ease, being most prevalent where the conditions favoring its spread most obtain; and that the presence of these conditions, more than racial or individual susceptibility, are the important factors favoring its prevalence. This view is supported by the death-rate from this disease of the community under consideration.

For some months previous to their arrival at Mount Vernon Barracks, and during the first four years of their stay there, all the conditions most favorable to the spread of the disease existed; and the deaths from it ran as follows: First year 11, second year 4, third year 18, fourth year 18, fifth year 27.

During the fifth year, though the condition of the Indians was greatly improved, the number of deaths from this disease was greater than before, as the disease had gained such a foothold during the preceding four years that no decrease could be looked for in so short a time. The disease is so slow in development and in running its course, that when unusually prevalent in a community, no sudden return to ordinary rates can be expected, but only a slow decline made possible by most thorough sanitary measures.

Whether the system of disinfection and enforced cleanliness now being carried out in this community together with its bettered condition, will be effective in staying the ravages from this disease remains to be seen, for the unfavorable conditions of changed climate and altered modes of life still remain.

It is to be hoped, however, that this most insidious of diseases can be controlled by the means taken and notwithstanding that the past five years have shown a steady increase of the disease, due to the presence of all the conditions most favorable to its spread, that the following years, through the absence of many of these conditions and the use of suppression methods, may show a steady decline.

Should such decline occur, it will be of interest in that it will show the adaptation of the community to its new environment, and the effectiveness of modern sanitary methods, when enforced.

THE NEED OF AGREEMENT ON THE LIMITS OF THE ABDOMINAL REGIONS, AND A PROPOSITION FOR A NEW METHOD OF DIVISION.¹

BY FREDERICK HENRY GERRISH, M.D., OF PORTLAND, ME.,
Medical Department of Bowdoin College.

THE surface of the abdomen, as viewed from the front, is very extensive, and presents in the normal condition few features which are at once obvious and constant. Indeed, the only one which is invariable is the navel. The depression called scrobiculus cordis is often lacking; the exact line of the groin must sometimes be searched for with care; the capillary embellishment of the pubes is absent in childhood; the linea alba, the linea semilunaris, and the sloping margin of the thorax are frequently obscured by corpulence.

¹ Read before the Association of American Anatomists at Princeton, N. J., December, 1892.

Last spring, during my annual course of lectures in the Medical Department, Bowdoin College, I told the class of my purpose to read this paper, for which the materials were then substantially collected, at this meeting of the Association. I had never seen or heard of a proposition looking towards agreement on the boundaries of the abdominal regions; and my first knowledge of any such was received after I had forwarded the title of this essay to our Secretary, who immediately kindly informed me of the intention of one of our colleagues to write on the same subject, and sent me a copy of the paper of Professor Anderson. I have, however, not read a line of the latter, in order to be absolutely free from the imputation of plagiarism.

The umbilicus alone, while varying in size and depth, is always present. The need, therefore, of some artificial markings to aid in the localization of parts or objects upon, within, or behind the parietes must have been felt by the early students of anatomy. Just at what period any such drawing of lines of latitude and longitude as at present obtains was begun, I am unable to declare, my opportunities for investigating this matter having been too limited to determine the point. It is sufficient for my purpose, as a practical anatomist, to know that such a method has been in vogue for more than a century, and that its universal adoption is evidence of the recognition of its value. Nobody now would wish to be deprived of the terms of convenience which this plan has fastened upon our nomenclature; but doubtless everybody who studies the subject would be glad to have these terms made so definite that there would be no room for doubt as to the exact meaning and the limits of application of each of them. It must be acknowledged, though the confession is not creditable to the scientific pretensions of anatomy, that there is a grievous lack of uniformity in the method of drawing the lines by which the anterior abdominal wall is mapped out into regions.

Having been for a long time annoyed on this account, I have had the curiosity to make a careful examination of the statements of the writers of the works most easily accessible to me, who make any mention of the matter. Though it is quite possible that search through a larger collection would reveal a still greater number of variations on the simple theme, the dozen which I am about to quote abundantly sustain the thought which I have made the title of this essay; and I have, therefore, forbore to make so unnecessary, and hence unwarrantable, a tax upon your patience as more extensive quotation would involve. One does not have to eat a whole cheese to get its flavor.

Before proceeding to a detailed presentation of the facts, it is well to place clearly before us the purpose in view in the creation of these artificial areas. This is so well stated in Quain and Wilson (Pancoast's edition, 1842) that I quote their words:

"The larger or upper compartment of the abdomen is subjected to what may be called a technical subdivision into regions; not that there are any septa or partitions between them, but because of the many important parts which are contained in it, and which require to be minutely described.

"It must be obvious that the very purpose and intent of marking out these lines show that they are not confined to the surface on which they are drawn. They are on the contrary supposed to be projected into so many planes, forming partitions, which divide the cavity into compartments, each containing a certain portion of the abdominal viscera."

Although not every author as distinctly expresses this idea, it is obvious that the conception of projected planes is entertained by all, for otherwise there would be little point in the artificial subdivision of the surface. As Bell says (fourth American from fourth English edition, New York, 1822): "To give greater accuracy to the description of the seat of the viscera, or, perhaps, rather more strictly to connect the knowledge of the internal parts with the outward marks of the belly," is the object of the arbitrary drawing of imaginary lines. All authors speak of certain organs as being situated in specific regions, which, of course, could be true only on the supposition of the extension of the

lines straight backward to the posterior wall of the abdomen.

The discrepancy in the drawing of the dividing lines between the various regions is very marked, and almost every possible variation, consistent with the general plan which actuates every method, is presented for our adoption. The greater part of the authors seem to make an effort at exactitude, though with a degree of success which is not altogether admirable; while others content themselves with the establishment of the vaguest boundaries. A good example of the latter class is Fyfe (1800), whose description is worthy of extended quotation:

"It (the abdomen) is distinguished into three Divisions or Regions, termed Upper, Middle, and Under Regions; each of which is subdivided into three others.

"The Upper Region begins opposite to the Cartilage Ensiformis, at a small depression called Scrobiculus Cordis, or Pit of the Stomach, and extends to about a hand-breadth from the Umbilicus or Navel.

"The middle of this Region is termed Epigastrium, or upper part of the Belly, and the two lateral parts Hypochondria, from their lying under the Cartilages of the False Ribs.

"The Middle Region occupies an equal distance above and below the Umbilicus. The middle part of it is called the Umbilical, and its lateral parts the Lumbar Regions or Loins.

"The Under Region begins where the middle one terminates, or at a line drawn between the superior anterior Spinous Processes of the Ossa Ilii, and forms in the middle the Hypogastrium, or bottom of the Belly, and at the sides, the Iliac Regions."

In this description there is not the slightest approach to precision; and the only semblance of such approximation occurs in the implication that the level of the anterior superior spinous processes is a hand's breadth below the navel—an idea which needs no comment, whether a "hand" (four inches) is meant, or the actual breadth of hand of the special person who conducts the measurement. The most that we get out of this account is this: the front surface of the belly is to be considered as mapped out into nine regions of indefinite boundaries and widely varying and undetermined areas.

As a type of the class who attempt accuracy, we may take Quain (1882 edition), who draws the two horizontal lines respectively "at the level of the lowest part of the wall of the thorax," and "between the highest points of the iliac crests"; and the lines dividing these vertically "upwards on each side from the middle of Poupart's ligament."

Between these extremes of vagueness and precision are numerous grades of indistinctness. The upper horizontal line is drawn "opposite the cartilages of the ninth rib," "parallel with the cartilages of the ninth ribs," "over the ninth costal cartilages," "between the cartilages of the tenth ribs," between "the most prominent point of the cartilages of the ribs," "from the inferior margins of the ribs," "across the base of the thorax." The lower horizontal line is drawn "on a level with the most prominent part of the crest of the hip-bone," "the crista of the ilium," and "between the iliac crests."

The lines dividing the zones are made to pass "from the cartilage of the eighth rib to the centre of Poupart's ligament," "from the spines of the pubis to the cartilages of the eighth ribs," and "from the middle of the groin vertically."

At the first glance I may seem to be in error in speaking of the most of these rules as being vague; but my reason for considering them so will be seen when I call attention to the facts that each of the cartilages mentioned presents so extensive a margin as to permit a variation of five centimetres, more or less, for the choice of the student in selecting a starting-point for his measurement; that the anterior margins of the ribs, as distinguished from their cartilages, are practically impossible of ascertainment through their natural coverings; that the most prominent point of the costal cartilages is not the same in different people; that there is large room for difference of opinion as to what is the most prominent part of the crest of the ilium; and that "groin" is a word of elastic application.

Some authors give exact directions, but differ vastly among themselves.

An influence which augments the confusion of the student's mind in these premises is exerted by the dictionaries. One says that the epigastrium is "the abdominal wall in front of the stomach," and another, "that part of the abdomen immediately over the stomach and below the diaphragm." One gives the following extraordinary definition of the iliac region: "The side of the abdomen between the ribs and the hips"; and of the umbilical, "That portion of the abdomen two or three inches above, below and on each side of the umbilicus"; and so on, to the great weariness of the spirit.

This dire confusion must suggest the necessity of agreement among anatomical teachers concerning the limits of the regions, which long usage and general consent admit are important. Consequently, I venture to suggest the adoption by this Association, which includes so large a number of the prominent specialists in anatomy in this country, of a system by which these regions may be described uniformly in all of our schools. The influence of our action would be felt abroad, especially if we were to request conference with similar societies in other lands.

The plan which I offer and defend may not meet with your approval; but I trust that some plan will be adopted, as I believe that the credit of modern anatomy requires a radical reform of our present slovenly method.

I propose that the dividing lines be drawn as follows:

The upper horizontal at the level of the lowest point of the inferior margin of the tenth costal cartilage.

The lower horizontal at the level of the anterior superior spinous process of the ilium.

The lines intersecting these from the middle of Poupart's ligament on each side perpendicularly.

In support of this drawing of the upper horizontal, I submit these advantages:

The ease with which the lower margin of the tenth costal cartilage is located.

The perfect definiteness of the directions, which is not attained by mentioning any particular cartilage, without specifying a point upon it.

The anatomical propriety of allowing as large an area as this permits for the upper zone, thus giving a nearer approach to uniformity of width in the three zones.

The fact that this drawing is recommended by some of the ablest authors, such as Bell, Quain and Leidy.

For the lower horizontal line I claim these meritorious points:

Absolute definiteness.

The facility with which the anterior superior spinous process of the ilium is found.

The approximation to uniformity of width of the three zones, which this method ensures.

The localizing of the navel more nearly at the vertical centre of the umbilical region, than is accomplished by having the line pass below the highest points of the iliac crests, as advised by Gray, Quain, Leidy, and others, who thus bring the umbilicus into the lowest part of the region to which it gives the name, and often on the line separating this from the region immediately below.

The fact that this drawing has the support of prominent teachers, like Bell, Owen, Macalister and McClellan.

My arguments for the intersecting lines proposed are as follows:

The middle of Poupart's ligament is easily determined.

The selection of this point is better than that of the bony prominence to which its outer end is attached (as practised by Bell and Cloquet), because we thus cause this line to divide the lowest zone into three regions, as in the case with the upper and middle; and make it divide the other zones much more equally. Only a little room is left for the hypochondriac and lumbar regions if the line is drawn perpendicularly from the anterior superior iliac spine.

The choice of this point is also better than that of the osseous process to which the inner end of the ligament is fastened, as advocated by Macalister and McClellan, because, if the line be drawn perpendicularly, the lateral boundaries of the central region of each zone become too close; and, if it be drawn to the cartilage of the eighth rib, as recommended by these writers, it is less definite, because no point on the cartilage is specified, and it is harder to carry abstractly in mind an account of its obliquity. It is worthy of remark in this connection that the difficulty, upon which I have insisted in the matter of the directions which merely mentions a costal cartilage, is strikingly shown in the picture which accompanies the description of the abdominal regions in that splendid and most recent American addition to our anatomical libraries, where in we find the text and the drawing in disagreement. If a mistake is so readily made by so painstaking an author, who is also his own artist, in a picture which delineates the cartilages in outline, how difficult it must be for an ordinary practitioner, who is not an expert in anatomy, to avoid such errors in the case of a patient whose thoracic framework is "padded round with flesh and fat."

The perpendicularity of the line is an obvious advantage: first, because it is so simple and, therefore, easy to remember; and, second, because it makes rectangles with the lines which it crosses, and thus contributes to uniformity of outline and comfort of memory. It is true that a line thus drawn will not in all cases strike the same point on the thorax—it will be further away from the linea alba in women than in men, on account of the relatively wider pelvis and narrower chest in the female sex. But no rule in this matter will give absolute results, and the one proposed is as free from disadvantages as any other can be.

There is only one point to remember—the middle of Poupart's ligament. Those who name a point on the chest wall for the other end of the line add an ele-

ment of difficulty to the task of the student, and can be by no means positive that the resulting line will be vertical. It is a method taught by distinguished anatomists, as Quain and Owen; and others, like Ellis and Gray, make the middle of Poupart's ligament one of the two points between which they draw each of these subdividing lines.

It will be observed that each of the component parts of this plan has the sanction of some illustrious authority; but their association does not occur, as far as I know, in the method of any writer.

In this system only three anatomical points require to be remembered—the lowest point of the tenth costal cartilage, the anterior superior iliac spine, and the middle of Poupart's ligament. I think that it will compare favorably with any other method in respect to theoretical simplicity, accuracy and uniformity of results, and practical applicability.

In this connection it is fitting that something be said about the names which are applied to the different regions.

The central region of the upper zone and the region on each side of it are called respectively epigastric and hypochondriac, by universal usage, except when the cognate terms, epigastrium and hypochondrium, are used. The central area in the middle zone is always named umbilical, and its lateral associates lumbar, by an almost equally unvarying custom. In the lowest zone the central region is generally designated hypogastric or the hypogastrium; but certain authors prefer pubic.

The sanction of ancient custom weighs with me in determining my choice of hypogastric, particularly as it seems to me so desirable to have the word pubic reserved for that area which, in the adult, is covered with hair, and includes not only the lower part of the hypogastric region, but also the bodies of the pubic bones and the structures in front of them.

Iliac is most frequently the adjective applied to the side areas in the lowest zone, though inguinal is preferred by some writers. My choice is the former, inasmuch as a part of the region is not groin, and all of it is neighboring to the hip-bone. Inguinal may well be applied to the long, obliquely situated area, which is located partly above and partly below Poupart's ligament—is, as it were, threaded upon the ligament—and is as much a portion of the thigh as of the abdomen.

In conclusion, a few words may appropriately be spoken in answer to an anticipated objection to this plea for uniformity and accuracy in the delimitation of the abdominal regions.

It has thus far been assumed that the mapping out of regions by imaginary lines is desirable; but I have heard it said that this is useless, because the contents of the designated regions are not the same in all cases.

Considerable variation is admitted; but it is probably not greater than obtains in many other cases in which the desirability of artificial aids to precision is universally admitted. In anatomy we do not look for mathematical accuracy and absolute uniformity, but only for approximations. Our rules are based upon the usual, not upon the invariable. And there seems to me to be no good reason why some uniform method of division of the abdominal surface may not be agreed upon by the anatomical world, which shall be of essential service in the direction of simplification and precision in the description of the relation of the viscera to the parietes and to each other.