indications of its restoration at some earlier date. Our own case confirms this view, as it is beyond question that the severance of nerve fibres was complete at the time of the operation, but in spite of this there were indications of recovery six and a-half months later. The original injury could not have caused a more complete severance of nerve fibres, and the want of all recovery after seven and a-half months therefore suggests some absolute bar to regeneration. The development of changes in the elbow-joint within a few days of the resection of the cicatrix appears to indicate *prima facie* that the operation sacrificed at least some nerve fibres which were previously intact, but such evidence must be received with caution; we are still too ignorant of the significance of "trophic lesions" and the importance of vasomotor changes in their production to assert or to deny that these changes were not evoked by the general disturbance of a severe wound in the neighbourhood of the subclavian vessels, or by traumatic injury of the elbow during anaesthesia, or during subsequent bandaging of the limb. The cicatrix which was removed presented no clear evidence of having been directly traversed by untorn or regenerated nerve fibres, in continuity between the peripheral and distal ends.

A further difficulty which was raised before operation was the impossibility of attaching the torn cords correctly to their proper peripheral ends, and it was suggested that the spinal nuclei might on regeneration be attached to muscles other than those for which they were intended, and that hopelessly confused movements might thus result. In my opinion this is a matter of little moment. When we perform secondary, or even primary, suture of a single motor nerve, it is unimaginable that the central axis cylinders grow into peripheral tubes, with which they were formerly connected, and that each eventually leads from its spinal cell to the muscle plate originally associated therewith. Hopeless anatomical confusion must occur in all cases, but there is no evidence of any ultimate physiological difficulty. In the case of the brachial plexus there is no new factor to disturb our results; it is a mere accident that the various fibres lie in five bundles instead of in one; the confusion can hardly be greater than in ordinary cases. In the case with which we are dealing to-day there is no evidence whatever of difficulty in moving the muscle which it is desired to move, and there is no ataxia. Sensory localisation is unquestionably imperfect, but such confusion is common after nerve injuries: in our case it differs only in degree, and not in kind, from that which is generally observed, and there is no indication of gross confusion, such as persistent mistaking of one part of the limb for another distant part.

Lastly, we have to inquire how far the operation was justified by results, and what hope is offered to us by it in similar cases. That the plexus is capable of repair after complete resection and secondary suture is clearly proved. The extent of recovery is disappointing, but its promise for other cases is less unsatisfactory than appears at first sight. Both sensation and motion have been partially restored in the whole upper limb, and even the small muscles of the hand have acquired some power. So much having been gained, there can hardly be a doubt that much more might have been gained by the aid of systematic massage, and by a little effort on the patient's part; the very fact that the flexors of the elbow and wrist and the adductors of the shoulder, which are the only muscles she has attempted to use, have improved much more than have other groups is an indication in this direction.

Even at this date slow improvement is in progress, and between two examinations which I made at an interval of seventeen days there was distinct improvement both in the sensation of the hand and in the mobility of the fingers, the interval having been devoted to education of the limb. On the experience thus gained there can be no doubt that old injuries of the brachial plexus located within an accessible region should be submitted to operation rather than condemned as hopeless—a position which has even led to amputation for the removal of a useless encumbrance. It is only in those cases in which the plexus is torn away from the cord that operation is impossible, and a careful examination on the lines indicated in an earlier part of this lecture will readily distinguish such cases.

ADDENDUM.

REPORT ON CICATRIX REMOVED FROM THE BRACHIAL PLEXUS.
By F. CRAVEN MOORE, M.D., Pathologist to the Manchester Royal Infirmary.

The specimen, which had been preserved in alcohol for some time, apparently consisted of a number of nerve trunks imbedded in dense fibrous tissue. The continuity of the nerve trunks could be traced towards one end of the specimen and then it was lost in a mass of fibrous tissue. Sections cut parallel to the long axis of the specimen and stained with borax carmine, and according to the method of Van Giessen, showed the following appearances.

A number of large nerve trunks, separated from each other by dense white fibrous tissue, could be traced from one end of the section to within 2 cm. of the other end, where they abruptly terminated in a mass of fibrous tissue; beyond this, short pieces of nerve trunks were present in the extreme opposite end of the specimen. The nerve fibres composing these trunks were degenerated, the great majority consisting merely of neurilemma sheaths containing large numbers of nuclei; here and there, however, a nerve fibre appeared to have escaped, and showed a well-defined axis cylinder. The tissue between the individual nerve trunks differed from the normal in its greater density, and obviously indicated the occurrence of inflammatory changes, culminating in the formation of dense cicatricial tissue. The mass of tissue which interrupted the continuity of the nerve trunks was of a similar nature. It consisted of white fibrils closely arranged, with but few cells and few vessels. A few nerve fibres could be seen in the midst of this cicatrix; they possessed well-defined axis cylinders and nuclei; the neurilemma sheaths were less well defined. Their course was very irregular, curving round in various directions, and not apparently passing directly from the nerve trunks at one end to those at the other. The exact meaning of these fibres it is somewhat difficult to estimate. They might represent either regenerated nerve fibres or fibres which had escaped destruction. The apparently adult constitution of the fibres is somewhat against the former hypothesis, but is discounted by the fact that more than seven months had been allowed for regeneration between the time of injury and the date of removal of the cicatrix. In consideration of their curiously irregular course, and of the difficulty in imagining how, if persisting nerve fibres, they had escaped destruction during the inflammatory changes which led to the extensive cicatrization present, it is probable that they must be regarded as evidences of regeneration.

CLINICAL NOTE ON A CASE OF FRACTURE
OF THE CARPAL SCAPHOID.

By SIR WILLIAM STOKES, F.R.C.S.I.,
Surgeon-in-Ordinary to H.M. the Queen in Ireland.
(SEE SPECIAL PLATE.)

THE signal aid which we now so frequently derive from *x-ray* photography, in the diagnosis of osseous lesions especially, is in no instance better illustrated than in its application to some of the forms of carpal injury. In their recognition it must, I think, be regarded as one of the most obvious examples of its practical value. Previously to the discovery of this latest development of photographic art no surgeon, however skilful a diagnostician he might be, could with any accuracy form a true estimate of many of these injuries. The case is different now, however, and it is no exaggeration to say that they can, as a rule, be recognised and differentiated as easily as any of the ordinary fractures or dislocations the surgeon has to deal with.

I feel confident this favourable estimate of the practical value of Roentgen-ray photography will be accepted by most persons interested in surgical diagnosis, especially in reference to the obscurer injuries which occur at or in the immediate vicinity of joints.

This opinion, however, cannot be said to be of universal acceptance, as witness the published views, among others, of Professor Stimson in his well-known and excellent work on fractures. He observes: "While the *x-rays* have been of interest and value in showing details of certain fractures, especially at the wrist, elbow, and ankle—yet it cannot fairly be said that they have yielded much information and practical value which could not be obtained by palpation. Probably their usefulness will be increased by improvements in methods and apparatus, but at present the information which they give needs to be sifted with great care from among many misleading appearances."

Such views as these will not, I venture to think, be endorsed by most surgeons, even by those of comparatively limited experience.

As a rule, the assistance derived from Roentgen photography will ever be gratefully remembered by surgeons, not only in the recognition of carpal and radio-carpal injuries, but also in many of the obscurer lesions—fractures, dislocations, or a combination of both—which occur at the elbow or ankle-joints. For example, it is hard to understand how by

"palpation" alone the various forms of fracture of the lower end of the radius, as classified by R. W. Smith, Voilemier, Chiene, Bennett, and other notable authorities, could be accurately differentiated; or how in a recently severely-injured elbow-joint, one in consequence probably enormously swollen, a surgeon could, under such circumstances, recognise the exact nature of the lesion. Many other instances I might adduce in which *x-ray* photography is in such cases of distinctive value.

The following instance of the comparatively rare lesion—fracture of the carpal scaphoid—is one about which I was recently consulted, and of which the following are the principal details:

R. M. M., aged 30, by profession a Clerk in Orders, whilst engaged as temporary chaplain at Badenweiler in Germany in the autumn of 1898, met with the accident in the following manner: He was going up the stairs of his hotel, and seeing the lift he determined to ascend by it to the floor where his room was situated. Not waiting for or summoning the lift attendant, he incautiously opened the door and stepped in. The lift, however, being at the time at a higher level, he fell down to the floor of the basement storey, a distance of about 21 feet. The mistake he made he attributed to the fact that the electric light was not "on." "I can hardly remember," he observed, "how I felt falling, but think I remember putting out my left arm as a sort of protection." He felt as if someone had twisted his wrist "right round." The case was treated by a local German practitioner who recommended the application of dry cold. The injured wrist was subsequently bandaged and kept at rest in a sling. For several days great pain was experienced, so much so that anodynes had to be employed both locally and internally. Four days subsequently, the arm being carefully fixed on a splint, the patient went to Heidelberg, and from there returned to England by easy stages, but suffering great pain in the wrist all the time. On reaching home the wrist, hand, and forearm close to the wrist were found greatly swollen, most probably due to acute synovitis of the wrist and carpal joints. Poultices were diligently applied, which afforded much relief, and the arm kept on a splint. This treatment was continued for about four weeks. Massage and passive exercises were then recommended, which were attended with "great pain." At this time an *x-ray* photograph was made of the wrist, from which the illustration (Special Plate) is taken, and in which the fracture of the carpal scaphoid is clearly seen. The skiagraph was forwarded to me, and my advice asked as to the further treatment of the case. While concurring in the main with the treatment previously adopted, I urged the importance of great caution being employed in the use of passive exercises of the joint, especially as they were followed at times by great pain in the wrist. At the present time, under the influence of rest, occasional massage, and the cautious use of passive exercises, the motions of the joint, though still limited, are to a great extent regained, and a fairly good recovery may, I think, be confidently anticipated.

As a proof of how these injuries, which, I believe, occur much more frequently than has up to this been believed—a view in which Professor Stimson concurs—have been left unnoticed is the fact that in few of the systematic treatises on fractures, and in none of the older ones, is any mention made of them. This is the case even in the beautifully illustrated work on fractures by Helferich (1897), of which an admirable translation by Mr. J. Hutchinson, jun., has recently been published by the New Sydenham Society. Malgaigne, in his classical treatise on fractures, speaks of these cases as being "extremely rare." He mentions that Cloquet¹ met with them in 2 cases which occurred in persons who had sustained falls on the wrist, and that M. Jaijaray² has also described a case produced in a similar manner.

In the last edition of Hamilton's work on *Fractures* the author states that in all the cases that have come under his observation the fractures have been compound and complicated, and resulted in the complete loss of the hand or serious mutilation or maiming. In no instance was treatment adopted that had special reference to the fracture with the object of insuring apposition and union of the fragments. The author apparently is of opinion that simple carpal

fractures demand very little surgical interference, and that they will generally unite without any considerable maiming; that probably some degree of ankylosis may supervene between the adjacent surfaces, but that in the normal condition of things there is so little motion that the complete loss of it would not be much felt. The author, however, apparently forgets that the injury that produced the carpal fracture could hardly occur without more or less serious damage being done to the radio-carpal and other carpal articulations, and that in order to avoid the unfavourable consequences of such injury the treatment in the early stages, at all events, of immobilisation and rest is distinctly indicated.

In Dublin the only cases of this fracture that have been noted are two, both observed by Professor Bennett of Trinity College. One of these occurred in a case in which there was evidence of previous chronic rheumatic arthritis. It was a *post-mortem* observation. The other case was observed during life, and was recognised by the aid of an *x-ray* skiagraph. The particulars of both these cases were discussed by Professor Bennett at a meeting of the Dublin Biological Club last session, and will, I hope, eventually be published.

In making the diagnosis in these cases we cannot rely on either symptoms or external physical signs—pain, swelling, crepitation, loss of power, may all be present in the absence of any carpal fracture, and in the absence of Roentgen-ray photography no accurate diagnosis can possibly be made as to the nature or exact situation of the lesion producing these signs and symptoms.

The etiology, too, of these injuries is involved in much obscurity, especially in the cases where the injury is produced by force indirectly applied. It is especially hard to understand how excessive dorsiflexion, as held by Hamilton, could produce a scaphoid fracture. M. Bouchet,³ however, in making forcible flexion and extension of the hand in the dead body, found among other lesions one or more fractures of the bones of the wrist. Probably a more usual etiological factor is that in falling, when the hand is thrown forward for purposes of protection, at the moment of impact with the ground, the axis of the forearm is at or nearly at a right angle with the wound, and the direction of the force, instead of passing, as it usually does under these circumstances, obliquely through the carpus and lower end of the radius, passes through the "ball of the thumb," scaphoid, and directly upwards in a line corresponding to the axis of the forearm, and not in front of it, as it is believed to do in the production of Colles's fracture of the radius. The results of such a fall as is mentioned above would be more likely to be either a fracture or luxation of the carpus, or a luxation at the elbow, than fracture of the radius. The former occur when at the time of impact the angle between the axis of the forearm and the ground is greater than 60°, a fact pointed out many years ago by Professor Chiene of Edinburgh.

The peculiar, somewhat oval, concavo-convex shape of the carpal scaphoid would, I think, render it more liable to be affected by such an injury than any of the other carpal bones, and hence the greater liability of its being fractured than any of the others in its immediate vicinity.

REFERENCES.

- ¹ J. Cloquet, art. Main, *Dict. de Méd.* ² Jaijaray, *Thèse Inaug.*, Paris, 1846.
³ Sur les Luxations du Poignet, *Thèse de Paris*, 1834.

THE SO-CALLED "STAVE OF THUMB," OR
BENNETT'S FRACTURE.

By GEORGE THOS. BEATSON, B.A.CANTAB., M.D. EDIN.,
Surgeon, Glasgow Cancer Hospital; Senior Assistant Surgeon,
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(SEE SPECIAL PLATE.)

It was as far back as August 1st, 1885, that Professor E. H. Bennett, of Dublin, drew special attention in the *BRITISH MEDICAL JOURNAL*¹ to the fact that museum specimens show that fracture of the metacarpal bone of the thumb is more common than that of any other of these bones; and, further, that when the fracture occurs in the metacarpal bone of the right thumb, it is not "just above the middle," as is usually asserted, but that it is situated at the base of the bone. This teaching of Professor Bennett has not, I am afraid, received that general recognition that it deserves, and reference to

Fracture of the carpal scaphoid. (*To illustrate Sir William Stokes's Paper.*)

Fig. 1.—“Stave of thumb”; before reduction.

Fig. 2.—“Stave of thumb”; after treatment.

(*To illustrate Dr. G. T. Bealson's Paper.*)