

dissection on the ground, however mistaken, that it might be displeasing to God, than for those who make it illegal by pandering to the prejudices of the ignorant. Dr. Johnson's advice, 'free your mind from cant,' is here singularly *à propos*. We cannot boast of our civilization till this is remedied.

Another subject which comes before us for discussion is the important question of anatomical nomenclature. German anatomists have recently adopted a report prepared by some of their number, working in company with representatives of other European countries. It is for us to consider whether this one can be looked upon as accepted and whether it is acceptable; whether we can join hands with our foreign colleagues, or whether we can devise an American nomenclature which shall be so much better that we can disregard the inconvenience of a distinct standard. We have had for years a committee on anatomical nomenclature, with Professor Wilder for secretary, who has given so large a part of his busy life to this matter. We may expect an important contribution to the matter in the report of this committee.

We are to hear also from the committee appointed to consider the anatomical peculiarities of the negro. I am not informed what success has been reached in the difficult task of collecting statistics. It is a work of such anthropological importance that it would be doubly to be regretted should it come to naught. As has already been said at our meetings, it is most proper that this Society should collect all possible information as to the anatomy not only of the negro, but of such savage races as still survive in North America, and of the extinct ones, whose bones can still be procured in large numbers.

Thus, gentlemen, you see that this meeting, besides the attractive list of papers, has before it matters of no ordinary interest and importance. I will no longer detain

you from your work, firmly persuaded that the action of this Association will be in the interest of civilization and science.

REPORT OF THE COMMITTEE ON THE COLLECTION AND PRESERVATION OF ANATOMICAL MATERIAL.

To the Association of American Anatomists:

The committee appointed at the meeting of the Association to obtain information with regard to the collection and preservation of anatomical material, and report what in their opinion are the best means of accomplishing these objects, begs respectfully to submit the following report:

In order to make the work of the committee as comprehensive as possible and to obtain information which would be of service in arriving at definite conclusions as to the best methods of accomplishing the purposes in the resolution, the committee deemed it desirable to send to the teachers of anatomy, not only in this country, but abroad, a circular letter, with the following questions appended, and respectfully requested answers to be made thereto as fully as possible:

1. Is anatomical material obtained in accordance with legal enactment, wholly or in part?

2. Is there an Anatomical Law in your State or country? If so, please send a copy to the chairman of the committee. Please state whether the law is satisfactory in its provisions, whether it is readily obeyed by those upon whom duties are imposed by it, and mention any improvements you would suggest as to its requirements.

3. Is the material received in good condition?

4. What disposal is ultimately made of the remains?

5. Please state what means are employed to preserve anatomical material for the purposes of dissection or operative surgery. If injections of preservative fluids are used,

state their composition and the methods of use, at what point injections are made, whether at the heart or in the large arteries, and their effect in accomplishing the preservation, with any changes in the color or character of the tissues. What length of time can material be used in dissection employed by you? If preservation by means of cold storage is employed please state the cost of the machinery which it was necessary to construct for this purpose, and what means are taken to prevent decomposition after the subject is placed upon the table for dissection.

6. Please state the cost by the method employed by you, for the reception, the injection and preservation of each subject.

7. Do you obtain an adequate supply of material for the purposes of anatomical instruction? How many students are assigned to each subject, and what is the method of allotment?

8. Please give any further information which you may deem of importance.

This letter was sent to the professors of anatomy in 148 colleges in the United states; 25 in foreign countries, and 25 copies were sent to the medical journals in this country and abroad. Forty-two replies have been received by the committee containing more or less specific answer to the questions propounded in the circular. An analysis of the replies received presents the following results:

1. Anatomical material is received wholly under the provisions of the law in thirty States and countries, in part by law, in seven; and without law, in five.

2. In reply to the second question proposed, fifteen copies of the laws which are in force, have been sent to the chairman of the committee, thirteen of them being the laws of States of this country, and two of foreign countries. With regard to the execution of the law, information was given to the effect that the provisions of the law

were satisfactorily complied with in ten, fairly so in ten, not satisfactory in twelve, and no replies were given in ten. In eight the provisions of the law were stated to be obligatory, and in six the provisions were optional. In considering the subject of the report so far as it relates to the collection of anatomical material by law, the committee has confined itself to the examination of and report on the anatomical laws of the States of this country.

3. The report as to condition in which anatomical material was received was that in twenty instances it was good; in twenty-one, fair; and in one, bad.

4. As to the disposition of the remains, in twenty-seven institutions they were reported buried; in ten, cremated; and in four, thrown away.

5. The answers received to the question with regard to the agents employed in accomplishing the preservation of subjects, gave information as to quite a large number employed and in various combinations. An analysis shows that of the agents used carbolic acid stands first, and that it was used not alone but in combination with other agents. Glycerine was reported as an ingredient in the next highest number. It was also employed in combination with other agents. The next in frequency was reported to be arsenic, and this agent was used also in combination. Chloral hydrate and chloride of zinc and bichloride of mercury come next in the order of use. Alcohol, either pure or in combination, carbonate of potassium, bicarbonate of sodium, chloride of sodium, methyl spirit, formalin, nitrate of potassium, brown sugar, boric acid, were reported as used in numbers varying from four to one. The preservation of subjects by cold storage was reported in five instances. Some of the agents above noted were used in combination to preserve the subject, which had been kept in cold storage after it was placed upon the table for dis-

section. In one instance the following plan was reported: Injection with carbolic acid one and a half pints, glycerine six pints, with alcohol one and one-half pints. After the injection, directions were given to paint the subject daily for fourteen days with carbolic acid, one part to glycerine six parts, and then place it in an air tight box over a pan of methylated spirits. Perfectly satisfactory results were reported to have been obtained by this method, both as regards the character of the tissues and the absence of odor. Subject keeps indefinitely. Chloride of zinc, a fifty per cent. solution of neutral reaction was reported as an agent used successfully in preserving subjects, but had the objection of unfavorable action on the tissues, causing hardness and change in color. If subject is not required for immediate use it was placed in a saturated solution of salt, forming a strong brine. If immersed for a long time in the brine the subject requires to be soaked in water for a period of twenty-four or forty-eight hours, in order to soften the tissues.

A number of formulæ were given, among them Wickersheim's Formula, consisting of three thousand parts of boiling water, one hundred and nine parts of alum, twenty-five parts of chloride of sodium, twelve parts of nitrate of potassium, sixty parts of carbonate of potassium, ten parts of arsenious acid, when cool filter, and to ten parts of the liquid thus obtained add one part of methylic alcohol and four parts of glycerine.

Van Vetter's Formula: Seven parts of glycerine, one part of brown sugar and one-half part of nitrate of potassium.

Langer's Formula: One hundred parts of glycerine, fifteen parts carbolic acid, eleven parts of alcohol.

Empersonne's Formula: Chloral Hydrate five hundred grains, glycerine two and a-half litres and distilled water.

Among the formulæ reported, arsenic was an ingredient in a large number, and in the

following combinations: 1. Arsenic (pure) eleven and one-half pounds, carbonate of potassium twenty-one pounds, crude carbolic acid and glycerine each two pints, with distilled water sufficient to make one gallon. 2. One pound of arsenic, one pound of bicarbonate of soda, one pint of salt, six quarts of water. 3. Injection of arseniate of potash, mixed in large quantity with liquid soap. 4. Arseniate of soda, in saturated solution, one gallon; carbolic acid, eight ounces; glycerine, one-half pint. The above formulæ afford examples of the use of arsenic, either in the form of arsenious acid, arseniate of potassium, or arseniate of sodium. As a rule, it was combined with some salt of potash, carbolic acid and glycerine. In a few instances it was reported as being used alone in solution.

Carbolic acid appears in a large number of the formulæ reported in use. In most instances in combination with arsenic, some salt of potash or soda or bichloride of mercury. In few instances it is reported as being used alone.

Bichloride of mercury is also reported as largely used alone or in combination with arsenic, salts of potash or soda, carbolic acid and glycerine; one formula being one five-hundredth solution of bichloride of mercury in mixture of water, glycerine and alcohol; another, a mixture of bichloride of mercury, glycerine, carbolic acid and spirit. The bicarbonate of potash, bicarbonate of soda, nitrate of potash, as well as the chloride of sodium, appeared in a number of the combinations employed. They are not reported as possessing sufficient preservative power which would permit them to be used alone.

Glycerine appears to be a favorite agent, as it forms a part of a large number of formulæ. The same may be said in a very less degree however, with regard to the use of alcohol.

Formalin is reported in two instances,

in one of which it was used in connection with the preservation of human subjects, and another in the preservation of an animal. In the latter instance the agent was used in the proportion of one part to two hundred parts of water. The animal was injected with the solution thus prepared and the body was placed in a tank with a large quantity of fluid which was changed after a period of one week, then after a period of three weeks and strengthened from time to time by the addition of a little formalin. Experience obtained in this case was that, to make the injection of this agent effective, the body should be thoroughly injected, washing out the blood if possible, and if the body is not to be dissected at once it should be placed in a receptacle capable of being sealed up to prevent the escape of formalin, and to prevent the formation of mould it should at all times be covered by the solution. The cost of the formalin was stated to be \$1.65 per pound package for a forty per cent. solution.

5. As to the point in which injections were made there were reported two in the heart, nineteen in the common carotid artery, and six in the common femoral artery. As to the condition of the tissues after injection but few replies were received and these were not satisfactory. With regard to the time in which material can be kept and used in dissection, the replies include periods from three weeks to one year. Five reported having used or were using the method of preservation by cold storage. The cost of the plant being from \$500 to \$3,000.

6. The cost of receiving and preserving material is stated to be from \$1 to \$25 per subject.

7. In fifteen cases the supply of material is stated to be sufficient and in fifteen not sufficient. In a number it was stated to be adequate, but more could be used if obtain-

able. The number of students were reported as assigned to each subject to vary from four to sixteen.

While the committee feels that the information gathered through the circular letter was not in some respects sufficiently specific to enable it to arrive at definite conclusions, upon the subject under consideration, yet it believes that certain statements may be made and conclusions deduced which will be of value to teachers of anatomy and those interested in the collection and preservation of anatomical material.

The committee regards it in every way as a matter to be most favorably commented on that out of the 42 replies from institutions 30 contained information that anatomical material was obtained for the purposes of instruction under the provisions of the law. An examination of the copies of the law which were sent to the chairman of the committee shows them to be defective in many respects, giving evidence in the provisions incorporated in the laws of a strong feeling on the part of legislators against the enactment of laws controlling the disposition of dead human bodies for the purpose of dissection. This feeling has no doubt its origin in a fear that by so doing they will expose themselves to criticism, if not to censure, by their constituents. This sentiment it believes can be largely changed by the influence exerted upon the public mind by the members of the medical profession. In every community it should be the effort of the medical profession to educate public opinion upon this point. To place before the public the great necessity which exists for the use of dead human bodies in providing the proper instruction of students in medicine, and the great protection afforded the citizens in each State by the enactment of laws which will regulate the supply of anatomical material and thus afford protection to the dead and prevent the desecration of their resting places.

With regard to the protection which a properly framed law affords to the community, it may be stated that it is within the information of the committee and also it may be said of the public that the body of a member of the family of one of the highest officers of the land was found in the dissecting room of a medical college. In the State in which this family resided there was at that time no Anatomical Law in existence. Since then one has been enacted, and the repetition of such an occurrence as that referred to is not possible under its provisions.

Since the preparation of this report was begun it has been reported in the daily papers that a physician residing in one of the Western States has been convicted for the desecration of a grave, by the removal of the body which it contained, and which was to be used for dissection, and has been sentenced to imprisonment for a term of three years. In the State in which this occurred, there is, so far as the committee knows, no Law governing the use of dead human bodies for the promotion of medical science. These instances afford, the committee thinks, in a very forcible manner, evidence of the protection which would be furnished to both the community and the profession by the provisions of a properly framed Anatomical Law. Attention has been called to the fact that in a number of existing laws their provisions on examination were found to be defective. In some instances they were so inadequate as to render the execution of the law practically impossible, and in other cases to make the law inoperative. On this point the committee feels it proper to express an opinion to the effect that the requirements of any law which is to be enacted should be made compulsory, and not optional, as to performance of duty on the part of public officers. It thinks that sufficient experience has been obtained in the effort to secure compliance

with the terms of Anatomical Laws to make it evident that under such conditions only can the proper supply of Anatomical material be obtained. In any law enacted it also believes that proper protection should be afforded the public as well as the profession in strict specification as to the right of claim for burial. This right should be limited to relatives either by blood or marriage.

In this way claims made by organizations and individuals moved by feelings of sentiment would be disposed of. In almost all States, if not indeed in all, legal provisions are in force which control the burial of the bodies of certain individuals, notably war veterans.

With regard to any other claims by organizations or individuals, it would be proper to leave them to the discretion of those having charge of the execution of the requirements of the law. A spirit of conciliation and a regard for public sentiment should always actuate those concerned in the execution of the law, in order, so far as possible, that any feelings of antagonism or hostility should be removed. As stated above, it should be the duty of members of the medical profession to educate public sentiment and obtain in every State enactment of a law which will control the use of dead human bodies for the promotion of medical science. At this time of writing the daily papers contain an account of the action by the Governor of a Western State, who has been compelled to call upon the military force to protect a medical college, which has been threatened by a mob. In this case the trouble has been caused by the discovering in the dissecting room of the college of bodies removed from a cemetery adjacent to the city in which the college is situated. Here is plainly made manifest the necessity of a law to protect both the public and the profession. An examination of the laws now in force in the States in this

country leads the committee to the belief that the law of the State of Pennsylvania is the best, in the fact that it includes in its terms all the provisions necessary to compel compliance on the part of public officers and to protect the citizens of the Commonwealth in all of their rights. It is also observed in the examination of the laws of other States that many of them have been founded upon this law, but in no instance have all of the provisions of the law been incorporated. This is possibly to be expected, as the conditions existing in each State control the actions of the legislative bodies in the framing of laws. A copy of the law of the State of Pennsylvania is appended to this report, and may be examined by the members of the Association.

With regard to the disposition of the remains left after dissection, the committee feels it proper to advise that so far as possible they should be decently interred. Under any circumstance the committee thinks that it is not in keeping with the proper sentiment to dispose of them in the manner in which it is feared it is sometimes done. The retention of bones in some instances for the purposes of study and instruction and for the preparation of articulated skeletons is necessary and sanctioned.

With regard to the preservation of anatomical material by the injection of chemical agents or by cold-storage method, the committee feels that the information received is not as specific and comprehensive as desired. The agents reported to be in use, either alone or in combination, are such as are well known to the teachers of anatomy. There is apparently no conclusive evidence that any one of the agents alone, or in combination, accomplishes all that is desired in the way of the perfect preservation of anatomical material. Perfect preservation includes not only freedom from decomposition, but the maintenance of the tissues in a normal condition as nearly

as possible, and the existence of these conditions for such length of time as may be necessary in the storage of subjects on one hand and the time required for the work of actual dissection on the other hand. In many institutions it is necessary to collect during a period of the year, and that the most unfavorable season, so far as temperature is concerned, a number of subjects which shall be kept in a state of preservation for a number of months, so that they may be, in every respect, suitable for dissection. To accomplish this it is necessary to employ an agent which will not only prevent decomposition, but also to provide some means to so keep the subject that it may be maintained in this condition of preservation without material change in the color or character of the tissues. These ends are to be obtained, it is also to be observed, within what may be regarded as a reasonable cost. To accomplish the latter object it is manifest that one agent should be used rather than a combination of agents. For instance, the use of arsenious acid or bichloride of mercury, both of which are inexpensive, will provide a means of preservation at no very great cost. When these agents, however, are used in combination with glycerine, rectified spirits, or methylic alcohol, the cost will be materially increased and the storage of the subjects, thus injected, in alcohol or other agent of similar character, will add to the expense. The committee is not able to say from the information received that any of these agents will preserve anatomical material for a number of months. Undoubtedly solutions of bichloride of mercury, arsenic or carbolic acid, will prevent the occurrence of decomposition for a limited period of time, sufficient under ordinary circumstances for the complete dissection of the subject, but no evidence was adduced that these agents, when injected into a subject which was to be stored in a saline solution for a number

of months, would be effective. The use of salts of potassa is advised in a number of instances, and, as is well known, they are of value in combinations, the effect being not only in a slight degree preservative, but is also manifest on the color of the tissues. The use of arsenic solutions is objected to by students on account of the irritation of the fingers which is produced. While there may be a few instances in which this objection becomes a matter of serious importance, it may be regarded as of minor importance in a great majority of cases. The objection against the use of glycerine is the production of mould, which occurs as the result of the hygroscopic action. The expense attending the use of alcohol is such as to forbid its employment in any large quantity for injection or storage purposes. Formalin is reported as effective as a preservative and storage agent, but its cost is a strong objection against its use. The committee believes that the method of preservation by means of cold storage is the best which could be employed, but the question of expense of the introduction of a plant necessary for this purpose is a very serious one. In cities where more than one medical institution is situated, it seems feasible to have a central plant in which subjects required in all the institutions can be stored, with the division of expense made amongst those entering into the arrangement. As to the time in which subjects should be injected which are kept in cold storage plants, it is desirable that this should be done prior to their deposit. They will be ready to place at once upon the table, and it is believed the injections can be better made before deposit rather than after they have remained some time under the influence of the cold.

Reference is made to the use of the solution of chloride of zinc as a preservative agent of value, especially where it is necessary to collect subjects during the summer

months, and to keep them in a solution of a salt. Solutions of chloride of zinc will, without doubt, not only prevent but arrest decomposition. The bleaching properties which it possesses and which it exerts upon the tissues is a very serious objection. This agent is used largely, if not, altogether in the medical institutions of Philadelphia, to which are supplied each year over seven hundred subjects. It is used as an injection in the proportion of one-half to one-third of a fifty-per cent. of solution of neutral reaction, a subject of average weight requiring from four to six quarts.

In the replies given as to the cost of the reception, preservation and injection of subjects a wide difference is observed. It is evidently impossible, unless subjects are transported without cost, to reduce the cost per subject for reception, injection and preservation to \$1.00 each. Under the provisions of a well framed law, it is believed that the delivery of subjects should not exceed as an average from \$5.00 to \$8.00, and the injection and preservation should be accomplished by an additional expenditure of \$5.00, making the cost of each when placed upon the table about \$12.00.

Less than one-half of the replies received as to the supply of anatomical material contained the statement that the supply was adequate. In an equal number the supply was stated to be not sufficient and the remaining number reported that more subjects could be used if obtainable. The conclusion to be deduced from these statements is manifestly to the effect that the supply of anatomical material in our medical institutions is not as great as it should be.

The number of students assigned to each subject were stated in the replies received to vary from four to sixteen. Here again, it is to be observed, a wide difference is expressed. The number on one hand to be too small to obtain the proper economy in the use of material, and on the other hand

too large to secure the full instruction necessary. It is to be observed that the manner in which instruction is imparted will modify the statements above made.

CONCLUSIONS.

1. Anatomical material for the promotion of medical science should be obtained wholly under legal enactment. The provisions of the law should be compulsory upon all officers of State and county institutions and municipal governments.

2. Of the anatomical laws which are in force in this country, the committee is of the opinion that the law of the State of Pennsylvania is the best. It is framed in such manner as to provide under a strict execution of its requirements anatomical material for the promotion of Medical Science and prevents the desecration of the resting place of the dead.

3. The committee believes it would contribute to the best interests of anatomical teaching in this country if action was taken by this association to secure the enactment in every State of a law controlling the collection and distribution of anatomical material and recommends such action.

4. The committee finds itself unable, from the information which has been received, to arrive at any definite conclusions with regard to the best means for accomplishing the preservation of anatomical material for the purposes of dissection. Many of the agents reported in the communications received have been long in use, and to a greater or less degree have been employed successfully in securing preservation of anatomical material, but not with all the conditions which are deemed as essential in perfect preservation, and those which afford the best results in dissection. Preservation by means of cold storage it believes to be a method which approaches nearest to perfection, and it should be arranged upon such a plan as will admit of the retention

of anatomical material, under the influence of the low temperature during dissection.

(Signed.) J. EWING MEARS,
J. D. BRYANT,
THOMAS DWIGHT.

NOVEMBER 19, 1895.

The following amendment to the report was adopted: "That Professors of Anatomy be requested to inform their students concerning the laws upon the subject of anatomical material, and request these students to use their influence with the authorities in their respective places of residence to increase the quantity of anatomical material by making available much that is now withheld, either from neglect or indifference."

ANATOMICAL LAW OF THE STATE OF PENNSYLVANIA, ENACTED JUNE 13, 1883.

For the promotion of medical science by the distribution of and use of unclaimed human bodies for scientific purposes through a board created for that purpose, and to prevent unauthorized uses and traffic in human bodies.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same:* That the professors of anatomy, the professors of surgery, the demonstrators of anatomy, and the demonstrators of surgery of the medical and dental schools and colleges of this Commonwealth, which are now or may hereafter become incorporated, together with one representative from each of the unincorporated schools of anatomy or practical surgery within this Commonwealth in which there are, or from time to time at the time of the appointment of such representative shall be, not less than twenty-five scholars, shall be, and hereby are constituted a board, for the distribution and delivery of dead human bodies hereinafter described, to and among such persons as under the provisions of this Act are entitled