science, were we to omit all reference to the gigantic intellect which has just been taken from the world, and which the Supreme Disposer of all things permitted to remain here, for the improvement and civilisation of mankind, so much beyond the usual term of human existence.

Of Alexander von Humboldt it has been impressively said that, "His canvass was the universe, and he used his pencil with a master's hand. His mind grasped with iron strength everything it met, and, instead of being weakened by the immensity it was brought in contact with, its appetite grew with what it fed upon. His merits are of such transcendent quality that praise is out of place. There is not one branch of science to which Humboldt has not contributed something—nay, much." We may say of him, indeed, what the Tuscans proclaimed on Machiavelli's tomb, in Santa Croce, "Tanto nomini, nullum par elogium."

When such men as those who filled this chair at Oxford and at Edinburgh did not think it right to omit all reference to the subject of empiricism in their introductory addresses, it might be unbecoming in me to do so, although I am conscious of the jarring transition of feeling to which such a course must necessarily give rise. Let us trust, however, that a very few words upon this repulsive topic may be thought sufficient. Concurring in the remark of Dr. Alison, that the success of imposture is owing to two causes—"the credulity of mankind and the *vis medicatrix naturæ*"—we differ from those who conceive that it will have a definite duration. On the contrary, we believe that it will be coeval with human society itself; inasmuch as the *vis medicatrix naturæ* must endure as long as our organism; while the masses of mankind are as liable to be led astray by their credulity now as when, nearly three thousand years since, the Samian Pythagoras taught believing multitudes the fantastic Absurdities of the Metempsychosis.

While it appears to be obvious that our attitude towards so tainted a thing as empiricism should be one of merely contemptuous indifference, we feel some embarrassment in defining the conduct to be observed towards those members of the profession—often found in a rank where we should not have expected such time-serving—who show a disposition to undermine the distinction between regular and pseudo medicine, by cooperating, more or less, with the professors of the latter; and thus aiding their fondly cherished object of elevating themselves by obtaining some sort of recognition, no matter what, from either the individual members or the general body of our order. There are many, whose opinion is entitled to very high regard, who do not hesitate to ascribe this disposition to the most sordid motives; but let us hope that it admits of a more charitable, and at the same time of a more correct interpretation. Let us hope that it arises from a want of moral courage, rather than from a want of moral principle; from weakness, rather than from meanness of character.

But we gladly abstain from prolonging this merely parenthetical digression, and revert at once to less distasteful matters.

You need not be reminded that you belong to a profession where no political distinction awaits you, and where no riches are to be amassed—nay, you belong to the only one among the professions through whose portals a man cannot, by the force of his genius, conquer for himself the honours of the state. And yet we congratulate you, for you belong to a profession whose annals glow with the triumphs of the intellect. Despite the penalties which all excursions into the domain of general knowledge inevitably inflict upon their material interests, so irresistible has been the thirst for it among the members of our profession, that there is scarcely a department of literature or of science, which has not received illustration and advancement from their labours. Nor do we ever fail to find them arrayed among the steady friends of civilisation and enlightened progress; the unflinching foes of every phase of tyranny and intolerance. You belong to a profession which has given to classical literature the names of Julius Scaliger, and of Thomas Linaere, the protégé of Lorenzo de' Medici, the friend of Erasmus, and one of the foremost spirits of his age at the revival of learning. To ethical philosophy and to political science it has given the name of John Locke: to natural history, Hans Sloane, Linnæus, and Blumenbach: to poetry, Akenside and Goldsmith: to comparative anatomy, physiology, and zoology, Hunter and Owen: to chemistry, Black, the discoverer of fixed air, and of the doctrine of latent heat: to the fine arts, John and Charles Bell: to natural philosophy and antiquities, Thomas Young, the discoverer of the key to the lost literature of Egypt, the greatest discoverer, after Newton, in the field of optics. To sacred knowledge it has given Haller and Abercrombie, the candid interpreters of those imperishable truths

which serve as a beacon light to man's weary wanderings while on earth, and sustain him with the hope of unceasing rest when his wanderings shall end.

These are, indeed, matters for the very highest satisfaction. But we congratulate you, still more emphatically, upon being the members of a profession whose mission it is to be the humble ministers of that mysterious aid, which the Incomprehensible One permits man to lend to the suffering helplessness of his fellow man, and which has never been better apprehended, or expressed with more terse sublimity than where, in the mediæval idiom of his country, it is thus enunciated upon the bust of Ambroise Paré, in that old amphitheatre at the School of Medicine, in Paris—

"JE LE PANSAY, DIEU LE GUARIT."

Original Communications.

THE FORMATION OF CLOTS IN THE VENOUS SYSTEM DURING LIFE.

(A THESIS FOR A MEDICAL ACT IN THE UNIVERSITY OF CAMBRIDGE.)

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II.—ON THE FORMATION OF CLOTS IN THE PULMONARY ARTERIES.

THE following examples of this affection have come under my notice.

CASE I. A thin, delicate lady, aged about 35, was confined with her third child, and had so quick and easy a time that the medical attendant, who lived close by, was not summoned. No unfavourable symptoms followed till the fourteenth day, when, having been nursing her infant, she went into an adjoining room, and whilst in the act of standing up to pour out tea, she suddenly fell back upon the sofa, as if faint, and died. The pulmonary arteries, on both sides, where they enter the lungs, were plugged with dark clots of moderately firm consistence. These were not of uniform colour, some parts being darker than others; and they did not appear to have formed long before death. They extended into the second divisions of the arteries, and were only slightly adherent to the walls of the vessels. The latter were quite healthy. The lungs, heart, and other great organs, and the blood in them and in other parts of the body, presented nothing remarkable.

CASE II. An exceedingly fat woman, aged 54, had been confined to her room three weeks by a sore leg, and in the last few days had suffered three attacks of dyspnoea and faintness, for which ammonia had been given by her medical attendant. One of these occurred on the 21st of the month, and she felt very ill all that day. On the 22nd she was better. On the 23rd, being in a neighbouring house, I was summoned to her in consequence of a sudden seizure, and was in time only to see her die. There were a few inspirations, but I could not feel the pulse. When first attacked, a few minutes before her death, she was quite sensible, and said, "It's of no use; I'm dying." The main trunks of the pulmonary arteries, on both sides, were distended with firm, dark, mottled clots, which extended into the second and third divisions of the arteries. The interior of the vessels was discoloured, but for the most part it preserved its polish. In a few places, where the clots were slightly adherent, it had lost somewhat of its natural smoothness. In other respects it was quite healthy. The substance of the lungs was natural. The walls of the heart were flabby and thin, but the muscular structure and the valves were healthy. The right auricle and ventricle were distended with clots which were large, firm, and fibrinous in their upper parts.

CASE III. A girl, aged about 18, had been in service in the town, in a hard place, under a hard mistress, had been ailing for several days, had one or two fainting fits, and in the last few days had suffered from shortness of breath, and other symp-

toms which excited suspicion of inflammation of the lungs. When she was admitted into the hospital she had an anæmic appearance, her breathing was quick and hurried, and her manner was suggestive of hysteria, rather than real disease, to the gentleman who then saw her. Next day a faint abnormal sound was thought to be audible about the base of the heart; ten minims of tincture of digitalis were prescribed. At six o'clock that day, just after the bowels had been relieved in bed, the bed pan being used, she fainted, and died before the house surgeon could reach the ward. The left pulmonary artery contained a tough clot, tightly impacted in the main trunk, with prolongations extending into the third and fourth branches. It was partly coloured, with alternating black and white portions, quite free and smooth in the smaller branches of the vessel; but in the first and second divisions it adhered at some points to the lining membrane so as to require slight pressure with the handle of the scalpel to detach it. The vessel appeared to have lost its epithelium at these points, and presented some patches of red. The right pulmonary artery was still more tightly plugged with a tough, dry, partly-coloured clot, which was adherent to about the first and second divisions of the vessel, and was at this part softened in its middle to a considerable extent. The heart, and the large vessels of the trunk and extremities, were healthy. The clots in the venous system were rather larger and firmer than usual, but appeared to have been all formed after death. The contiguous parts of the upper and lower lobes of the right lung were consolidated by pneumonia, and covered with lymph.

CASE IV. An emaciated young man had for several weeks suffered under symptoms of abdominal and pulmonary phthisis, with feverishness and diarrhoea. He was reduced to a very low state, and was slowly dying for some days. There were tubercles in the peritoneum, and in both lungs. In the pulmonary artery of one lung was a large, firm, fibrinous clot, nearly filling the vessel, with prolongations extending into its third and fourth divisions. It was slightly adherent about the point where the artery first divides; and the interior of the vessel, at this part, was rather rough and reddish when the clot had been removed. At the corresponding situation in the other pulmonary artery was a mottled clot of darker colour, and apparently more recent. It was slightly adherent to the vessel, and its prolongations extended into the large branches. The left lower extremity was œdematous; and the femoral and profunda veins and their tributaries were distended with dark, mottled clots, which were slightly adherent about the neighbourhood of the valves. Neither the coats of the vessels, nor the investing tissue, had undergone any change. In the profunda, two valves were adherent together; and a narrow, tough bridle, of yellowish colour, passed from them to the adjacent side of the vein. It looked as if it were the remnant of a clot which had formed at some previous period.

CASE V. A lad, aged 12, died, much emaciated, with disease of the hip and discharging abscesses. The left pulmonary artery was extensively occupied by clots. These, in the larger branches, were light coloured and soft; in the smaller branches they were darker, more mottled, tougher and drier; in neither were they adherent to the lining membrane, except in one situation where a vessel looked as if converted into a long narrow abscess. There was no other disease in the lungs. Well formed coagula, of the usual character, and some fluid blood, were found in the cavities of the heart. The lower part of one external iliac vein, with the femoral and profunda veins, were blocked up by coagula, which were closely adherent in the vicinity of the valves.

CASE VI. An old man died exhausted, after suffering retention of urine for some time, which required the frequent use of the catheter. The left lower extremity was swollen; and the great veins were distended with clots from the junction with the right iliac, where the clot terminated abruptly, to low down in the leg. They appeared to have commenced where the profunda joins the femoral. In the left pulmonary artery, where it divides into its primary branches, was a small, toughish, slightly mottled clot, adhering to the lining membrane, which was very slightly altered.

CASE VII. In the patient who died after removal of a portion of the lower jaw, followed by erysipelas and pneumonia, whose case has been before referred to (page 602), the trunk and primary branches of the right pulmonary artery were nearly filled up by a firm, white, fibrinous clot, which was for the most part loosely adherent to the vessels, but in some places was so firmly attached that the lining membrane was torn up in the attempts to detach it. In the smaller branches of the artery the clot

was mottled with red and white portions, was less adherent, but was firm and dry, and filled up the canal. Its ramifications extended as far as I could follow them. The lower lobe of the lung was hepatized; and there was sero-purulent fluid in the pleural cavity. The trunk and primary branches of the left pulmonary artery were occupied by a still firmer and older clot, which was white, quite closely adherent to one side of the vessel, so as to form a part of its wall; and the smooth surface of the clot was continuous with that of the artery. Though the new structure stood out in strong relief, and occupied a considerable space of the canal, there was still room enough for a large column of blood. The ramification of this clot in the secondary and tertiary branches of the artery were closely adherent to the sides of the vessel, so as to form mere ridge-like projections, which would not have much interfered with the current of blood. They were marked with dark lines and spots, as if from deposit of pigment in them. In some of the branches of the artery the only remaining trace of the clot was a staining of the lining membrane with delicate dark lines. These stains were continuous with the clots which occupied the larger branches. There was no apparent disease of the vessel itself. The lower lobe of this lung was in a pneumonic state.

There can, I think, be little doubt that the formation of the clots in the pulmonary arteries, in these, and other like cases,* is due to the same causes as the formation of the clots in the great veins; that is to say, it is due, primarily, to an increase in the coagulative tendency of the fibrine of the blood, and, secondarily, to some facilities which the vessel offers for that coagulation to take place. With regard to the primary cause: the pulmonary clots have been found chiefly, if not exclusively, in cases where the vital powers have been lowered by some other disease; in short, in cachectic states, especially where an inflammatory affection was superadded; and after confinements; that is, in precisely the same conditions as the venous clots. Moreover, the clots are often found in both situations in the same patient, as in Cases IV, V, VI, and VII.†

With regard to the secondary, or immediately inducing cause: it has not been satisfactorily shown in any one instance that the clot was preceded by, or attributable to, disease in the coats of the vessel. The discoloration and roughening, where it was present, was evidently due, as in the case of the veins, to the presence of the clot, and was not the cause of it.‡

It appears, from the above related cases, and others which have been recorded, that the clots begin to form, in some instances, in the smaller branches of the vessels; and that in these instances there is often some obstruction to the circulation in the artery, caused by inflammation, pulmonary apoplexy, or other cause, which must tend to promote the settling of the fibrine. In other cases the affection commences in the larger branches, or in the main trunk; and in these the spot at which the first deposit takes place is usually at or near the root of the lung. In this situation the pulmonary artery breaks up at once into a number of branches, which radiate off from it, at different angles, to the several parts of the lung. Consequently, a large extent of surface is presented to the blood, and there are numerous angular projections into the current; both which conditions are calculated to induce the coagulation of the fibrine. It must also be remembered that the rate at which the blood travels through the pulmonary arteries is subject to considerable variations, depending, partly upon the alternating contraction and repose, and the varying force of the contraction, of the right ventricle, and partly upon the vicissitudes of respiration; and both these sources of disturbance become more marked in those enfeebled states, with tendency to fainting, in which we have found that the fibrine has a peculiar tendency to settle. In such states the circulation in the vessel must always be feeble; and, probably, the current is sometimes absolutely suspended in certain portions of the artery, or in the main trunk, for short periods. Moreover, the venous blood seems to exhibit an increasing tendency to coagulate in the body as it approaches the lungs, and therefore may be presumed to acquire the property in the greatest degree in the pulmonary arteries.

* Baron, *Archives Générales de Médecine*, ii, p. 1, appears first to have directed attention to the subject. Paget, *Medico-Chirurgical Transactions*, ix and x. Ormerod, *Medical Gazette*. Virchow, *Archiv*, x, 225. (In the case related here, the blood in the heart was fluid.) And *Handbuch der Speciellen Pathologie*, Bd. i.

† Virchow, *Forcip's Notizen*, xxxviii, 35, remarks that in only one case out of eleven, in which clots were found in the pulmonary arteries, did he fail to discover them in some other part of the venous system.

‡ Kidd, *Dublin Journal of Medical Science*, xxii, 376, attributes the affection to inflammation of the pulmonary artery. Baron alludes to the absence of an inflammatory condition of the vessel in the case described by him. Nevertheless, in some other cases, to which he refers, he conceives that inflammation of the wall of the vessel led to the formation of the clots.

At any rate, the clots which we find in ordinary *post mortem* examinations are more common and larger in these vessels, and in the right cavities of the heart, than in any other parts of the body. Frequently they are of firm consistence, while the blood in the veins, and in the left side of the heart, is quite fluid.

Virchow attributes the formation of these plugs in the pulmonary arteries to the lodgment there of small clots, or fragments of clots ("emboli") which have been formed in the veins, and have been wafted with the blood through the right cavities of the heart, towards the lungs. These fragments, he thinks, become detached from the ends of the clots which project into the great venous trunks; thus, in any case where the end of a clot, formed in one iliac vein, projected into the vena cava, a portion may be washed off by the blood flowing against it from the other iliac vein, and, being carried into the pulmonary artery, may lodge upon one of the projecting angles of the vessel, and constitute a nucleus for the formation of a plug. It is not improbable that this may sometimes occur. It must, however, be remembered that the surface of the venous clots is usually quite smooth, and therefore not very likely to be dismembered by the slowly flowing current of blood; secondly, that in many cases, as in No. I, II, III, there was no reason to suppose that the pulmonary clots were preceded by clots in the veins; and thirdly, the effects of a preternatural tendency of the venous blood to coagulate are, for the reasons just given, likely to be exhibited in the pulmonary arteries as well as in other parts of the system.

The pulmonary clots undergo the same changes as those in the veins, provided that the patient survives. They may soften (Cases III and V)* or become firmly adherent to the vessel and disappear, leaving scarcely a trace behind (as in Case VII); or be converted into threads or bands, stretching from one part of the tube to another. I do not know an instance in which they have caused obliteration of any of the pulmonary vessels; though it is probable that this may take place occasionally in the smaller branches.

The plugging in the pulmonary arteries does not appear so easily to induce inflammation on the exterior of the vessel as it does in the case of the veins of the limbs. It is not usually attended with pain or uneasiness, or any symptoms which lead, with certainty, to a diagnosis. Hurried, oppressed breathing, with faintness, occurring without any other obvious cause, would make us suspicious of this affection, and should induce us to auscultate in the situations in which a bruit, originating in the pulmonary arteries, would be most likely to be distinguished. I am not aware that a bruit, produced in this manner, has yet been recognised, though it probably would have been discovered had attention been directed to the point during the life of any of the patients.

It is indeed a remarkable feature in the affection that the pulmonary arteries, one or both, in the main trunks, or in the larger branches, may be blocked up to a considerable extent without causing any sign of obstruction to the circulation, or of affection of the lungs, or, indeed, without producing any symptom whatever. In Case VI, it was clear, from the size of its remains, that a clot must at some time have occupied nearly the entire calibre of the main trunk of each of the pulmonary arteries; yet there had been no symptom of such condition observed during the life of the patient. In Case I, the patient appeared to be in her usual health till the moment of the fatal seizure. In this, and other parallel cases that have been recorded, there can be no doubt that the clots were forming for some time before death, and that sufficient blood found its way by the side of them into the lungs to maintain the circulation and supply the wants of the system.

The sudden death is probably caused by a slight exertion following a period of repose. During the repose we may judge that the clots are increasing; and the ensuing exertion, by causing a greater demand for oxygenated blood than can be supplied through the impeded pulmonary vessels, induces fainting, which is fatal. The extreme suddenness of the fatal seizure in these cases has suggested the idea that it may have been caused by some displacement of the clots, producing more complete occlusion of the vessels; but this is opposed by the facts that the clots are usually more or less adherent to the walls of the vessels, and show no sign of such displacement having taken place.

[To be continued.]

* In the case related by Dr. Kidd, *loc. cit.*, one of the clots was softened in the middle, and the tissues around the artery, on one side, were condensed and indurated.

REMARKS ON THE INTENDED CHANGE OF THE WEIGHTS USED IN PHARMACY.

By G. E. PAGET, M.D., F.R.C.P., Cambridge.

It is generally understood that the Committee for the Preparation of a National *Pharmacopœia* have come to a resolution to make a complete change in the weights for pharmaceutical purposes. The avoirdupois pound and ounce are to be substituted for the troy pound and ounce, which have hitherto been used in apothecaries' weight; and a new drachm, a new scruple, and a new grain, are to be established.

The former of these changes is manifestly desirable. The avoirdupois pound has, by recent enactment, become the standard imperial weight; and the avoirdupois pound and ounce are those which have long been used in all mercantile transactions, except those of goldsmiths and jewellers. They are the weights which are used by manufacturing chemists, as by all other manufacturers; and their adoption for the dispensing of drugs would do away with the ambiguity and inconvenience arising out of the use of two different sets of weights by manufacturing and dispensing chemists.

The substitution, therefore, of the pound avoirdupois for the pound troy, may be hailed as a sensible improvement; and the corresponding change in the ounce might be allowed to pass unquestioned. But the change in the values of the drachm and scruple is less free from objection; and the establishment of a new grain appears to me to introduce inconveniences greater than those which it is intended to remove.

The object of the *Pharmacopœia* Committee, in proposing to establish a new grain, seems to be this: to make the avoirdupois ounce divisible into 480 *integral* parts, like the troy or apothecaries' ounce. The latter, as everybody knows, contains 480 standard grains. But the avoirdupois ounce contains only 437.5 standard grains; so that if this be divided, like the apothecaries' ounce, into drachms and scruples, each drachm will contain 54.6875 standard grains, and each scruple will contain 18.2291666 . . . standard grains.

These, then, will be the actual weights of the proposed new drachm and scruple. But, in order to make the scruple contain 20 grains, the drachm 60, and the ounce 480 grains, as heretofore, the Committee propose to establish a *new* grain, which shall be lighter than the standard grain, in the proportion of 91 to 100.

To the establishment of this new grain there are objections which seem to me deserving of consideration. The present standard grain has been formally established by Act of Parliament, being defined as the seven-thousandth part of the standard pound deposited in the Exchequer Office. It is not only in actual use for medicines and the precious metals, and in scientific investigations, but has been in use for ages, and is known and understood both at home and in foreign countries as our standard grain. It will, of course, continue to be used by men of science in their experiments and calculations.

The establishment of a new grain to be used for drugs alone would have the effect of making diverse what is now common between medicine and other sciences. This will not be a mere temporary inconvenience; it will occasion an ever-recurring ambiguity. When we meet with statements of weight in grains in medical, physiological, or chemical investigations, we may be left in doubt which kind of grain is meant, the standard or the new grain; and this is a doubt which calculation will not solve.

Besides, for the honour of medicine, is it advisable to sever any of its bonds of connexion with the more exact sciences? Shall we not be blamed for it by men of science? and shall we not be liable to incur ridicule, if, while remedying the ambiguity of the pounds and ounces, we create ambiguities of the same kind and greater in degree?

It may be added, as a minor objection, that the new grain, if it be the four-hundred and eightieth part of an ounce avoirdupois, will not be .91 of standard grain, but the long recurring decimal .911458333 . . . If the new grain be .91 standard grain, 480 new grains will not make exactly an ounce avoirdupois. The difference is unimportant in the dispensing of drugs, but not so in scientific investigations; and a *reform* involving such an error of calculation would do little credit to medical accuracy.

These are not the only objections to the proposed change. The new drachm and scruple will be different from the drachm and scruple heretofore used. The names will be preserved, but will not have the same meaning; and hence will arise further ambiguities or inaccuracies.