flecting that due supply of venous blood to a lung would seem to be quite as essential a condition for the physiological action of a lung as due supply of air can be, and that the dyspnoea which people generally connect with insufficient air-supply may equally come from interference with blood-supply. Your contraction of capillaries, if of a spasmodic kind affecting the lung-capillaries essentially, would I think very much account for such phenomena as I observe in this form of asthma. I shall certainly use quinine in the next case of spasmodic asthma that comes under my notice." So he goes, taking his newly acquired insight to the bedside, and finds that with quinine he can greatly control and often can indefinitely postpone the attacks of disease that have before seemed intractable. He has acquired, in his turn, a starting-point for new observations that may be expected to lead to the establishment of a fresh empirical law.

Curiously enough, it has been when these problems of therapeutics have been thought of in the light of physiology and pathology, that the notion of practical medicine being something of a different order from physiological and pathological work has arisen; it is then that the word empirical has been used with a scarcely concealed sneer; and it is then that we have heard most about the art, as if it were something estranged from the science of medicine. Happily, the time has now arrived when all this antique folly may be given up. The action of remedies in diseased states is recognised as among the most potent methods of discovery as to the nature of a diseased state, and even as to the conditions of a healthy state; and that this recognition should have been delayed, may more justly be regarded as a reflection on the pathologist and physiologist than on the therapist. Thus, from early times the physician has observed the action of digitalis as a diuretic, of special benefit, in certain cases of dropsy of cardiac origin. Only recently it has occurred to anyone to inquire how this came to be so, and to discover that the drug produced a distinct action on the muscular tissues of the heart (and probably on that of the great vessels also), regulating and increasing the force of the cardiac contractions. Now, the physiologist observer comes to the physician with an explanation: "You have here an agent that, by increasing the blood-pressure in the vessels, assists the secretion of urine by the kidneys, at the same time that it renders the circulation capable of taking up the effused dropsical fluid. It is thus in effect what you call a tonic to the heart, and this is the way in which it operates usefully in the cases you have observed;" an excellent explanation, particularly as our physiological friend has already perceived it to involve some imperfectly understood points within his own particular branch of study; a scientific explanation, too; but not more scientific than the processes of observation and induction by which the virtues of foxglove were apprehended, and the circumstances of its usefulness ascertained many and many a year before.

Now that the truth has been accepted, that the domain of therapeutics is not distinct from the province of physiology and pathology, but that the latter sciences may learn from therapeutics as much as therapeutics may learn from them, it is to be hoped that the empirical facts of therapeutics will be more efficiently taken in hand. What could be more interesting than to receive answers to questions such as these, that are put loudly enough by the practitioner? How do counter-irritants act in the relief of pain? How do ice-bags applied to the chest operate in checking lung-hæmorrhage? How are we to look at pyrexia when we see the marvellous influence that cold bath treatment has on it? These are specimens of scores of questions that the empirist, scientific in the best sense, puts before his fellow-workers. And in the interpretation of these and like facts of experience lies the most immediate service that physiologists and pathologists can render to practical medicine.

"In such cases" (I quote Sir John Herschell) "the inductive and deductive methods of inquiry may be said to go hand in hand, the one verifying the conclusions deduced by the other; and the combination of experiment and theory which may thus be brought to bear in such cases forms an engine of discovery infinitely more powerful than either taken separately. This state of any department of science is perhaps of all others the most interesting, and that which promises the most to research."

Gentlemen, it is in this state that our science of medicine exists at the present day. Let us look, then, on our body constituted as I have shown it to be, as being charged in a special way with the advancement of medical science, for the very reason that it is, among all other societies, the most comprehensive in its range of work.

THE W. and S. Tuke Prize (one hundred guineas) has been awarded by a Committee of the Medico-Psychological Association of Great Britain to Dr. E. C. Spitzka of New York, for the best essay on the Somatic Etiology of Insanity.

REMARKS ON THE USE OF CARBOLISED CATGUT IN THE LIGATURE OF ARTERIES IN THEIR CONTINUITY.

BY JAMES R. LANE, F.R.C.S.,
Surgeon to St. Mary's Hospital.

THE merits of the carbolised catgut ligature, when applied to arteries in their continuity, has again been brought under the notice of the profession by Mr. Bryant, in a paper read at the Clinical Society on October 12th, when, from the report of the discussion which followed, it appears that there is still considerable difference of opinion among surgeons as to its efficiency and safety.

Mr. Bryant related his experience of fourteen cases, and, notwithstanding the occurrence of slight secondary hæmorrhage in two of them, concluded by expressing his opinion that "we have in carbolised catgut the best ligature at our disposal." In the discussion, Mr. Barwell mentioned that he had tied five cases with catgut, all of which were successful. Mr. Maunder, on the other hand, although quite satisfied in five cases in his own practice, stated that the records of "serious consequences, such as solution, slipping of the knot, division of the coats of the artery in one instance, immunity from this in another, while death had followed from early hæmorrhage and embolism, had decided him, enthusiast in its favour as he had once been, never to use it again. It was obvious," he added, "that no such accidents attended the use of silk." Mr. Callender said that "in one case the catgut had given way and the pulse had returned in the sac of the aneurism. In three other cases, pulsation had returned in the vessel within a few days after the operation with catgut".

The question is an important one, and it is evident that a further accumulation of facts is necessary for its solution. I venture, therefore, to offer the results of my own experience, amounting to fifteen operations, comprising seven of ligature of the femoral artery, two of the external iliac, three of the carotid, one of the brachial, one of the radial, and one of the ulnar. The three latter occurred in the same patient; one of the femoral and one of the external iliac were also in one subject. The result in all of them, so far as it depended upon the ligature, has been eminently satisfactory.

The following case is, I think, worthy of a somewhat detailed account, as it serves to illustrate several of the points at issue. It was one of popliteal aneurism, in which I had occasion to tie the femoral artery, and, twenty-five days afterwards, the external iliac; the death of the patient subsequently affording the opportunity of examining the vessel at both the points ligatured.

The patient, aged 45, a strong and healthy man in outward appearance, and of very active habits, was admitted into St. Mary's Hospital on December 14th, 1876, with a tumour of the size of a large hen's egg, evidently aneurismal, in the left popliteal space. He had first noticed a small throbbing swelling a month previously in this situation, and it had gradually increased to its present size. His pulse indicated increased arterial tension; but there was no other evidence of cardiac disease. His urine was albuminous, and contained casts. I intended, after he had rested for a day or two, to employ compression with the Esmarch bandage; but, on the morning of December 16th, when getting out of bed, he felt something give way in the tumour, which began to increase in size. In the evening, I was sent for to see him, by which time the popliteal space had become greatly distended; the swelling extending downwards under the gastrocnemius, and outwards under the biceps tendon. There was a faint pulsation in the tumour, and the pulse was just distinguishable in the anterior and posterior tibial vessels. It being evident that the aneurism had burst, it was obviously necessary either to tie the femoral artery or to amputate the limb. I decided on the former course, and ligatured the vessel at the apex of Scarpa's triangle with carbolised catgut. The ligature was drawn tight, so as to divide the internal and middle coats, and its ends were cut short. The wound was brought together with silver wire sutures and dressed with lint dipped in carbolised oil. The limb was wrapped in cotton-wool.

On the next day, he appeared to be doing well; but, on the day after, the 18th, there were such evident signs of gangrene in the foot and leg that it was determined, after consultation, to remove the limb. I accordingly amputated at the junction of the middle with the lower third of the thigh, making anterior and posterior flaps. Four vessels were tied with catgut, and, as there was slight oozing from the main artery, notwithstanding its ligature higher up, this was secured in the same way. Examination of the limb after removal showed a rent an

inch long on the outer side of the aneurism. The sac was filled with coagulum, and there were large masses of clot effused amongst the surrounding parts. For several days after the amputation, he was in a very precarious condition, with high temperature, quick pulse, and violent delirium. The wound made for the ligature of the femoral, which at first appeared to have healed, discharged a considerable quantity of pus. The stump also suppurated freely. On the 24th, a separate collection of matter was observed on the outer side of the thigh, at its upper part. This was incised, and a drainage-tube was inserted through the opening and brought out at the stump. From this time, he went on favourably, the suppuration diminished, the wound looked healthy, his appetite was good, and he was daily gaining strength till January 3rd, when slight hæmorrhage took place from the stump. This recurred on the following day (January 4th), when six ounces of blood were lost. The bleeding was stopped by plugging the wound with lint dipped in solution of perchloride of iron. It appeared to proceed from the outer part of the anterior flap, probably from some descending branch of the external circumflex artery. There was further hæmorrhage on the 7th and 8th, which was only arrested with difficulty by careful plugging. It recurred on the 10th to an alarming extent, and it was then decided, in consultation, to secure the external iliac artery. I tied this vessel an inch above Poupart's ligament by the usual method, employing carbolised catgut and cutting the ends short. No further hæmorrhage took place; but the patient, who had been suffering from broncho-pneumonia for a day or two before the operation, died from this and from exhaustion consequent upon the loss of blood, on the morning of January 13th, sixty hours after the last operation.

No examination of the body was permitted by the friends; but I enlarged the wounds and removed the external iliac and femoral arteries. Their coats appeared to be healthy throughout. Dissection of the femoral artery, which had been tied twenty-eight days before death, showed an abrupt constriction at the ligatured spot, but no trace of the ligature remained. Above and below this the artery was filled with firm coagulum, which was closely adherent to the arterial walls for at least an inch upwards, above which it filled the vessel, but without adhering to it, up to the origin of the profunda. Below, there was an equally firm clot, also adhering to the vessel, and about three-quarters of an inch in length. The external coat was entire, and showed no sign of having ulcerated through. It formed a cord connecting the ends of the vessel, but was placed, not in the centre, but at one side, having been drawn apparently towards the side at which the knot was tied. The femoral vein was perfectly healthy. The suppuration in the thigh had evidently not extended down to the vessels, which were shut off from it by plastic exudation. The sheath of the artery above and below the ligature was somewhat thickened, but could readily be dissected off as a distinct layer from the proper external coat of the vessel.

Examination of the external iliac, which had been tied sixty hours before death, showed the ligature in its place. The internal and middle coats had been cut through, and the external coat constricted and drawn towards the side where the knot was placed. The loop of the ligature was beginning to soften down, but could be distinctly seen maintaining its hold securely. The knot, as might be expected, was less acted upon. There was a very firm clot above the ligature, filling the vessel for three-quarters of an inch and already adherent. From this it tapered upwards as far as the bifurcation of the common iliac. Below the ligature was an equally firm clot reaching downwards nearly to the origin of the epigastric and circumflex iliac arteries. The external iliac vein was perfectly healthy, and showed no sign of inflammatory action. There was some suppuration of the wound superficially, but it did not extend down to the artery. The deeper parts of the wound appeared to be closed by plastic effusion. The specimen has been preserved.

The action of the catgut ligature on these two vessels seems to me to leave nothing to be desired. Coagulation was perfect in both; the internal and middle coats had been cut through; but there was nothing to indicate any ulceration of the external coat, either commencing in the iliac or having taken place in the femoral. The external coat in both cases appeared to be drawn tightly across the ends of the coagula and gathered into a cord at one side. Both vessels were surrounded by an effusion of reparative material, which separated them from the parts where suppuration was going on, which, in the case of the femoral, was beneath the fascia, from just below Poupart's ligament to the amputation-wound. The advantage of this in sealing up the deeper parts of the wound is obviously very great, as compared with the old practice of leaving one end of a silk ligature ready to convey noxious secretions into actual contact with the vessel at the point ligatured.

The only other case in which I have had an opportunity of examin-

ing the vessel at the point ligatured occurred at the Lock Hospital in 1873, after operation on the external iliac artery. The patient was a girl aged 17, in feeble health and of dissipated habits. She was admitted with secondary syphilis and a sloughing abscess in the glands below Poupart's ligament. Hæmorrhage took place from this sloughing wound, proceeding, I believe, from ulceration into the superficial external pudic artery, near its point of origin from the common femoral. The bleeding recurred again and again, and was so serious that it became necessary to tie the external iliac artery, which I did on November 28th, using the carbolised catgut ligature. This was effectual in arresting the hæmorrhage, which did not return; but the foot and leg mortified as high as the knee, and the operation-wound almost immediately took on a sloughing action similar to that of the neighbouring bubo from which the bleeding had proceeded. Notwithstanding all these serious complications, the patient struggled on, but gradually sank, and died from exhaustion on December 30th, thirty-two days after the operation.

At the time of her death, the operation-wound had been converted into a sloughing cavity as large as the palm of the hand, extending down to, and involving, the abdominal muscles, which were softened and disintegrated into pulpy shreds. Examination showed that the slough nearly reached the vessels and outer surface of the peritoneum, but these did not appear as yet to be implicated in it. The artery was constricted and closed at the point of ligature, and was full of firm coagulum upwards beyond the bifurcation of the common iliac, and downwards for some distance into the femoral artery. No trace of the ligature could be discovered. The vein was full of soft coagulum, probably the result of the slow mode of death; for it showed no sign of inflammation. The neighbouring peritoneum was also sound. It would be difficult to imagine a chain of circumstances more unfavourable from beginning to end than those which were present in this case. In spite of them all, the artery was obliterated; there was a very efficient coagulum both above and below, and the ligature had disappeared. It is not, I think, going too far to attribute this favourable result to closure of the deeper part of the wound by adhesive effusion immediately after the operation, the new material not having been completely destroyed at the time of her death, by the sloughing process. On the other hand, had there been a ligature protruding from the wound, it must have carried the infection of sloughing phagedæna down to the vessel, ulceration of which, followed by softening of the incipient clot and secondary hæmorrhage, would have been an exceedingly probable, if not an inevitable, consequence.

In all the remaining twelve operations, recovery has taken place; suppuration of the wound has been present in ten, in some of them trifling, in others very profuse; but there has been no secondary hæmorrhage, no recurrent pulsation, or anything to indicate inefficiency on the part of the catgut ligature. In these ten cases, as well as in the three to which I have alluded in detail, no antiseptic treatment, excepting the catgut ligature, was adopted. The remaining two operations have occurred recently, and were for popliteal aneurism. In these, the carbolic spray was used, and every antiseptic precaution carefully observed. In both, immediate union took place, with the slight exception that in one a few drops of pus exuded from one point in the wound about a week after the operation.

Thus in the first thirteen operations, the progress of the wound was unfavourable, inasmuch as suppuration took place to a greater or less extent in all; but notwithstanding this, complete security from hæmorrhage was obtained. If by carefully following out the antiseptic treatment the wound can be made to unite by adhesion either wholly or in great part, as in the last two cases, the security, no doubt, will be much increased. I look upon the chief merit of the catgut to be, that it may be cut short and left in the wound without risk of irritation being set up; and that it thus admits of adhesive closure of the deep part, as shown in the cases first related, even although extensive diffuse suppuration, or even sloughing phagedæna, may be present nearer the surface.

I have always used a moderately stout ligature, and have tied the knot tight enough to secure the division of the inner and middle coats, taking care to observe that the first noose has not relaxed before the second one is drawn tight. It is important to attend to this, catgut being a somewhat stiff and slippery substance as compared with silk; and for further security, a third noose should be tied; and if this be done, subsequent slipping and loosening are impossible. The ordinary double knot, whether reef-knot or "granny", and whether of silk or catgut, is unreliable; and the difference between these two kinds of knot, which has been so much insisted upon, is not warranted in fact, as may easily be demonstrated by tying them round the ends of a pair of dressing forceps, when, if the blades be forcibly separated, either will give way, the one as readily as the other; whereas with a third noose,

the loop of the ligature will always break while the knot remains entire.

Mr. Lister has been credited with recommending that the catgut should be applied so as to close and not injure the artery, when the lymph which is effused around it will contract and permanently close the vessel. I cannot, however, find sufficient warrant for this statement. Mr. Lister, in 1869, said, after giving the results of some experiments on animals, that they suggested the revival of the old question, whether it would not be better always to avoid rupture of the internal and middle coats, so that the wall of the vessel would be left from first to last entirely intact. But he also said that probably it was a matter of indifference; and, judging from one of the experiments, that the injury done to the vessel at the outset by tight tying seemed to lead to changes which increased its power of resistance. And at the meeting of the British Medical Association in 1875 he said, "As to the catgut not cutting through the internal and middle coats, he always applied it so as to do so".

I believe that the division of these two coats is greatly conducive to safety by favouring the closure by adhesion of the divided ends, and, what is perhaps of more importance, by insuring, as far as possible, the formation of an efficient coagulum above and below the ligature. It is upon these processes that safety mainly depends; and properly prepared catgut, of sufficient strength and securely tied, may, I believe, be relied upon to hold the artery long enough for their accomplishment, while it will probably in most cases soften down soon enough to prevent any ulceration of the external coat from being set up.

It appears to me that to ligature a vessel with catgut with just such a degree of tightness as to approximate its sides without damaging any of its coats must be a matter of extreme difficulty; and that in attempting to avoid doing injury, there will always be risk, with catgut especially, that the knot will either be tied so loosely as not to intercept the circulation, or so insecurely that it will be likely to open out under continued pressure of the current of blood. May not this be the explanation of the cases in which pulsation has returned in the vessel within a short time after the operation? I know of no reliable evidence in favour of this practice, and I would submit that it is more consistent with sound surgery to adhere to the long established rule of tight ligature and division of the two internal coats; while as regards material, I entirely agree with Mr. Bryant, that we have in carbolised catgut the best and safest ligature at our disposal.

ON THE MEDICAL INJUNCTION OF STIMULANTS IN DISEASE AND IN HEALTH.*

By DYCE DUCKWORTH, M.D., F.R.C.P.,

Assistant-Physician to St. Bartholomew's Hospital; Examiner in the Practice of Physic in the University of Edinburgh; etc.

I AM not unmindful that I open up in this brief communication a very large subject; but it seems to me that I can fairly well embody what I have to remark within the compass of a short paper, provided that I avoid arguments upon general principles, and exclude deductions from particular instances. There can be no doubt that the public is much stirred and interested at the present time upon the subject of stimulants. It has come home to the minds of a large number of true-hearted and patriotic Englishmen that the reproach cast upon this country for its notorious drunkenness is utterly grievous, and calls on all hands for the best efforts to remove it. We find, therefore, that such efforts have taken form in various organisations to promote temperance. It appears to me that all action in this matter should be based upon the soundest principles; and, as a problem of this nature manifestly lies within the sphere of medical men to solve, it is clear that the members of the medical profession should exhibit such unanimity upon the subject as becomes those who have received the fullest measure of physiological training in the community. And, indeed, the question of our national intemperance practically comes, in the meantime, to be dealt with by the clergy and the doctors. When the medical profession presents an united front, or, at all events, a stronger body in line than it actually does to-day, arrayed against this evil, it will be in a position to lay down principles which should guide the clergy in their efforts, and the time will then have arrived when the members of these two professions can together lay such a case at the doors of our legislators as they can neither gainsay nor resist.

I apprehend that a vast deal of energy is lost in this cause, and no little harm done to the legitimate influence of medical men, because such

immense differences of opinion prevail amongst our members on the subject of stimulants. As one who signed the famous medical declaration respecting alcohol some years ago, my own position in regard to this question is fixed. I have never materially wavered in my opinion, and I think I see clearly the aspect in which this subject should be viewed by all thoughtful and observant practitioners of the medical art. But what do we find as the expressions of opinion of men from within our ranks? We have in London a Temperance Hospital. If a temperance hospital be a proper and superexcellent institution, then all the hospitals in the world are worked on an erroneous principle in this respect. We find one of our most original members, a man of unquestioned ability, and fertile in ingenuity beyond his fellows—Dr. Richardson—actively engaged in propagating teetotalism as the outcome of elaborate physiological experiment. We find the most skilful lithotritist of the day enjoining the same practice of abstinence. On the other side, we find, if not a large number of practitioners, yet very many, who, if not in a position to teach, certainly enforce by their injunctions, the principle of the value of full stimulation both in health and disease. We find further, and happily, that a clear majority enjoins what may be termed a legitimate and sensible course in this matter.

But, when we review this varied expression of opinions, can we allow that it is satisfactory or in any way creditable to our profession? If such gulfs exist within our own ranks, what opinion is to be formed by the laity who, in these days, are wise enough to think for themselves on most subjects? Here we have a vast body of men specially trained to observe, brought into the closest contact with their fellow-men under every conceivable variety of circumstances, differing, be it noted, about *facts*. Now, as my late revered teacher Professor Hughes Bennett used to say, it must always be discreditable for medical men to disagree about *facts*, though large latitude may be allowed for difference of views about *theories*. If this be so—and I accept this dictum—then there is no middle course for us to pursue. Stimulants, therefore, are *all right if they be rightly used*, or they are *all wrong if they be used at all or in any degree*. It behoves every one of us to have a clear understanding in this matter, and to frame our conduct upon well-ascertained and incontrovertible principles; for I suppose no one here will stand up to defend the exploded theories as to change of type either in humanity or the diseases of that humanity. We are all old enough to have witnessed some wave, or it may be waves, of fashion in therapeutic measures. Some may recall the bloodletting days, others the days of distinct stimulant treatment; some have seen mercury abused, and some have perchance seen attempts made to treat disease without this drug. But what do we all agree to say and to affirm to-day in respect of such reminiscences? Do we not say that all these waves successively represented unstable struggles towards the truth; that one was a Nemesis for its predecessor; and that assuredly all of them have now foamed out their own shame upon the everlasting shores of attained medical truth?

If we then cast our eyes over the prevalent varied opinions upon this subject of stimulants, we see several waves upon the horizon; and, when we confront such an outlook, I think we are not likely to be wrong if we believe that these perturbations, like others that have come before, will subside and leave us with some settled opinions. But the whole question must be taken up; and its claims for our best attention are very strong, especially at this time. I believe, then, firmly that a wave of fashion in physic very rarely, if ever, represents a wholesome thing in itself; and our duty is to resist being carried away upon such waves by holding on to the ever sure method of constant clinical watchfulness. The settlement of this vexed question comes, I apprehend, by honest clinical work in so far as the sick are concerned.

On the topic of stimulants for healthy people I shall express myself presently; but I would remark in this place that it seems to me inconceivable, if not absurd, that a solution of such questions could ever be attained by the best researches made in laboratories upon any of the lower animals. Arguments deduced from such sources, however, weigh very heavily with the laity; and it is easily intelligible that appeals should be made to such researches by zealous but non-scientific labourers in the great temperance cause. I am not here to decry the splendid work done in the laboratories of this or other countries, nor to discourage any earnest seekers after new truths in physiology—far from it; but surely the great laws affecting the physical well-being of our humanity are best to be learned by the study of that special humanity itself and of all that influences it. There must ever be a great gulf fixed between all that pertains to man and all that affects even the next inferior order of beings. We cannot in all respects apply the physiology of the lower animals to problems which man's body alone furnishes for us daily. The chief study of the medical mind should be *man*.

* Read at the Conjoint Meeting of the East and West Surrey Districts of the South-Eastern Branch.