tained in the tincture is very soon precipitated when mixed with water, and it is the more the longer it may remain, so that at last there is nothing but a mixture of water and alcohol. A preparation which unites in such different proportions, cannot be expected to produce similar effects; I find it then most expedient to mix the ingredients at the time of using them, and to make the degree of pain suffered by the patient, the criterion for leaving the injection a longer or shorter time in the tunica vaginalis. The mixture may also be applied warm, for then the iodine will remain longer united with the spirit. By the employment of the caoutchouc flask in place of the simple syringe, there is a double advantage to be derived, the permitting of the fluid to pass many times back and forwards, without any danger of extravasation into the cellular tissue, and by shutting out the light to prevent the separation of the iodine.

S. L. L. BIGGER.

ART. XI.—*Simple and Complete Dislocation of the Astragalus from the Os Calcis and Navicular Bone, upon the Dorsum of the latter, without disturbance of the Relations between the Tibia, Fibula, and Astragalus, and without Fracture of any of these Bones; the Case of Richard Carmichael, Corresponding Member of the Académie Royale de Médecine, &c.* By JOHN MACDONNELL, M.D., one of the Surgeons to the Richmond Hospital and House of Industry, &c.

THE following case possesses a high degree of interest on several accounts: on account of the extreme rareness of the accident; on account of its having happened to a medical man, capable of giving strictly correct information respecting every particular relating to the accident and its consequences; and on account of the individual to whom it occurred. Independently of its claims

because of its rareness, and the completeness of its history, this case will be received by the profession with a deep, and, I think I may add, an affectionate interest, wherever British surgery, and the genius by which Mr. Carmichael has so largely contributed to improve and advance surgical science, are held in honour. For myself, bound to him, my master and my friend, as I am, by the strongest ties of obligation and of respectful attachment, it is a source of pride and gratification to me to record the fortunate issue of this severe injury; and that I had any share in contributing to this issue, I shall, while I live, regard as one of the happiest occurrences of my life.

On the evening of the 6th of last August, Mr. Carmichael was riding in the immediate neighbourhood of Dublin at a brisk trot, when his horse suddenly fell. The abrupt stop was calculated to precipitate him forwards, which he prevented by throwing himself back in the saddle, and strongly extending the foot, leg, and thigh, to meet the ground. The shock of his descent was accordingly received upon the anterior extremity of the metatarsal bones, especially that of the great toe of the right foot, which alone came to the ground. The inner edge of the foot was slightly inclined downwards and outwards; for on examining the boot, the part of the upper leather on the inside ball of the great toe was found covered with mud. In a few seconds the animal sprung to her feet, carrying Mr. Carmichael, who did not lose his seat, along with her. Heavy tensive pain, which almost caused fainting, and deformity, obvious through the boot, convinced Mr. C. that he had suffered a dislocation of the foot. A humane gentleman, a stranger to Mr. C., who was passing in a car, gave it up to him, and lest he should require help, followed him on foot, a distance of nearly three miles, to his house. On his way thither, he called at the shop of Mr. Beatty, apothecary, Sackville-street, and requested him to summon Dr. Hutton and me to his assistance. We were at his house immediately; indeed I was there before himself, and on getting after his arrival some idea of the injury, I had his bed properly

prepared with mattress, &c. without delay. Having carried him to bed, and having had him undressed, we were now enabled to inquire and examine minutely into the nature of the injury. The following was the deformity we observed : the toes were turned outwards, the inner edge of the foot forming an angle of about 30° with its natural direction ; the sole was slightly turned outwards, and the outer edge slightly elevated. The concavity of the tendo achillis posteriorly, was manifestly increased, and the heel lengthened. On grasping the soft parts between the tendo Achillis and tibia, we found the distance between these parts much greater than in the other foot. The absence of the hard projection which would have been formed by the upper articulating surface of the astragalus, had it passed backwards with the other tarsal bones, was evident. The malleoli were perfectly defined. Below and before the inner there was a hard prominence, over which the skin was tense, formed by the inner surface of the astragalus, brought into relief by the dislocation and the slight eversion of the sole of the foot. Much the most striking part of the deformity consisted in a prominence on the dorsum of the foot. Immediately in front of the tibia it presented a flat surface, broad enough to receive the finger, and from which there was an abrupt descent upon the anterior part of the tarsus. Over this projection, caused by the head of the astragalus thrown on the upper surface of the scaphoid and cuneiform bones, the integuments were so tense, that it was evident, a very small additional force would have driven it through the skin : lastly, on taking the distance from the point of the internal malleolus to the extremity of the great toe, with a tape measure, I found it to be nearly exactly an inch less than the distance between the same points in the left foot. We could detect no fracture. The foot could be flexed and extended ; but, as any movement occasioned great pain, we did not ascertain to what extent flexion and extension could be carried.

There was no obscurity about the deviations from the natural form just enumerated. The accident had happened about

half an hour before. There had not therefore been time for inflammatory tumefaction to arise, and no effusion whatever of blood or other fluid had taken place. We concluded the dislocation to be that designated in the title of this paper.

Before describing the mode of reduction, I shall endeavour to establish the rationale of the accident. In the production of it, there were, I conceive, three principal forces in operation. 1st. The dash of the anterior part of the foot upon the ground, (the foot and whole limb being strongly extended), which tended to drive the foot upwards and backwards. 2nd. The powerful effort of the posterior muscles of the leg, which dragged the foot in nearly the same direction. 3rd. The shock of the weight of the body descending with violence, and aided by part of the effort of the posterior muscles of the leg. This force, by the strong extension of the foot, gained a purchase on the back part of the upper articular surface of the astragalus, and was thereby enabled to unseat it from the calcis, and jet it on the dorsum of the scaphoid. I think also, that a consideration of the action of the extensor longus pollicis upon the astragalus, where its tendon passes through the groove in the posterior part of that bone, will convince us, that it was especially effective in throwing the astragalus upward and forward.

There are, in the action of the posterior muscles of the leg when they raise the body on the toes, some peculiarities, which came into play in this accident, and are worth adverting to. Though what I shall have to say would apply, *mutatis mutandis*, to the deep muscles, I wish to confine attention to the gastrocnemius, plantaris longus, and soleus muscles. 1st. These muscles, in raising the body, and in the accident they did the same, act on the foot as a lever of the second kind, the fulcrum being placed at the anterior extremity of the metatarsus, the weight acting at the ankle joint, and the power at the posterior extremity of the lever. This, as is well known, is a kind of lever of which few examples are met with in animal mechanics. It contributed essentially in determining the nature of the acci-

dent, by enabling the gastrocnemius, &c. to maintain the heel elevated, by the mechanical advantage it afforded them over the weight. I look upon it as certain that the heel did not come to the ground; if it had, (the shock, as will be recollected, having been received by the foot with its outer edge somewhat elevated, and the inner depressed,) the violence would inevitably have resulted in the common compound dislocation of the tibia inwards, with fracture of the fibula near its malleolus, and perhaps the tearing up of a shell of bone from the tibia by the inferior interosseous ligament. 2ndly. In muscular action, the part of the contractile effort expended upon the fixed attachment of the muscle is usually simply lost, neither adding to nor diminishing that which acts at the moveable attachment. This is not the case in the elevation of the heel; and I think it is demonstrable, that in the dislocation, the whole enormous effort of Mr. C.'s powerful gastrocnemius, &c. was effective in the production of it. In all cases of muscular action, half the effort acts at the origin, and half at the insertion of the muscle. In general the former is either lost by the absolute fixedness of the origin, or neutralized by other muscles. But in the case under consideration, while half the muscular effort raises the heel, the other half draws down the tibia, &c. and is therefore not to be looked upon as lost with regard to the elevating half, but as what an algebraist would call a minus quantity, to be subtracted from it. Thus supposing the gastrocnemic muscles to exert a force equal to 120, the heel will be raised by a force as 60, and the tibia, &c. drawn down by a force as 60. But if so, it may be asked, how comes it that the one does not neutralize the other. Because the former acts on a longer lever than the latter, and therefore has a mechanical advantage over it. By a simple calculation we may make a near approximation to the truth, respecting the part of the elevating actually neutralized by the depressing force. Thus, supposing the distance from the anterior extremity of the metatarsus to the middle of the astragalus (where the depress-

ing force acts) to be to that from the same part of the metatarsus to the posterior extremity of the calcis, as 2 : 3, then the depressing force equal to 60, acting at the astragalus, is equivalent to, or neutralizes a part of the elevating force equal to 40 ; since these numbers are inversely as the levers by which the forces act, and these consequently balance one another. The remaining part of the elevating force, equal to 20, *i. e.* one-sixth of the whole muscular effort, is that by which the weight of the body in ordinary cases is raised, and by which, in the accident, the violent descent of the body was more than counterbalanced. I have entered into this analysis because it shows clearly how enormous the whole force exerted by these muscles must have been ; and as one-half of it was employed in drawing up the calcis, and the other, in conjunction with the shock of the body, in gouging (if I may use the expression) the astragalus from its bed on the calcis the inferior calcaneo-scaphoid ligament and scaphoid bone, it is plain that it must have mainly contributed to effect the dislocation.

In this injury the synovial capsules between the calcis, astragalus, and scaphoid were torn, and the following ligaments must have been completely ruptured ; the middle division of the external lateral ligament, running from the point of the external malleolus, to the upper and middle part of the external surface of the calcis ; the part of the internal lateral ligament which is attached to the inner part of the calcis, and sheath of the long common flexor of the toes ; the posterior and external ligaments, the one connecting the posterior edge of the astragalus, the other, the part immediately below the external malleolus, to the neighbouring parts of the calcis ; and lastly, the powerful interosseous ligament, occupying the interval between the superior articulating surfaces of the calcis, and running to the corresponding deep groove between the inferior articulating surfaces of the astragalus ; the astragalo-scaphoid ligament connecting the neck of the astragalus to the upper surface of the scaphoid bone was torn, but I believe some bundles of its fibres,

especially those running to the cuneiform bones, were not ruptured.

Having satisfied ourselves respecting the nature of the dislocation, and that the proper manœuvre (after flexing the leg strongly on the thigh, to disarm the posterior muscles of the leg, and making extension, and counter-extension, at the foot and knee) was, to press the heel forward, and the astragalus and tibia backwards, while the toes were drawn inwards, and the outer edge of the foot somewhat depressed, Dr. Hutton and I tried our full force upon the foot successively, putting Mr. C. to great torture, but without the slightest good effect. We therefore resolved, with his concurrence, to have immediate recourse to the pulley apparatus, which Dr. H. procured from Mr. "C.'s Armamentarium." Having buckled a strap, on the part of which corresponding to the sole was a pad with an iron ring firmly attached to it, round the foot, immediately in front of the astragalus, and having placed on the heel a piece of girth-web, the ends of which were crossed on the dorsum of the foot, and then made fast to the ring, he attached the pulleys to this. The further end of the pulleys was well secured; and a padded strap, taken round the lower part of the thigh, was fastened to a bed-post. The leg, the outer side of which was downward, and which sloped gently upwards from the knee to the foot, was strongly flexed on the thigh. Mr. Beatty took charge of the pulleys, and made gradual and steady extension for about ten minutes, occasionally retaining the force at a given point for a few seconds. Dr. H. placed one hand on the heel, and grasped the fore-part of the foot with the other, prepared to, perform at the proper moment, the manœuvre already described; while I, with one hand grasping, for the purpose of drawing it backwards, the lower extremity of the tibia, and with the other on the internal malleolus, for the purpose of depressing it, held myself in readiness to meet and favour his effort. Up to the moment of the reduction, Mr. C., with admirable fortitude, encouraged us to proceed, exhorting us "to do our duty"—"not to mind him." Mr.

Beatty, who, though not a large, is a strong man, had put his whole strength to the pulleys, (which consisted of a system of six pulleys in two blocks ; three of the pulleys were fixed, and three moveable, and consequently multiplied the force applied to them six-fold,) and owing to the pain his hand suffered from the cord, had drawn it over his shoulder, and thrown the weight of his body, in addition to his strength, upon it. The pain now became unendurable ; and while Dr. H. and I were intently engaged in the guidance of the bones, Mr. C. made a violent effort, which was sensibly felt by Mr. Beatty, across the pulleys. At this instant the pulleys were relaxed, and the reduction was effected without noise. All deformity, and the tensive pain experienced before the application of the pulleys, were gone, and the agonizing pain of the extension replaced by a feeling of uneasiness merely, about the ankle. His first remark was, that in any similar case occurring in his practice he would use the pulleys alone ; declaring, that we had put him to greater pain by the jerking unsteadiness of our first efforts, than he had suffered from the pulleys.

No case of similar violence ever did better. He experienced more annoyance at the ball of the great toe, which became swollen and ecchymosed, than at the dislocated joint. Twenty-five leeches were immediately applied, forty-eight the next day, and twenty-four the next. The ankle and foot were wrapped up in a large soft poultice of linseed meal, and stupes were occasionally used. He took no anodyne, being afraid that opium would, as it had often done before, disorder his stomach. On the second night he took a blue pill, and next morning a purgative draught, with grs. xv. of electuary of scammony. For some days his diet was of course strictly antiphlogistic. I may say he had not a bad symptom. On the fourth day, owing to the discontinuance of the poultice, the parts about the ankle became hot from cool, their veins full from nearly empty, and the skin tense and satiny from being shrivelled ; but these unpleasant symptoms soon disappeared on having again recourse

to the poultice. He expressed a decided preference for warm stupes, and warm and moist poultices, which kept the parts as in a vapour bath, and afforded him great comfort. He gave a trial to cold, which, however, he soon left off, finding them much less agreeable than warm applications. On the twenty-sixth day after the accident, he could lay a good part of his weight on the right foot, with but little pain ; and on the thirty-third, I saw him stand upon that foot without any. To-day (the thirty-ninth since the accident) the tumefaction, from effusion into the synovial capsules of the ankle-joint and extensor tendons of the toes, &c., which was at no time very considerable, is much diminished ; but the skin has not recovered its colour, nor the ankle its natural fineness.

A remarkable circumstance of the accident was, that Mr. C. was sensible of no pain at the moment of the dislocation. The rapidity of the injury is probably the principle on which the explanation of this depends. Injuries which we should expect to produce intense pain, if instantaneous, often produce little or none ; as in the case, related by Dupuytren, of a man, who in passing through a foundry, placed his foot in a channel in which the molten metal flowed upon it at a white heat. The foot and ankle, bone and all, were charred, without his being conscious of injury. Probably no sense can appreciate an injury which acts but for an instant. With respect to vision, the curious phenomenon presented in the child's play, in which a rod, the end of which is red hot, is made to produce a riband, a circle, or a figure of eight of fire, by rapidly moving the ignited point, and several other optical illusions, are explained on the hypothesis, that an impression on the retina acts on the mind for about the ninth part of a second ; and I think it follows, with regard to the perception of colour, for example, that a second colour, presented for an instant to the eye already occupied with another, cannot be perceived ; because the latter will occupy the perceptive faculty for the ninth part of a second, before the end of which time the second colour is removed.

With respect to the rareness of the dislocation, none of my

surgical friends here have met with another case ; and, after a diligent search, I cannot say positively that I have found a single case of the same accident. Sir A. Cooper, Boyer, Chelius, and Gibson, have not recorded it, which I look upon as good proof that it is not a recognized dislocation, admitted to occur by the surgeons of Great Britain, France, Germany, or America. Mr. Adams, who is known to have devoted much attention to the subject of dislocations, has met with no example of it in his own practice, but has referred me to the following case, related by Mr. Hey, as differing merely in being compound. "A case of compound luxation occurred in 1758, when I was a pupil of St. George's Hospital, in London. The patient was a corpulent woman, who in alighting from a horse on which she had been riding single, happened to catch hold of the stirrup with the heel of one shoe. In consequence of this she came down to the ground, upon the other foot, with so much violence, that the inferior extremities of the tibia and fibula, together with the astragalus, were forced through the capsular ligament. Mr. Bromfield, whose patient she was, finding reduction to be impracticable immediately amputated the leg ; but the woman did not recover." Perhaps this was a luxation similar to Mr. C.'s. I incline to think, however, that it was not. If it were, all ligamentary connexion between the dislocated bones being completely destroyed, the impossibility of reduction is difficult to conceive. But this impossibility is quite consistent with the opinion to which I incline, that it was the comparatively common luxation of the astragalus from all the bones it articulates with. It will be observed, that Mr. Hey does not say he saw it himself, and the case bears internal evidence of not having been recorded with the usual care of that excellent surgeon. It is obvious, that there is no capsular ligament through which the "inferior extremities of the tibia and fibula, together with the astragalus," could be forced. "J'ai eu occasion," says Boyer,* "de voir une luxation incomplète de la tête del'astragale

* Traite des Maladies Chirurgicales, tom iv. p. 406.

en haut et en dedans, sur un homme qui avait fait une chute de cheval: le gonflement inflammatoire qui survint était si considérable qu'il m'empêcha de reconnaître ce déplacement dans les premiers jours; et lorsque je pus en juger par la tumeur légère que formait la tête de l'astragale, il fut impossible de remettre cette éminence dans sa place naturelle. Les mouvemens du pied furent gênés pendant longtemps, parceque l'articulation tibio-tarsienne avait souffert, une entorse considérable; mais ils se rétablirent par la suite, et il ne resta qu'une légère difformité." Dr. Tarral* quotes, from a manuscript by M. Roux, three cases of luxation, without fracture, of the head of the astragalus on the cuboid bone. These are the dislocations most nearly approaching to Mr. C.'s, to which my search for such cases enables me to refer the reader.

ART. XII.—*On Animal Magnetism*. By ANTI-QUACK.

TO THE EDITOR OF THE DUBLIN JOURNAL OF MEDICAL SCIENCE.

SIR—This age must be beyond all others the age of quackery and imposture. Never before have such experiments been made upon the temper and patience and common sense of the sober and really rational part of our species. The follies and freaks of the phrenologists might have sufficed to occupy the credulous, while their doctrines remained proof against reason and ridicule, but mesmerism and magnetism have come upon us accumulated, and contemporary, and claim a divided empire with the unproved and unproveable, and if I may use the phrase, undisproveable follies of the phrenologist. Indeed, Sir, the fact that such formidable assaults have been, and continue to be made upon the understandings of the public by men of a character which *would* be respectable but for their repeatedly vouching, what till now had been unhesitatingly de-

* Cyclopædia of Practical Surgery—Art. Ankle.