it in so simple an operation as the extraction of a tooth; and a jury would be doing its full duty in holding responsible for the death of the patient any physician or dentist who administered it in such a case, with a fatal result.

ONE OF THE DIFFICULT problems which presents itself for solution in the south is how to reduce the mortality among the blacks. That it has not yet been solved is made evident by a study of the vital statistics of southern cities. These records show that the death-rate of the negroes is double that of the whites. Savannah, Ga., however, seems to be exceptionally unhealthy in this regard. It is stated that in that city, while the rate for the white population is but 12.19 per thousand, a remarkably low rate and probably not correct, that for the blacks is 122. If these figures are correct, there is opportunity for much missionary work of a sanitary nature in the city of Savannah.

ECONOMIC LAWS AND METHODS.

IF it should be said that the material out of which the science of mechanics was built was wood and stone, iron and steel, every one would see the mistake. But when Mr. H. C. Adams, in his interesting paper on economics and jurisprudence, speaks of the material surroundings of men and the legal structure of society as material out of which the science of economics is built, he falls into precisely the same error (*Science*, July 2).

It would be unfair to Mr. Adams personally to lay too much stress on a random expression torn from its context; but it is not unfair to the school of thought to which he belongs. We have singled this expression out for criticism because it is characteristic of the school. It represents a view of the whole subject which is likely to lead to grave mistakes in thinking and in action. That Mr. Adams himself will make those mistakes, we do not believe. We should be sorry to say a word which should even seem to detract from the value of his work. He is one of the few men who combine originality with critical judgment. But the high character of the writer makes it all the more necessary to protest against his mistakes, even though they be but incidental. What he does inadvertently, others will be led to do deliberately.

The error lies in confounding the material to which a science is applied, with the material out of which it is built; or — to put the same thing in another form — in identifying the material of a science with the materials of an art. In itself this may seem a trivial matter; in its consequences it is extremely serious.

The material out of which the science of mechanics is built is not wood or iron, in any sense whatever. The science is built out of a few simple laws of motion, nowhere *exactly* realized in nature, and yet now admitted by every sensible man to be true. And in like manner the material out of which the science of economics is built consists of a few simple laws of human nature, the chief of which is that men strive to obtain the maximum of satisfaction with the minimum of sacrifice. It does not insist that the sacrifice shall be solely physical, or the satisfaction purely material. It makes no more unwarranted assumptions than does pure mechanics. The 'economic man' has as much and as little real existence as the 'material point.' As the fundamental assumptions of mechanics are involved in the definition of motion and the fact of its measurement, so the fundamental assumptions of political economy are involved in the definition of motives, and the fact of their measurement. This measurement is far less accurate in moral science than in physical science: the danger of dogmatism is therefore greater, and the need for verification more constant. But to say that the verification *is* the science, is as much a mistake in the one case as in the other.

It is a mistake which is often made, and which does great harm, both in science and in practice. It defeats the usefulness of verification as a means of discovery. An illustration will help to make this clear. The discovery of Neptune was due to a study of the motions of Uranus. It was found that these motions were not exactly such as the laws of mechanics, applied to the position of the known planets, would explain. It was therefore assumed that there must be certain unknown conditions which entered into the case; and careful reasoning led to the discovery of a new planet, whose position and size fulfilled those conditions.

Now, let it be observed, that, by the method which the historical school so highly commends, the inference from the motions of Uranus would simply have been that the law of gravitation *was not as rigid as is commonly supposed.* Such an inference would not merely have been wrong in itself, but it would have prevented the discovery of Neptune.

It is only when you assume a rigid law that your verification leads to new discoveries; and it leads to the most fruitful discoveries where the law at first seems to fail. That these new discoveries may sometimes take such a form that the old statement of the law will need to be partly or wholly

rejected, does not alter the case. The man who tries to reason without rigid hypotheses cripples his power of investigation. Any one who understands the real power and importance of verification is justly indignant at any such conception of science as will prevent the use of verification as a means of discovery. The failures of the attempt to work without rigid hypotheses, from Lord Bacon down, have been so conspicuous that they hardly need repetition. Where the German school of economists has made any advance in the field of political economy itself, it has been done by an abandonment of the so-called historical method, and by a rigid application of deductive reasoning combined with careful verification. It is Cohn, and not Roscher, who represents the really fruitful line of German thought; and, whatever Cohn may at times have professed, he relies strongly both on abstract reasoning and on the rigidity of law.

There is one class of cases where these distinctions fall away, and where the Baconian method is a good one. When a science is so crude as to be mainly occupied with description and classification, there is little chance for the use of rigid hypotheses. Here the distinction between the material and the science falls away. Physics remained in this condition till the seventeenth century; chemistry, till the eighteenth; it was not till the nineteenth that 'natural history' began to give place to biology.

Sociology as a whole can hardly be said to have advanced beyond this stage; but certain departments of sociology are distinctly beyond it, notably law and political economy. They have reached the point where it is possible to frame hypotheses and to carry out deductions and verifications. The field of each science is limited; but, within its proper sphere, each is a true science. It is right enough to say that each is a part of something greater. In the future we may hope that a scientific sociology will be developed which shall include many other sciences. But we have a science of political economy, and we have not as yet a science of sociology in any thing like the same sense. To reject the part which we have for the sake of the whole, which we have not, would be the extreme of folly. It would be the same thing as to have rejected the undulatory theory of light fifty years ago because the correlation of forces was not yet discovered. The theory of light was but a part of the truth; but it was only on the basis of such parts that the whole could be built up. A scientific part is a better starting-point than an unscientific whole.

There is another class of dangers to which we are exposed when we deny all independence to economic reasoning. The man or state that refuses to recognize the rigidity of economic laws is likely to suffer for it, sooner or later, in his practical experience.

It is impossible for a man not to let his habits of thought affect his habits of action. If he is accustomed to make rigid assumptions, he tries to make things conform to these assumptions, and to insist that something is wrong where they do not. If, on the other hand, he reasons loosely, he comes to act recklessly, and to believe that his own luck or skill will save him from the necessity of careful calculation. The error of reckless overconfidence is at once more destructive and more common than the error of fatalism; and any thing which encourages the former is usually more dangerous than that which encourages the latter.

If a nearly spent cannon-ball is slowly rolling toward you, the natural and sensible thing to do is to get out of the way. The fatalist may refuse to do so because of his blind belief in fate. The fool may refuse to do so because he thinks it is not coming fast enough to hurt him. Now, either extreme is bad; but the practical danger is from the latter. The experience of army surgeons will show that in the instance given there are probably ten fools to one fatalist.

And in like manner the danger of believing that economic laws can be interfered with by human effort is ten times greater than the danger of an extreme belief in *laissez-faire*. Human nature is far more inclined to the former error. Where the economists make a mistake in opposing state interference (as when they tried to stop English factory legislation), people will generally take their own course in spite of them. Where they make the mistake of not opposing it, people will be only too ready to seize upon their arguments. And the same thing holds true of individual action as well as of state action. The danger of believing that the results of past experience are uncertain is far greater than the danger of believing that we are helpless to improve upon them.

As a matter of fact, there are limits within which the results of past experience are surprisingly rigid. That the worse currency drives out the better; that food prices depend upon the margin of cultivation rather than upon rent; that reckless marriage means starvation wages, — are laws which nations have been for centuries attempting to disregard, and of which they are hardly yet learning the full force. They mark limits, and effective limits, upon legislative activity. As long as political economy is occupied with defining those limits, it can maintain its claim to the position of an authoritative science. It says to the legislator, 'Thus far shalt thou go, and no

farther.' It does not say, 'Such and such legislation will produce the best results;' but it says, 'Beyond certain limits, all legislation fails.' This is the natural relation of a science to an art. Mechanics does not tell the bridge-builder exactly how he must build his bridge; considerations of beauty and convenience must be taken into account: but mechanics warns the builder, that, if he disregards certain conditions of stability, his bridge will fall. Nobody insists that the axioms of mechanics should be modified because a bridge with the maximum of stability would be inconvenient or unsafe. Nor do we insist that mechanics should solve all the problems of bridge-building. We let mechanical considerations limit the practical application of aesthetics, and we let aesthetic considerations limit the practical application of mechanical principles. We do not attempt to fuse the two things together, and then distrust both of them.

This may fairly illustrate the relation of economics and jurisprudence. Whether we shall ever be able to combine them into one science may be uncertain; but we have not been able to do so as yet. Each limits the practical application of the other. Industrial activity is limited by legal conditions; legislative activity, by economic conditions. The attempt to confuse the two, and to merge them in a crude science of sociology, seems for the present likely to check scientific progress, and to involve us in serious practical dangers. Each, as a science, is independent, authoritative, and rigid; each forms the basis of an art which is subject to a thousand limitations.

ARTHUR T. HADLEY.

CONVOCATION OF THE UNIVERSITY OF THE STATE OF NEW YORK.

THE twenty-fourth convocation of the University of the state of New York began its sessions in the senate chamber of the capitol at Albany on Tuesday morning, July 6. There was assembled a large number of college professors, normal and high school teachers, and friends of education, from New York and other states.

The address of Hon. Henry R. Pierson, chancellor of the university, was a very able and eloquent defence of the work of the university and its board of regents, having special reference to the proposal recently made to abolish them both. The chancellor examined in some detail the history and organization of Oxford, Cambridge, and London universities. He showed that these universities stand in precisely the same relation to the federated colleges under their control that the University of the state of New York bears to the high schools, academies, and colleges of the state. The history of the university amply justifies its existence. Starting in 1784 with only one weak college — King's college, now Columbia — under its control, it embraced, in 1885, 45 colleges having 784 instructors and 11,702 students, and 1,571 graduates during the year. The total value of this college property is $23,164,612.82, and their yearly expenditure amounts to $1,787,391.51. Besides this, there were, in 1885, 283 academies under the control of the regents of the university, and 72,426 answer-papers were examined and passed upon under the supervision of the regents during the year. The chancellor stated that post-graduate courses, with corresponding examinations and degrees, were now under consideration. He concluded, "Read the record of these convocations, and I venture to say that no similar records of educational value can be found. Shall we consider these convocations a failure and nothing worth? It is true, the university does not confer many degrees, because that is a power concurrent with the colleges, and it has been thought best to leave that duty mainly with them. I think I have proved that in its past and present the duties of the university have been defined by law, and that it has performed all the duties devolving upon it; that the corporate name is not a misnomer, and should not mislead; and that the regents are doing too noble a work to be abolished or merged with any other body of educational workers."

The main interest of the first morning session centred in the discussion of the subject of manual training, which was introduced in a paper by Principal Love of Jamestown. Mr. Love claimed that the test of the practicability of manual training must be its usefulness. Any system of training that does not start out with the idea that the scholar must become a producer is defective. Principal Love detailed the workings of a system of manual training introduced by him in Jamestown, asserting that it did not detract from, but rather added to, the quantity and quality of intellectual work performed by the pupils. His account showed a gratifying success with an experiment which must sooner or later become general.

The afternoon session was given up to a discussion of the question, 'Has the college a logical place in the American system of education?' The subject was introduced by papers by Prof. Oren Root of Hamilton college and Prof. S. G. Williams of Cornell. Both essayists, as well as Vice-Chancellor MacCracken of the University of the city of New York, who opened the discussion of the papers, combated the view expressed in some quarters, — notably by Professor West of Princeton, in a paper read before the National teachers' associa-