a series of meteorological observations, he traces a curve in accordance with the numerical values he has previously obtained. This curve, which rises, falls, or remains stationary, shows what has really taken place much more clearly than a column of figures, which is tedious and fatiguing to read down. The comparison of the two curves is as it were instantaneous; their identity and their dissimilarity strike the eye at once. The sum of every kind of observation can thus be expressed by curves: changes, pressure, weight, or bulk, or variations of intensity of any kind of force. Still more, all kinds of statistics lend themselves to the use of this method, and thus yield to the first essay results which could only be disengaged by a long and assiduous study. Therefore the use of the curve becomes daily more widely diffused, though not with sufficient rapidity for the wishes of those who realise the sum of its usefulness. How is it possible not to anticipate with impatience the day when long and obscure descriptions will give place to satisfactory representations? All who occupy themselves with experimental study or observations, readers overwhelmed and invaded by the accumulation of written documents, the economist, the statistician, the financier, the statesman, who accumulate around them volumes full of figures, one of these days will find, in one atlas containing some luminous curves, the whole essence of these crude materials. If the graphic method, however, possesses such great advantages from the aspect of the exposition of observed facts, how great is its superiority when the phenomenon of which it gives up the tracing belongs to those which entirely escape the perception of our senses! Here there is no longer any intermediary between the act and its graphic expression. Transformed into inscribing apparatus in meteorological observatories—the barometer, the thermometer, the hygrometer—incessantly determine the state of the atmosphere. Patient, conscientious, infallible, these instruments do what would be impossible to a legion of observers. Formerly, the boldest imagination could not have dreamed that the velocity of a cannon-ball could be seized at all points of the trajectory. This important problem, however, is now solved, and still greater velocities are determined at the present day. The graphic method is equally applicable to the measurement of extremely slow movements. We do not see the growth of a plant; but we can obtain the tracing of its increase, and record that, at certain hours and under certain influences, vegetation is accelerated or retarded. The method of making these determinations is in all cases identical. To force a stylé to move under the influence of the movement which it wished to inscribe is never a very difficult operation. This done, it suffices to receive the tracing on a surface which moves more or less quickly according to the movement which is intended to be inscribed. To measure the velocity of a projectile, a velocity of 200 to 300 *mètres* per minute is printed on the paper; whilst the growth of a plant should be inscribed on a paper which does not change its situation more than a few *centimètres* in the twenty-four hours.

In the enumeration just made, it may be noted that only very simple movements are treated of, moving in a rectilinear direction, sometimes in one direction only, sometimes alternately in two opposite directions. How, indeed, would it be possible to seize those capricious movements which arise in all directions of space? Though more complicated, however, my problem is not insoluble. Everyone is acquainted with the pantograph; everyone knows that, if the outlines of any given object be followed with one limb of this instrument, the other reproduces the same figure either reduced or enlarged. An analogous arrangement allows the inscription, at considerable distances, of all movements on the same plane. My apparatus is, like the two others described, composed of two parts, of which the one is the explorer and the other the receiver. These two parts transmit the movement to each other by air-tubes; each carries a point; and if one of them be led so as to trace a circle, you will see the other point likewise trace a circle; write your name with the first point, and your signature will be reproduced by the other instrument. An easily understood arrangement admits the reproduction of the movement according to its three dimensions in the space.

With these complex transmissions, there is no movement which cannot be reproduced. A flying bird, if of sufficient size, can carry instruments constructed on this principle; the creature, bound by one or two India-rubber tubes to the inscribing instruments, gives the curves of every movement it performs. Thus the trajectory of the wing at every moment of the flight is determined: the torsion movements which are imparted to it by the resistance of the air, even to the oscillations and to the jerks the body of the bird receives from the reaction of its wing-strokes.

I here terminate this exposition, which, though perhaps too long, is yet very much compressed. I have been able to show partly the results of a method which is yet in its infancy, and which, without doubt, will attain still greater perfection. Should we not, therefore, expect much

from the graphic method? Should we not hope that, thanks to its employment, experimental science will advance with a sure and rapid step? Such is my profound conviction, and one which I should like to see widely shared.

CLINICAL LECTURE ON A CASE OF CYSTIC DISEASE OF THE LOWER JAW.

Delivered in University College Hospital.

By CHRISTOPHER HEATH, F.R.C.S.,
Holme Professor of Clinical Surgery.

GENTLEMEN,—The patient whom I bring before you, before sending her to Eastbourne, is the woman upon whom, a month ago, I performed an operation for cystic disease of the lower jaw. She was sent to me by Dr. Parsons of Dover, and was admitted on November 3rd, 1875, with the following history. About nine years ago, the patient first noticed a lump of the size of a pea beneath the tongue, on the right side, which gave her some pain, and for which a tooth was extracted. From that time, she had a succession of abscesses (?) in the lower jaw, some of which discharged in the mouth, and one externally, and for which she had several teeth extracted. Dr. Parsons sent her to me three years ago, and I then recommended her to come into the hospital; but she declined, and went on with a steadily increasing tumour of the lower jaw on the right side. About nine months ago, the tumour seems to have begun to increase with some rapidity, and, two months ago, the following characteristic event happened. While eating, the patient felt a sudden crack in the lower jaw, and this occurred twice in the same week; and upon each occasion she felt great pain in the floor of the mouth and upon moving the tongue. Upon admission, there was really very little to be seen externally, and I show you a photograph taken at the time to remind you of the fact that, excepting a very small projection beneath the skin in front of the angle of the jaw, there was nothing to call attention to the patient's face. On looking into the mouth, however, the tumour was at once obvious; and I show you a cast taken from the jaw at that time (Fig. 1). The right

Fig. 1.

side of the lower jaw is seen to be greatly expanded from immediately in front of the ramus to beyond the median line, the tumour measuring two inches across at the broadest part, and reaching under the tongue. Its surface was lobulated and rounded, firm and osseous in the greater part, but yielding distinctly on pressure in two or three places. The mucous membrane was entire over the tumour, except at one point where there was an opening, from which a discharge constantly exuded. The incisor teeth of the right side were displaced over to the opposite side, and were loose. The central incisor of the left side was displaced completely in front of the other teeth. The left canine and

bicuspid were firmly fixed. Now, anyone superficially examining this case, without carefully manipulating it throughout, would not unnaturally have regarded it as a case of solid tumour, probably osseous, requiring the removal of a considerable portion of the lower jaw. It became obvious, however, on a careful examination, that the bone was thinned and expanded by some growth within it, and that this was cystic in its nature was shown by the distinct fluctuation of the nodule projecting on the face and the constant escape of fluid within the mouth. The "cracks" experienced by the patient two months before were very characteristic of bone expanded and thinned by cystic growth within. Notwithstanding the size of the tumour, the outline of the lower border of the jaw was scarcely interfered with, the disease being mainly confined to the alveolar portion of the bone; and I, therefore, decided to operate from within the mouth, so as to avoid, if possible, all external scar.

On November 10th, the patient was put under chloroform (ether being unsuitable for prolonged operations on the mouth), and a gag having been introduced on the left side, I first extracted the four incisors, and then made a free incision with a stout scalpel along the upper surface of the tumour, cutting easily through the thin bone and thick membrane forming its upper wall. A quantity of dark-coloured cystic fluid at once escaped, and I then cleared out the semi-solid contents with the finger and gouge. The finger introduced into the cavity passed completely under the canine and bicuspid teeth of the opposite side without disturbing them. I next cut away a portion of the cyst-wall with scissors, and crushed together the remainder as far as I could with my fingers and thumb. The actual cautery was applied to one spouting vessel in the margin of the alveolus, and the cavity was stuffed with lint dipped in chloride of zinc (twenty grains to one ounce).

The patient had very little constitutional disturbance; the plugs were gradually removed from the cavity of the jaw, which was carefully syringed out frequently with Condyl's fluid, and soon began to granulate and fill up. At the present time (December 6th), the right side of the lower jaw is still somewhat enlarged, and a bony rim can be felt at the point near the angle where the cyst projected externally, the hole being filled up by soft tissue. Inside the mouth, the two plates of the lower jaw have come together, and the cavity is filled up almost completely by elastic granulation-tissue, there being only a shallow cavity half an inch long still to be filled up midway between the angle and the symphysis.

This, then, was a case of cystic disease of the lower jaw running its course for nine years; for, no doubt, what the patient describes as abscesses were discharges of cystic fluid taking place from time to time. Originating in the sockets of the teeth, the disease gradually expanded the entire alveolus and extended across the median line. In the museum of St. Bartholomew's Hospital is a beautiful macerated specimen, of which I show you a drawing (Fig. 2), in which the

Fig. 2.

skeleton of a case similar to our own is well seen. You will observe that the whole of the alveolus of one side is expanded, and that por-

tions of the bone here and there are wanting, it having been thinned and absorbed, as in the case before us.

But, in addition to this form of cystic disease, there is another which affects both upper and lower jaws, and is found in connection with non-developed or ill-developed teeth; and these cysts are called "dentigerous cysts". An early recognition of these cases is very important; their treatment is simple enough if their nature be recognised, consisting merely in opening up the cyst and extracting the misplaced tooth, after which the parts soon contract and heal up. The growth of these tumours is slow and, for the most part, painless, and their recognition is generally guided by a careful examination of the teeth. If a tooth be absent, or if, as sometimes happens, a temporary tooth occupy the position of a permanent one, the tumour in its neighbourhood is in all probability a dentigerous cyst, and no mutilating operation should be undertaken without first opening up the tumour to discover its nature. But, in the lower jaw, especially where the two plates become gradually expanded without much absorption taking place, the recognition of a cyst may be difficult, and very excellent surgeons have been deceived by such cases. The drawing I show you (Fig. 3) is from a

Fig. 3.

specimen now in the College of Surgeons, which was removed in error by a late eminent provincial surgeon (Mr. Fearn), who had the courage to publish his case as a warning to others.* The patient, a young girl of 13, had a large, apparently solid, tumour of the lower jaw, which, when amputated, proved to be a thick-walled cyst, containing the canine tooth, as seen in Fig. 4. Similar cases have been recorded in the practice of other surgeons.

Again, cysts of large size may be found in connection with solid tumours of the lower jaw, constituting cystic sarcoma, and of this I had

Fig. 4.

Fig. 5.

a good example four years ago in a young man, whose photograph I show you (Fig. 5). In this case, the cyst was quite obvious; but the

* BRITISH MEDICAL JOURNAL, August 27th, 1864.

solid tumour necessitated amputation of one-half of the jaw, from which the patient made a good recovery.

And now as regards the pathology and treatment of cystic disease of the lower jaw. You will remember that I removed a portion of the wall of the cyst from our patient, and this I submitted to Mr. Gould for careful microscopical examination, his report being as follows. "The piece of the cyst-wall that was removed is one-third of an inch thick. On section, it appears lobulated, the lobules being separated by fibrous bands and containing minute cysts. On microscopical examination, a section of the cyst-wall shows a glandular structure. There are coarse fibrous bands dividing the tissue into well marked alveoli of various sizes and of a rounded shape, which are lined by a single layer of indistinctly columnar cells, and filled with rather smaller granular cells. One of these alveoli is seen in the section developing into a cyst." This description corresponds very closely with that given by Mr. Wagstaffe of his examination of a specimen of cystic sarcoma of the lower jaw and with that of my case of cystic sarcoma just referred to, which was microscopically examined by Mr. Beck. In all three cases, the glands of the gums seem to have been the starting-point of the two diseases, which may be taken to be primarily the same. In the case of compound cysts, the cystic element predominates, and the glandular element is found only in the thickened cyst-wall; while in the cystic sarcoma the glandular element undergoes great hypertrophy, and the cysts may be developed in one portion of the tumour or scattered throughout its substance.

As regards the treatment of these cases, simple puncture of the cysts from time to time may be resorted to as a palliative measure; but a radical cure can only be effected by more active measures. Of course, it is most important to avoid any external incision, if practicable, and it is quite possible, in the majority of cases, to do all that is necessary from within the mouth with knife and gouge, particularly the latter instrument. Mr. Butcher of Dublin, who is a strong advocate of this practice, gives the caution to avoid wounding the facial artery within the mouth, because of the difficulty of securing it in that position; and he shows that, when the disease is found to be too extensive to be treated satisfactorily from within the mouth, a single incision below the jaw is sufficient for every purpose. The plan I adopted of crushing in the bony walls of the cysts is that recommended by the late Dr. Mason Warren of Boston, and gave very satisfactory results, a few minute spicula of bone being detached and coming away in the course of the treatment.

WHEN WE MAY BLEED, AND WHEN WE MAY NOT BLEED.

Part of an Address delivered before the East Sussex District Branch of the British Medical Association.

By HENRY MOON, M.D., F.R.C.P.,
Physician to the Sussex County Hospital.

In therapeutics, there has been an immense improvement. I will only take one instance amongst many others, that of blood-letting. During my apprenticeship at a large London institution, my chief employment from day to day was to bleed and cup those patients who had been seen by the physicians and surgeons. Blood-letting was then used as a remedy whenever there was an increase of the temperature and a quickening of the pulse; and, doubtless, this indiscriminate irrational application of so bold a remedy destroyed thousands of lives annually. In some cases, however, blood-letting, with the light of modern science, is still a remedy of great practical usefulness.

We may bleed in, for instance, cerebral hæmorrhage, if the impulse of the heart be strong, and its sounds loud; if the pulse be regular, and no signs of commencing œdema of the lungs exist, we should bleed without delay. Here a judicious timely bleeding may prevent the extension of the paralysis from the cerebrum to the medulla oblongata, which is essential to life.

In order that as much arterial blood as possible may enter the brain, we must try to facilitate the escape of venous blood, without, however, diminishing the propelling powers too much.

We may not bleed when, on the contrary, the heart's impulse is weak, the pulse irregular, and rattling in the trachea has already begun; we may be almost certain bleeding will do harm, since the action of the heart, which is already weakened, would be still more impaired, and the amount of arterial blood going to the brain would be thus still more decreased. When these conditions occur, the indications require just the opposite treatment, in spite of the original dis-

ease being the same, and being due to the same causes. Here, by the use of stimulants, we must strive to prevent paralysis of the heart; frictions, sinapisms, wine, ether, and musk, instead of bleeding, are called for.

We may bleed in acute croupous pneumonia, when the pneumonia has attacked a vigorous and hitherto healthy person, and is of recent occurrence; the temperature being higher than 105 deg. Fahr., and the pulse rating at more than 120 beats in a minute. Here danger only threatens from the violence of the fever; and a free venesection will reduce the temperature, and lessen the frequency of the pulse. In those, however, who are already debilitated, bleeding increases the dangers of exhaustion. Should the fever in pneumonia be moderate, blood-letting is not indicated, even in healthy and vigorous individuals. It cannot cut the fever short; indeed, the fever is more apt to persist, although in a somewhat more moderate degree; so that the enfeebled patient is thrown into greater danger than if he had to pass through a more violent fever, but with unreduced strength.

We may bleed in fluxion of the lung, arising from excessive cardiac action threatening life. The result of a bold venesection here is astonishing; as soon as the volume of the blood has become lessened, the pressure diminishes in the arteries (as it depends upon two forces: first, the energy of the cardiac contractions; secondly, the fullness of the cavities of the heart). The patients often breathe more freely during the operation, the bloody foam which they were expectorating vanishes, and life may be rescued from the greatest dangers by aid of the physician.

So also in collateral fluxion of the lung (acute hyperæmia) during the course of acute pneumonia, pleurisy, or pneumothorax, we may bleed. Here a large part of the dyspnoea depends upon the overfilling of the capillaries and swelling of the vesicles in the portions of the lung unaffected by the inflammation.

When patients die in the first stages of pneumonia or pleurisy, or shortly after the air has penetrated into the pleural sac and compressed the lung (pneumothorax), they die of collateral fluxion (hyperæmia) and collateral œdema. If collateral fluxion threaten life during the progress of these diseases; if the patient be attacked with intense dyspnoea, and a moist *râle* become audible; if the sputa become serous,—the danger is imminent. Then pay no regard to the small pulse, or rather, look upon it as a new reason for bleeding; for thereby the force of the heart is diminished, the pressure in the arteries of the hyperæmic parts of the lungs is also reduced; the capillaries are less full; the transudation of serum, which was threatening, or had already set in, does not occur or ceases; and here, too, we often see the patient breathe more freely and deeply when the blood is flowing.

Since, however, in by far the greater number of cases venesection has an unfavourable effect upon the main disease by increasing the danger from exhaustion and impoverishment of the blood, we should not be led astray by these striking instantaneous results, so as to bleed without necessity; that is to say, unless life be threatened. Should œdema threaten in the course of disease of the heart, immediate danger to life may demand a diminution of the volume of the blood, and the relief consequent on venesection is usually beneficial.

The blood of persons of long-standing disease of the heart is poor in fibrin and albumen, and has great tendency to form serous transudations. Venesection renders it thinner, and, therefore, bleeding should never be used in these cases but under the most pressing necessity.

Blood-letting should never be used in the hyperæmia of asthenic fever, no matter how great, and though the œdema threaten life.

In endocarditis, as a rule, bleeding is decidedly injurious; still a condition sometimes exists where the indication as to symptoms calls for venesection. In cases where overcharge of the pulmonary circulation imperils life by threatening œdema of the lungs, and demands prompt relief by diminution of the volume of the blood. A great acceleration of the pulse and signs of feebleness, however, in the action of the heart indicate the administration of digitalis. Should palsy of the heart threaten, give stimulants boldly.

If, gentlemen, this imperfect and very limited survey of our store of wealth in knowledge be in any way correct, the question may well be asked, How is it that some persons prosper, ride in splendid equipages, and become rich, who regard none of these things?

The longer one lives, the more proof there is that he possesses many of the prominent faculties of the untutored savage within him, and there is no one perhaps more predominant than that of credulity associated with whatever else he may possess. A small proportion only of the human race exercise thought, and really seek after truth. The confidence, sympathy, and support of this class may be anticipated by all right-minded and hard-working men: whereas the majority by far are too much occupied in many ways to regard physical science and