERAPEUTICS.

If discrimination is called for in prescribing work, it is equally necessary in prescribing rest, and a review of our practice in the latter and of the doctrines which have led up to it may not be without profit. In the first instance, I propose to deal with rest as it is employed in the treatment of psychopathological conditions, and the word "rest" will, for the moment, mean confinement in bed with partial or complete isolation. May I remind you again of the fact that for a period of years rest cures were regarded as the orthodox method of treating neurasthenic and psychoneurotic disorders, and may I suggest that the practice has become less fashionable because experience has exposed its failure to deal effectively with all cases? It may be that rest cures still have their value, and it may be that we are still not quite competent to judge when complete rest is indicated or contraindicated. The rest cure prevailed at a time when our insight into so-called "functional disorders" was not so clear as it is now, and there can be little doubt that it was employed indiscriminately for a number of conditions which differed in origin and which therefore called for different treatment. Moreover, when it successfully attained its object, and relieved the patient, there was always some doubt as to the relative share of the prescribed rest, of suggestion, and of the lapse of time in achieving the result. The bulk of "functional disorders" can be divided for practical purposes into three categories: (1) the anxiety neurosis, (2) hysteria, and (3) the milder forms of the manic-depressive psychosis. Hysteria may be dismissed from further consideration here, because its treatment is essentially based on psychotherapy and rarely demands serious rest. In fact, we may be assured that a rest cure unassociated with psychotherapy would be singularly unsuccessful in curing the frank hysteric.

In spite of our improving insight into psychopathological disorders, the differentiation of an anxiety neurosis from a mild manic-depressive psychosis is not always made with the sharpness it deserves, and in view of its importance for the purpose of treatment a short consideration of the problem will not be out of place. Certain symptoms are common to both conditions, and so lead to mistakes in diagnosis and to inappropriate treatment. Depression, insomnia, failure of concentration, decision, and memory, exhaustibility and restlessness, are complained of both by the neurotic and by the psychotic patient, and particular attention must be directed to one or two of these symptoms in order to make a diagnosis. The depression of the neurotic patient is variable and sometimes dispersible; it is made worse by fatigue and may be alleviated by distraction. It is attributed to the faults of others or to unfortunate circumstances, and it is very rarely of a quality or intensity which leads to suicide. The depression of the psychotic patient, on the other hand, is that of a person who is incapable of interest in anything. It involves loss of natural affections and appetites, and cannot be dissipated by distraction. It is associated with self-accusation and remorse for some real or imaginary wrongful act or behaviour in the past, and no arguments will avail to correct the obsession. It is at its worst in the early morning, when morbid and suicidal thoughts are apt to be translated into deeds. With the neurotic patient sleep is always a difficulty, and he is inclined to lay the blame for his sufferings on insomnia. With the psychotic patient sleeplessness is not so invariable, and indeed may sometimes be self-inflicted, owing to his dread of the terrible depression which overtakes him on waking. The one fears the night, the other the day. Further consideration of the distinctive characters of these two conditions would be out of place, and I have said enough to indicate the features concerned with the question of therapeutic rest. Harking back to the success and failure of the rest cure it is easy to realize that many a patient suffering from psychotic depression was well protected and cared for during the period of his illness, and that the necessities

for his recovery—rest, encouragement, and time—were all available, if his pocket could stand the strain. We know that such patients always recover in time, that sympathetic care rather than active treatment conduces to safety, and that psycho-analytical attacks are more of a danger than a help. The patient with an anxiety neurosis is a different problem. Rest may or may not be helpful, depending on the state of exhaustion prevailing at the moment he comes under medical attention, but recovery will depend more on skilled psychotherapy than on the prescription of so many weeks' confinement to bed. In fact, we must never forget that rest tends to narrow and to limit the patient's environment, and so encourages preoccupation and introspection.

I have memories of the anxiety neurotic patient emerging from a prolonged rest cure unrelieved, and I can recall certain patients with psychotic depression being released too soon from allotted periods of rest only to end their lives. The question of rest in the treatment of functional nervous disorders is not, therefore, so simple of solution as it at first appears. Its value can only be estimated accurately in the light of a correct diagnosis. The rest cure has fallen into comparative disrepute now that we realize that rest is a useful ally, but rarely the essential agent, in the relief of the "psychopath." But a rest and a rest cure are not synonymous terms, and the former is loosely used to indicate relaxation and recreation as well as physical torpor. In this way rest from work may include recreation, which is often play, a species of activity the reverse of restfulness. In the maintenance of health there is much variation among individuals in regard to the amount of sleep or complete repose required in order to avoid undue fatigue. It would seem that every individual is endowed with his own capital of nervous energy on which to draw, and that over-expenditure is attended by symptoms with which we are all familiar. We also recognize that prolonged activity of one part of the nervous system may lead to fatigue of its particular function or reactions, without unduly depleting the capital of nervous energy or interfering with the function of other parts. It is on this principle that the healthy person, consciously or unconsciously, regulates his life; in other words, he employs various parts of his nervous system in turn without tiring out any one of them. Unwittingly he recognizes the physiological law that reactions are more easily fatigued than the common paths through which they are executed, and that one set of reactions may regain their functional integrity, after fatigue, while others occupy the field of action. The repetition of one operation may in the end produce what is called specific objective fatigue, a form of fatigue which does not interfere with the performance of another operation. On the other hand, general objective fatigue which may be induced by one kind of work may affect the output of an entirely different kind of work to a small extent. Experiment has shown, however, that fatigue produced by mental work is evanescent, the mind being restored to efficiency by sleep or by short interruptions of its activity. The phenomena attributed to overwork are more often and more justly to be ascribed to preoccupations of a personal character amounting to an anxiety neurosis. According to Gillespie: "Clinical experience bears out these experimental findings. Mental exhaustion, brain strain from overwork, and the like can be safely discarded as a hypothesis in 999 out of 1,000 cases. The apparent mental incapacity in such cases is nearly always the result, not of intellectual effort, but of anxiety or a kindred emotional disturbance. This is brought home very dramatically in the sudden recovery of persons complaining of 'brain-fag,' which has perhaps limited their work to periods of less than an hour each, when a source of worry is removed."

Except during sleep, the mind is always active, and it is customary to allot a certain number of hours in each day to a specific form of work, mental or physical, the remainder being spent in recreation. The latter may be of various kinds, according to the interests of the individual: the pursuit of art, science, or literature, or participation in sport or games. They all involve cerebral activity, and derive their beneficial effects from the fact that the centre of interest and action is temporarily

changed. The player of a game, for instance, is refreshed by following his favourite ball because his centre of interest is altered, other reactions are initiated, and his mind is preoccupied with problems entirely different from those associated with his work. It is probably not an exaggeration to say that these factors are of much greater importance than the physical exercise the game involves in promoting a state of good health. Realizing, as we must do, that interest depends largely on inborn facility, and that without interest the benefit of recreative pursuits is greatly discounted, we should be well advised not to make a fetish of games as the only means of securing relaxation from work. "Take up golf" is in danger of becoming a tabloid preparation, too easily prescribed, readily swallowed, and not always producing the desired results. To many, a change from one form of mental work to another is much more recreative than the pursuit of a ball whose flight and destination are of much less interest than those of a moth or a bird. It is certainly true, moreover, that a very small amount of muscular exercise will suffice for the maintenance of good health. It is sometimes alleged, and the allegation sounds sensible, that the crowds of people who watch football or baseball on a Saturday afternoon would be better employed playing some game themselves. As their interest cannot be doubted, and as they spend their time in the open air, the conditions favouring relaxation and recreation appear to be adequately fulfilled. On the other hand, it must be admitted that their interest is often more financial than sporting, and therefore predisposes to the development of an anxiety neurosis, which may not always yield to the recuperative influence of the next week's work. Incidentally, it is our duty to expose the fallacy that the good health, especially the mental good health, of an individual is directly dependent on the size of his muscles. Physical exercises, unassociated with cerebral activity and recreation, are no panacea for mental exhaustion; on the contrary, they constitute a super-tax on the nervous system, and encourage the musculature to make further and uneconomic demands on its limited sources of energy. Muscles are intended to be the servants, not the masters, of man, and the efficiency of their service must be measured not by their bulk, but by the speed and accuracy of their response to the demands of the nervous system.

Perhaps, in order to anticipate remonstrances, I ought to explain that these remarks are not intended to be an attack on physical jerks as a whole. They are directed rather against the craze for various systems of exercises advertised to cure all disorders, whether of the liver or of the nervous system, and largely taken up by the sedentary worker, lacking a hobby, in the vain hope that they may dissipate his weariness of spirit. He may be unaware that this weariness represents a subconscious inhibition of a particular activity, in other words, a psychological state of staleness rather than one of real exhaustion.

RELAXATION.

While the question of recreation is complicated by personal idiosyncrasies, and must be answered only after careful consideration of individual needs, that of relaxation deserves perhaps more general examination. Remembering the remarkable capacity shown by nervous centres to recuperate rapidly from fatigue, and taking into account the natural aptitude possessed by certain individuals for long periods of intense work, interrupted by comparatively short spells of complete repose, it may be asked whether more could not be done to acquire and cultivate such enviable powers of alternating concentration and relaxation. The cult of relaxation is no new thing, but, like most cults, may have lacked the recognition it deserves owing to the enthusiasm of its protagonists. At any rate, we are all familiar with individuals who appear to wear themselves out by maintaining a continuous state of restless but unproductive activity. It may be that a scientific study of complete mental and physical relaxation, its methods of induction, its proper relationship to work and play, and its value in everyday life, might show that it is a habit, the acquisition of which is worthy of becoming an item in everyone's education. At any rate relaxation, like work and recreation, is not

likely to escape further study, and we may perhaps look forward to the time when we shall be able to switch off our nervous energy as readily as we do our wireless or our electric light, and so regulate its consumption to our better advantage. In these days the problem of utilizing time advantageously is becoming a more and more difficult one, and those who learn early in life how not to waste the hours at their disposal have taken a most important step in achieving such success as lies within their reach.

CONCLUSIONS.

In the course of these rather desultory and disjointed remarks no attempt has been made to lay down hard-and-fast regulations governing the prescription of work, rest, or play for the preservation of health or for combating disease. No prescription of the kind can be printed and distributed indiscriminately to all who seek advice on this subject, and no rules can be formulated, applicable to any case, without careful consideration of the individual and personal factors involved.

But if regulations are impossible guiding principles are not without their value, and among these I would emphasize again:

(a) The recognition of work as an ally, not an enemy, in therapeutic operations on nervous disease.

(b) The paramount importance of a correct diagnosis in functional disorders before determining the part to be played by rest and work in their treatment.

(c) The value of physiological and psychological considerations in the choice of recreations.

The subjects to which I have directed your attention, if they are not altogether commonplace, at any rate pertain to everyday life. The questions I have raised are among those which every individual believes he is best fitted to decide for himself. They certainly do not admit of dogmatic answers, and I shall be well content if they stimulate serious consideration, and suggest habits and prescriptions of work, rest, and play such as will promote health and prevent disease.

THE PROBLEMS OF MELANOMA.*

BY

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THE problems of melanoma maintain their position as the most interesting and complex of any department of oncology. Numerous competent investigations of the past decade, especially those of Dawson¹ and of Masson,² while illuminating some questions, have left others quite untouched or even more conspicuous and uncertain. The complexity of the sensory nerve endings, the peculiar relations between these structures and the cutaneous epithelium, the wide distribution of chromatophores, and the ramification of the whole subject of pigment formation in the animal kingdom render the study of melanoma quite a different matter from that of any other malignant tumour process. It is the object of this communication to enumerate some of these problems, not with the ambition of presenting a solution, but with the hope that a simple statement of them may lead to more definite efforts toward a solution as the progress of knowledge permits. Tumour pathologists may not feel flattered that the discovery of the nervous origin of the naevus, made by Soldan³ in 1899, remained practically unnoticed until it was rediscovered and elaborated by Masson in 1927. Possibly there are other important data lying within easy reach of the alert observer.

ORIGIN OF THE QUIESCENT NAEVUS CELL.

Since the work of Soldan, and especially after the more elaborate and complete exposition of Masson, there is no longer any room for debate about the nervous origin of the naevus cell. In the so-called "nerve naevus," occurring mainly in the subcutaneous tissue, but often quite superficial, Masson has shown that the naevus cell is a

derivative of specialized cells in the sensory nerve endings. In and about the groups of small glassy quiescent naevus cells he finds many nerve fibrils, and in many cases of nerve naevus these cells are aggregated into definite end-organs of the type of Meissner's corpuscles, and in such intimate relation to the nerve fibre bundles as to leave no doubt that they belong to the peripheral nervous system. Every transition from the nerve end-organ with a ring of polyhedral cells up to the characteristic groups of pure naevus cells can be followed in these nerve naevi, while the epidermis fails to show the slightest sign of abnormality. It is remarkable that this fact could so long escape recognition, even after the simplest histological technique.

Masson does not undertake to decide whether the naevus cells are mesodermal, glial, or epidermal, but insists that they belong to the nerve end-organ. The relation to the chromatophore remains unaffected by this observation. The cells of the Meissner corpuscle are unpigmented, but a mantle of chromatophores often covers the peripheral rim of the naevus. In some cases the two orders of cells, pigmented and unpigmented, appear to be entirely separate, but in other cases the more peripheral cell groups show increasing pigmentation. These features strongly indicate that the special cells in the nerve naevus produce the pigment.

All these recent studies seem to dispose finally of the theory, first advanced by Unna, that the naevus cell is a displaced down-wandering epithelial cell, or that it is an endothelial cell, because of its endothelial morphology. There has never been any substantial basis for either of these time-honoured misconceptions. They do not, however, dispose of the possible participation of epithelium in some of the manifestations of melanoma or of the general class of pigmented tumours.

Unna originally, Nicholson, Dawson, and many others, have described in detail what they regarded as the down-wandering of pigmented naevus cells from the epithelial layer and their depigmentation when originally pigmented. I believe that these observations were made upon active melanomas, where it is undoubtedly possible to trace the down-wandering of tumour cells, but they fail entirely to prove that these down-wandering cells ever assume the glassy appearance of quiescent naevus cells. The evidence points strongly to the conclusion that in the active naevus the glassy cells proliferate in the derma while at the same time certain cells of the Malpighian layer also proliferate, the two groups uniting and forming the complex picture of the growing melanoma with supposed epithelial invasion. In most melanomas, especially those derived from deep naevi, there is no participation whatever of the epithelial layer, but in some cases both types of cells, those of the Malpighian layer and those of the corium, are active.

It thus appears that melanoma involves a growth of the specific cells of the sensory nerve endings, naevus cells in the corium, and in other cases the tactile corpuscle of Merkel-Ranvier and the chromatophores in the epidermis. One can find much evidence favouring the view that the epidermal participation in melanoma does not involve the whole epithelial layer, but only the specialized cells of Merkel and the chromatophores. These soon form small groups that stand out prominently in the Malpighian layer and then invade the derma. These cells are never exactly like those of ordinary epidermoid carcinoma. They are finely granular and opaque. They form peculiar groups of crescentic or polyhedral cells, which the experienced histologist easily recognizes as melanotic, and they retain these characters in metastases.

THE TACTILE CORPUSCLE OF MERKEL-RANVIER.

The nature and behaviour of the tactile corpuscle of Merkel-Ranvier still remain obscure, untouched by recent studies, and continue to present one of the fundamental questions. Merkel and Ranvier showed that the terminal filaments of the sensory nerves arborize about certain cells of epithelial morphology lying in the Malpighian layer of the skin. These cells do not appear to differ in any respect from the average epithelial cell of the skin, but their relation to the nerve filaments raises an assumption that they may be of nervous origin, and to that extent

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