As it has been repeatedly shown that consumptive diseases, in their earlier stages, are favourably influenced by the removal of the patient to higher elevations, it appears surprising that this plan of treatment has been almost entirely disregarded by the medical men of Europe. I will, therefore, shortly discuss the principal objections met with in conversation with men of deservedly high reputation in our profession.

1. The low temperature and the roughness of the Alpine climate during the greater part of the year are usually regarded as hostile to the delicate constitution of the consumptive patient. Cold, however, is in itself surely no cause of phthisis, which, in some of the most northern parts, is rarer than in the South of Europe. The popular prejudice against cold may, perhaps, be understood, by considering that cold induces delicate people to remain indoors, and keep their doors and windows closed, and that it often prevents the poor from gaining their livelihood; that it, therefore, gives rise indirectly to the most powerful causes of consumption: viz., confinement in ill-ventilated rooms, insufficient exercise and imperfect breathing, scanty clothing, and want of proper food. With more reason we might say, that cold in itself counteracts the tendency to consumption where there is a sufficiency of food and clothing, for it causes an increased abstraction of heat from the body, to supply which the respiratory action must be proportionately increased and the expansion of the lungs promoted, which latter is one of the greatest prophylactics against consumption.

2. A second objection often raised is, that the rarefied air of elevated localities increases the tendency to hæmoptysis. It probably owes its origin to the description of great ascents by Saussure, Humboldt, and others; but these climbers were in conditions very different from those of the invalid gently walking about near his temporary mountain residence. Those who have ascended high mountains, and especially steep snow-slopes, without being in thorough training for such work, will remember the violent beating of the heart and the throbbing of the carotid and temporal arteries, which might, one should think, easily lead to rupture of the weak vessels; yet, how rarely such a rupture actually does occur, how seldom any bleeding from the nose or mouth takes place, all those can testify who are in the habit of spending their holidays on the Swiss mountains. Some of the famous guides who constantly accompany the great Alpine climbers tell us that they have rarely, others that they have never, seen those much talked of bleedings, either in their fellow-guides or in their enterprising patrons. It may, therefore, be concluded that this supposed effect of rarefied air has been much exaggerated; but, even if it were to occur amongst active climbers, this ought not to deter the quiet invalid sojourning in elevated valleys. One of the most frequent causes of pulmonary hæmorrhage is probably the rapid breaking down of lung-tissue, and through this the lesion of blood-vessels before they have been obliterated; and circumstances favouring such a process are likely to increase the tendency to pulmonary hæmorrhage, while those unfavourable to it diminish the tendency; and I trust that such an influence may sooner or later be accorded to well selected Alpine climates.

But, apart from reasoning, let us see what experience teaches. Dr. Archibald Smith, after having mentioned that hæmoptysis is very common in Lima, says: "Climate is supposed to be omnipotent in the cure of hæmoptysis—i.e., the removal to the temperate recesses among the hills."* The recesses referred to are about 9000 feet to 10,000 feet above sea level. Again, he says, in another place: "Incipient tubercular phthisis, usually attended with more or less hæmoptysis, is one of the most common pulmonary affections known in Lima and other parts of the coast of Peru. It is a disease almost certainly curable, if taken in time, by removing the coast patient so attacked to the open inland valley of Jauja, which runs from 10,000 to 11,000 feet above sea-level."† My own experience is limited; but, amongst the invalids in whom I have been able to watch the influence of Alpine climates, there were five who, while living in low elevations, had suffered from one or more attacks of serious hæmoptysis, and all of them remained quite free during their stay in Alpine regions.

3. A third objection often raised is, the great difficulty of finding a proper mountain residence for the invalid; and this, I must confess, is not without foundation. It is impossible for an invalid in a changeable climate to live without a proper house and food, and some comforts; and it is almost impossible for him to live without society, occupation, and amusements. On the mountains of Great Britain there are, as yet, no such homes for invalids; but, in the British colonies, on the Himalaya range, there are probably many already well inhabited localities where consumptive invalids might regain their health, where the British army might have its sanatorium for the consumptive soldier. In South America, the Peruvian Andes offer many eligible situations, and especially, according to Dr. Archibald Smith, the two principal health-

resorts for the phthisical invalids from Lima, Jauja and Huancayo, where the climate is temperate and equable, the sunshine bright, and fogs very rare. With the increasing facilities of communication, these Andine sanatoriums for the consumptive will become more and more accessible. The high table-land of Mexico, too, may offer many eligible localities, when once the social conditions of that country have become more settled.

[To be continued.]

ON THE TREATMENT OF FRACTURES BY ELASTIC EXTENSION.

By H. WORTHINGTON, M.R.C.S., late House-Surgeon to the Middlesex Hospital.

THE many cases of fracture of the lower extremities admitted into this hospital, and the labour and pain necessitated in their reduction and successful treatment, induced the trial of elastic extension. Its mode of application is easy, and the results, as far as they have gone, have proved highly satisfactory. The following is a description of the way in which elastic extension is applied at the Middlesex Hospital.

The splint employed is of suitable size, and a modification of that recommended by Mr. Barwell for extending the leg in hip-joint disease.

It consists of a long, straight, stout splint, with a piece of wood about a foot in length let in at right angles to it about six inches from its lower end. The long arm of the splint is well padded on its inner side. An inch or two from the upper end of the splint is a small pulley, fixed in an aperture made for the purpose; a similar one is placed at the lower end. That part of the splint which is let in at right angles, is provided with a slit extending nearly its whole length, admitting another pulley of similar size, which can be shifted to various parts by means of an iron pin passing through holes bored in the sides of the cross-piece. A strong piece of strapping is now applied to the sides of the leg, leaving a loop at the sole of the foot as in the ordinary way, care being taken that the loop shall be large enough to admit a tightly rolled leg-bandage; this being placed transversely at about the middle of the sole of the foot, so that it is enabled to receive all lateral pressure when extension is applied. Without this, the strapping would cut the hollow and outer side of the foot, and give rise to considerable pain and inconvenience. In cases of fracture of the leg, the strapping should not come above the seat of injury. The foot should now be bandaged, so as to retain the strapping firmly. A piece of strong cord is then fastened to the loop of plaster, so as to include it and the roller, and this gives us a fixed point to pull upon from below. The cord, thus fastened, is next passed over the pulley which lies in the slit in the cross-piece, then over the pulley at the lower end of the splint, and is carried to about the middle of the outside of the long side-piece. Here it is attached to one end of a patent elastic door-spring, or accumulator. To the upper end of the elastic is attached a piece of wood,* about four inches long, one inch broad, and half an inch thick, perforated by three holes equidistant, and just large enough to admit the cord used. By one of these holes, it is secured to the elastic. A well padded perineal band is now applied, to the upper part of which a separate piece of cord is fastened. This is brought over the pulley at the upper end of the splint, and then made to perforate successively the two remaining holes in the piece of wood attached to the elastic. It will now be evident that, by slipping this piece of wood up the cord fastened to the perineal band, the elastic will be put on the stretch, and, in this way, extension may be regulated to a nicety.

The limb may now be brought into position, and extension applied as far as is deemed advisable. It does not appear necessary to reduce the fractured limb to its normal length on the immediate application of the splint; for, if this be not directly obtained, the constant extension

* "Practical Observations on the Diseases of Peru," *l.c.*, p. 8.

† "Climate of the Swiss Alps and Peruvian Andes compared," *l.c.*, p. 349.

* Similar to what is used for tightening the robes of tents. It is used here on the same principle, and was suggested by Mr. De Morgan.

which is kept up gradually overcomes the contraction of the muscles; and, with very little adjustment, the limb will be found to have gained its proper length in the course of two or three days, the extension being increased or diminished according to the necessities of the case.

There are many advantages besides this. Apart from doing away with the forcible extension necessary to overcome spasmodic contraction of the muscles, which often gives rise to so much pain and subsequent excessive irritability of the parts, there are many reasons for urging the trial of the above-mentioned plan, more especially in fractures of the thigh.

With the exception, perhaps, of an occasional twist once or twice round the knee or ankle to steady the limb, no bandaging is required; or a sand-bag on the inner side of the extremity will generally effect all that is wanted. With the dispensing of bandages, not only is the patient relieved of much pain at the time of putting up the fractured limb, but also of all distress occasioned by their subsequent renewal and adjustment. The surgeon's time is saved, which is no small gain if he have several such cases to attend to daily. The large surface of skin remains exposed. Thus its excreting power is unimpaired; and the irritation which is occasioned by its excretions being pent up, and which at times becomes almost unbearable, is altogether avoided. The limb can be cleansed daily without interfering with the appliances, and every practical surgeon knows the value of this measure. Moreover, with a momentary glance, it can be ascertained whether the position of the limb is good, and any irregularity remedied.

Another very great advantage is, the being able to place the splint and perineal band on the sound side, as has been for some time practised by Mr. De Morgan in cases of hip-disease. This, of course, will be especially useful when there is abrasion or bruising of the injured side, which would be aggravated by anything coming into contact with it. When the splint is used in this way, a sand-bag on each side of the limb will be sufficient to steady and support it. With the old Liston-splint, and its mode of application, requiring, as it at times does, great force in reducing the fracture, and then even failing to obtain proper length, it has frequently occurred to my mind that the separated fragments are often either too far apart, or form with each other a more or less obtuse angle.

The amount of force used, and the mode of fixing above and below, seem almost incapable of bringing the ends of the fractured bone into close and perfect apposition. The present mode of using the elastic is calculated, I think, to ensure this. The extension is equalised; the power above being as great as that below the seat of fracture, overlapping is more easily corrected, and, as the contraction of the muscles is overcome, the elastic, by its contraction, tightens the cords, so that sufficient extension is always kept up. As the limb lengthens, the elastic of course shortens; and this shortening of the elastic is very essential; for, as the limb attains its normal length, the extension ought to be diminished, otherwise the fractured ends might possibly be pulled too far apart. This required diminution of tension is brought about by the lengthening of the limb. Both objects are effected at the same time, the one by means of the other. When once the separated ends of the bone are placed in good apposition, the length of the limb is easily maintained, slight tension being required to steady them on the one hand, while the contraction of the muscles assists in doing so on the other. The result is close apposition of the parts. This, of course, facilitates and hastens union, and prevents anything like shortening.

Mr. Nunn is of the opinion that, by means of this extension, the normal co-ordinated tension of the muscles is able to keep the bones in proper position.

The appended cases will show with what results this mode of elastic extension has been used. If space allowed, several could be added, besides which we have many more now under similar treatment, all promising like success. This plan could not, of course, be adopted in cases complicated with delirium of any kind; but there appears no reason why it should not be tried in oblique compound fractures, where so much difficulty is experienced in their reduction.

CASE I. James E., aged 16, was admitted under Mr. Nunn's care on January 11th. Right leg short by an inch and a half; foot everted; oblique fracture of femur at junction of lower with middle third; very considerable effusion and tension around seat of fracture; swelling around, and effusion into knee-joint. Elastic extension on sound side, owing to an ulcer in the right groin; ice to knee; proper length obtained. February 12th. Splint removed; firm union, but slight thickening; length perfect.

CASE II. Charles H., aged 13, was admitted February 6th, under the care of Mr. Moore. Right leg short by two inches; foot everted; crepitus at junction of middle with upper third of right femur. Elastic extension was applied. Shortening less by one inch. February 7th. Shortening less by one inch and a half. February 9th. Length normal.

March 9th. Splint removed; firm union; length normal. Discharged March 10th.

CASE III. Thomas K., aged 44, was admitted under Mr. Nunn on January 12th. Very oblique fracture of tibia, with fractured fibula; lower fragment of tibia riding, but thinly covered by skin; considerable ecchymosis and swelling. Ordinary back iron-splint was applied; remained on this splint fifteen days; constant adjustment and alteration required to keep fragments in position, but without success. Elastic extension. Fragments reduced to proper position. In three weeks, there was firm union; line and length of tibia quite normal, but slight thickening of tibia to indicate seat of fracture.

CASE IV. John W., aged 43, was admitted under the care of Mr. Nunn on January 10th. Oblique fracture of tibia at middle third, with fractured fibula; lower fragment drawn up above upper one. Back splint and lateral splint were in succession applied, with very unsatisfactory results. February 7th. Elastic extension applied. Fragments easily reduced to their normal position. On the 21st, the splint was removed. Firm union; length normal; line of tibia almost uninterrupted. On the 27th, he was getting about with the help of sticks.

CASE V. William C., was admitted on February 19th. Transverse fracture of tibia and fibula about four inches above the malleoli; considerable displacement, with shortening and bruising. Elastic extension was applied on March 18th. Firm union; but slight thickening on inner side of tibia to indicate seat of fracture.

EXPERIMENTS ON THE POISON OF THE COBRA-DI-CAPELLA.*

By GEORGE B. HALFORD, M.D.,

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A MELANCHOLY accident which lately happened with the cobra-di-capella induced me to make some experiments and observations upon the action of the reptile's poison, which have proved eminently interesting.

When a person is mortally bitten by the cobra-di-capella, molecules of living "germinal" matter are thrown into the blood, and speedily grow into cells, and as rapidly multiply, so that in a few hours millions upon millions are produced at the expense, as far as I can at present see, of the oxygen absorbed into the blood during inspiration; hence the gradual decrease and ultimate extinction of combustion and chemical change in every other part of the body, followed by coldness, sleepiness, insensibility, slow breathing, and death.

The cells which thus render in so short a time the blood unfit to support life, are circular, with a diameter on the average of one seven-teen-hundredth of an inch. They contain a nearly round nucleus of one two-thousand-eight-hundredth of an inch in breadth, which, when

further magnified, is seen to contain other still more minute spherules of living "germinal" matter. In addition to this, the application of magenta reveals a minute coloured spot at some part of the circum-

* Communicated by James Paget, F.R.S., London.