# JAMES JOSEPH WALSH

## THE POPES AND SCIENCE

James Walsh

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**Walsh J.**

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# James J. Walsh
# The Popes and Science / The History of the Papal Relations to Science During the Middle Ages and Down to Our Own Time

## PREFACE

*A new edition of this volume being called for, I take the occasion to place it under the aegis of the University of Notre Dame as a slight token of gratitude for the formal recognition of the work by the faculty of that institution, and bind this Notre Dame edition in the University colors, blue and gold.*

There is much more readiness at the present time to accept the conclusions with regard to the relations of the Popes and science here suggested than there was when the book was first published. Knowledge of the general history of science has grown very materially in the last ten years. Every increase in historical knowledge has shown more and more clearly how utterly without foundation were many ideas which had been very commonly accepted, particularly in English-speaking countries, on the subjects here discussed. The supposed opposition to the development of science on the part of the Popes and the Church is now readily seen to have had no existence in reality, and popular notions on the subject were due entirely to ignorance of the history of science. There was supposed to be no scientific development and no nature study until quite recent times. The generations immediately preceding ours knew of none, and therefore concluded there must have been none. They went even farther, and felt that since there had been none, there must be some special reason for this lacuna in human progress. The Church and the Popes were the favorite scapegoats for human failings, so they were blamed. Now we know that there was a magnificent development of science, not only in the Renaissance period under the fostering care of the Popes and ecclesiastics, but also during the old university times. What has come above all to be recognized is that the medieval universities were ***scientific universities***. They paid more attention to the ethical and philosophical sciences than we do, but they devoted a great deal of time to mathematics and the physical sciences. Mr. Huxley, in his inaugural address as Rector of the University of Aberdeen, declared thirty years ago that the curriculum of these old universities was better calculated to develop the many-sided mind of man than the curriculum of any modern university. Above all, in surgery and in medicine they did magnificent work. Anaesthesia, antisepsis, and the natural methods of cure were all anticipated in the medieval time. At the International Congress of Medicine last summer, a section on the history of medicine was organized because it has come to be recognized that very much that is even of practical value can be learned from medical history.

The fact of the matter is that during the eighteenth and early nineteenth centuries there was a great decadence of interest in scholarship and true education. There is a distinct descent in human culture at this time. Education was at its lowest ebb, hospitals {iv} were the worst ever built, art and architecture were neglected, and human liberty was so shackled that the French Revolution was needed to lift the fetters from men's minds as well as bodies. They, in their ignorance, spoke slightingly of old-time scholars. During the past century we have come to a better knowledge of the Middle Ages, and he is indeed a backward student of history who now thinks of them as "dark." Our millionaires have gathered, at immense expense, magnificent examples of the arts and crafts and beautiful books of the medieval and Renaissance periods. Our binders imitate their books, our artists study their works, we have revived their architecture and literature, are imitating their social ideas until, instead of "the dark ages," we have come to think of them as "the bright ages." What is not generally realized

is that they are just as bright in science as they were in art, architecture, literature, and the arts and crafts.

Literally, the Popes were as much the patrons of science as they were of the arts. Professor White's book, "The Warfare of Science with Theology," like Professor Draper's "History of the Conflict Between Religion and Science," are now seen to represent simply an interesting evidence of the lack of real knowledge of the history of science and, above all, complete ignorance of details as to the genuine accomplishment of the olden time on the part of the generation by which they were taken seriously. Being quite sure that there was no science to speak of in the older times, these writers gathered every possible reference, found anywhere in secondary authorities, for they almost never went to the original documents, as evidence for their preconceived conviction that the Church must have suppressed science whenever that was possible. The real history of science was ignored. As soon as that is known there is no further question of Church opposition, but, on the contrary, of the extent of ecclesiastical patronage and encouragement of science.

Some of this very different story is told only too incompletely in this volume. It would take many volumes to give all the details of it. Readers will find here at least such references to the actual documentary history as will form a good basis for definite knowledge of the genuine relations of the Popes to science. The series of new appendices in this edition, especially those on Papal Physicians, Science in America, and the original Papal documents so often quoted, but seldom seen entire, is meant to supply material for the correction of many false notions that are unfortunately prevalent. They present historical matter that has not been readily available hitherto in English-speaking countries and that has nowhere been easy of access in the form here given.

Appendix VII by Rev. Father Leahy on ***The Fathers of The Church and Science*** presents a controverted point of history to persuasion. Appendix IX shows how amusing and amazing was Professor Draper's lack of knowledge of the history of science and above all of medicine and surgery when he wrote his "histories" that were so widely read and accepted because we in America knew no better for the moment.

# PREFACE

For years, as a student and physician, I listened to remarks from teachers and professional friends as to the opposition of the Popes to science, until finally, much against my will, I came to believe that there had been many Papal documents issued, which intentionally or otherwise hampered the progress of science. Interest in the history of medicine led me to investigate the subject for myself. To my surprise, I found that the supposed Papal opposition to science was practically all founded on an exaggeration of the significance of the Galileo incident. As a matter of history, the Popes were as liberal patrons of science as of art. In the Renaissance period, when their patronage of Raphael and Michel Angelo and other great artists did so much for art, similar relations to Columbus, Eustachius, and Caesalpinus, and later to Steno and Malpighi, our greatest medical discoverers, had like results for science. The Papal Medical School was for centuries the greatest medical school in Europe, and its professors were the most distinguished medical scientists of the time. This is a perfectly simple bit of history that anyone may find for himself in any reliable history of medicine. The medical schools were the scientific departments of the universities practically down to the nineteenth century. In them were studied botany, zoology and the biological sciences generally, chemistry, physics, mineralogy and even astronomy, because of the belief that the stars influenced human constitutions. The Popes in fostering medical schools (there were four of them in the Papal dominions, and two of them, Bologna and Rome, were the greatest medical schools for several centuries) were acting as wise and beneficent patrons of science. Many of the greatest scientists of the Middle Ages were clergymen. Some of the greatest of them were canonized as saints. Albertus Magnus and Thomas Aquinas are typical examples. At least one Pope had been a distinguished scientist before being elected to the Papacy. For seven centuries the Popes selected as their physicians the greatest medical scientists of the {vi} time, and the list of Papal physicians is the worthiest series of names connected by any bond in the history of medicine, far surpassing in scientific import even the roll of the faculty of any medical school.

In a word, I failed to find any trace of Papal opposition to true science in any form. On the contrary, I found abundant evidence of their having been just as liberal and judicious patrons of science as they were of art and education in all forms. I found also that those who write most emphatically about Papal opposition to science, know nothing at all of the history of science, and above all of medicine and of surgery, during three very precious centuries. Because they know nothing about it they think there was none, and go out of their way to find a reason for its absence, while all the time there is a wondrous series of chapters of science for those who care to look for them. This is the story that I have tried to tell in this book.

This material is, I think, gathered into compact form for the first time. No one knows better than I do how many defects are probably in the volume. What I have tried to do is to present a large subject in a popular way, and at the same time with such references to readily available authorities as would make the collection of further information comparatively easy. I am sorry that the book has had to take on a controversial tone. No one feels more than I do that controversy seldom advances truth. There are certain false notions, however, which have the prestige of prominent names behind them, which simply must be flatly contradicted. I did not seek the controversy, for when I began to publish the original documents in the subject I mentioned no names. Controversy was forced on me, but not until I had made it a point to meet and spend many pleasant hours with the writer whose statements I must impugn, because they so flagrantly contradict the simple facts of medical history.

# INTRODUCTION

When, some years ago, the announcement of the prospective opening of the medical school at Fordham University, New York City, was made, the preliminary faculty were rather astonished to find that a number of intelligent physicians expressed surprise that there should be any question of the establishment of a medical school in connection with a Catholic institution of learning, since, as they understood, the Church forbade the practice of dissection, and in general was distinctly unfavorable to the development of medical science. Most of us had already known of the false persuasion existing in some minds, that by a Papal decree the practice of dissection had been forbidden during the Middle Ages, but it was hard to understand how men should think, in this day of general information, that Catholics were not free to pursue the study of any true science, and above all medical science, without let or hindrance from ecclesiastical authorities. In a word, though we live in what we are pleased to call an enlightened age with the schoolmaster abroad in the land, as is so proudly proclaimed, we encountered the most childish simplicity of belief in a number of old-time prejudices as to the position of the Church with regard to the study of science.

We found such a curious state of positive ignorance and such an erroneous, pretentious knowledge with regard to the supposed attitude of the Church to medicine especially, that we realized that the first thing that the new medical department would have to do would be to set about correcting authoritatively the false notions which existed with regard to the Popes and medical science. Most of the misinformation in this matter in American minds, we soon found, had its origin in Dr. Andrew D. White's volumes, "On the History of the Warfare of Science with Theology in Christendom." It is impossible for anyone to read Dr. White's chapter on from Miracles to Medicine in this work without coming to the conclusion that the constant policy of the Church for all the centuries down practically to our own time was to prevent the progress of medicine as far as possible. The reason for this policy, presumably, must be taken to be that it was to the interest of the ecclesiastics to have people apply to them for healing. Sufferers were to look to miracles rather than to drugs for their relief from ailments of any and every kind. Prayers were to be considered as much more efficacious than powders, and Masses much more likely to do good than the most careful nursing. These ecclesiastical offices had to be paid for. Accordingly, people had to be discouraged from applying to physicians, medical schools were kept under an ecclesiastical ban, "dissection was prohibited," anatomy declared "a sin against the Holy Ghost," "chemistry forbidden under the severest penalties," "the medieval miracles of healing checked medical science," "the practice of surgery was relegated mainly to the lowest orders of practitioners and confined strictly to them," "as the grasp of theology upon education tightened, medicine declined," and every possible means was employed to keep the popular mind in subjection to the clergy, and to prevent physicians from getting so much knowledge as would enable them to help free the people from the bondage of superstition, of which they were the victims and the slaves.

We do not think that we exaggerate the impression likely to be obtained from Dr. White's book in stating the ordinarily accepted opinions thus baldly, and as a matter of fact, as the quotation marks are intended to show, most of the strongest phrases that we have used are Dr. White's own. For those who can take such statements in good faith, it must be a very genuine surprise to learn a few facts from the history of medicine in the Middle Ages. Before the beginning of the sixteenth century, that is, before the religious revolt in Germany, which has been dignified by the name of reformation, altogether some twenty medical schools were founded in various parts of Europe. Of these, the best known in the order of their foundation were Salerno, Bologna, Naples, Montpelier, Paris, Padua and Pisa. Excellent schools, however, were established also at Oxford, Rome, Salamanca, Orleans and Coimbra. Even early in the fourteenth century such unimportant towns as Perugia, Cahors and Lerida had medical schools. These schools were usually established in connection with the universities. It

was realized that this would make the teaching of medicine more serious and keep the practical side of medicine from obscuring too much the scientific and cultural aspects of the medical training. In modern times in America we made the mistake of having our medical schools independent of universities, but with the advance in education and culture we have come to imitate the custom of the thirteenth and the fourteenth century in this regard.

The universities, as is well known, were the outgrowth of cathedral schools. Practically all those in authority in them, by far the greater number of teachers and most of the pupils, were of the clerical order, that is, had assumed some ecclesiastical obligations and were considered to be churchmen. At these universities, if we can trust the example of England as applicable to the Continent also, there were, according to trustworthy, conservative statistics, more students in attendance in proportion to the population than there has been at any period since, or than there are even at the present time in the twentieth century in any country of the civilized world. From this we can readily appreciate the enthusiastic ardor of those seeking education. Of these large numbers, the medical schools had their due proportion. [Footnote 1]

> [Footnote 1: This subject of the attendance at the universities of the Middle Ages is discussed, and authorities quoted, in my book "The Thirteenth, Greatest of Centuries," published by the Catholic Summer School Press, N. Y.]

Of course it will be said at once that though there were medical schools and medical professors and students, what was taught and studied at this time was so far distant from anything like practical knowledge of medicine, that it does not tell against the argument that medical education was practically non-existent. Some people will perhaps harbor the thought, if they do not frankly express it, that very probably these schools were organized under ecclesiastical authority, only in order to enable the Church and the clergy to maintain their control of medical education and keep the people from knowledge that might prove dangerous to Church authority. They were thus able to satisfy some of men's cravings for information in these matters, and yet prevent them from making such advances as would endanger the Church's policy of having them apply for prayers and Masses rather than for more physical remedies, except possibly for certain minor ailments. We do not doubt that there are many educated people who would be quite satisfied to accept this as a complete explanation of the situation in medical education at the medieval universities. Those who have read Dr. White's "History of the Warfare of Theology with Science" and have placed any faith in his really amusing excursions into a realm of which apparently he knows nothing– the history of medicine–must believe something like this. For them a little glance at even a few of the realities of medical teaching in the thirteenth century will show at once what a castle of the imagination they have been living in.

Only those who are thoroughly and completely ignorant of the real status of medical teaching in the thirteenth and fourteenth centuries continue to hold these absurd opinions as to the nullity of medieval medicine and surgery. The reading of a single short recent contribution to medical history, the address of Professor Clifford Allbutt, Regius Professor of Physic at the University of Cambridge, England, before the Congress of Arts and Sciences at the Exposition held in St. Louis in 1904, "On the Historical Relations of Medicine and Surgery down to the Sixteenth Century," would suffice to eradicate completely such traditional errors. He pointed out some surprising anticipations of what is most modern in medicine and surgery in the teachings of William of Salicet and his pupil Lanfranc, Professors of Medicine and Surgery in the Italian Universities and in Paris during the thirteenth century. As these two professors were the most distinguished teachers of surgery of the period and the acknowledged leaders of thought in their time, their teaching may fairly be taken as representative of the curricula of medieval medical schools. William of Salicet, according to Professor Allbutt, taught that dropsy was due to a hardening of the kidneys; ***durities renum*** are his exact words. He insisted on the danger of wounds of the neck. He taught the suture of divided nerves and gave explicit directions how to find the severed ends. He made a special study of suppurative disease of the hip and

taught many practical things with regard to it. He taught, though this is a bit of knowledge supposed to come three centuries later into medicine and history, the true origin of chancre and phagedena. Most surprising of all, however, remains. William substituted the use of the knife for the abuse of the cautery, which had been introduced by the Arabs because they feared hemorrhage, and he insisted that hemorrhage could be controlled by proper means without searing the tissues, and that the wounds made by the knife healed ever so much more kindly and with less danger to the patient. In the matter of wound healing, he investigated the causes of the failure of healing by first intention, and expressed on this subject some marvelous ideas that are supposed to be of late nineteenth century origin.

While it is usually said that whatever teaching of science was done at medieval universities, was so entirely speculative or purely theoretic and so thoroughly impractical as not to be of any serious use for life and its problems, the utter falsity of such declarations can be seen from the fact that William of Salicet insisted on teaching medicine by clinical methods, always discussed cases with his students, and his medical and surgical works contain many case histories. This is just what pretentiously ignorant historians of medical education have often emphatically declared that medieval teachers did not do, but should have done, in the Middle Ages. It is not surprising then to find that William himself, and his great pupil Lanfranc, insisted on the utter inadvisability of separating medicine and surgery in such a way that the physician would not have the opportunity to be present at operations, and thus gain more definite knowledge about the actual conditions of various organs which he had tried to investigate from the surface of the body. It is a very curious coincidence that both the Regius Professors of Physic in England at the present time, our own Professor Osler, now at Oxford, as well as his colleague, Professor Allbutt, of Cambridge, have within the last five years emphasized this same idea in almost the very words which were used by William and Lanfranc nearly seven hundred years ago. Lanfranc went even beyond his master in practical applications of important scientific principles to medicine and surgery. He added to the means of controlling hemorrhage. In arterial hemorrhage he suggested digital compression for an hour, or in severe cases ligature. His master had studied wounds of the neck. Lanfranc has a magnificent chapter on injuries of the head, which Professor Allbutt does not hesitate to call one of the classics of surgery. Lanfranc was thoroughly appreciated by his contemporaries. After years of study and teaching in Italy he was invited to Paris, where he became one of the lights of that great university. Both Salicet and Lanfranc did their wonderful work in scientific medicine down in Italy where ecclesiastical influence was strongest. Italy continued to be for the next six centuries always the home of the best medical schools in the world, to which the most ardent students from all over the continent and even England went for the sake of the magnificent opportunities provided. It was literally true, in spite of the tradition of Church opposition to medical science, that the nearer to Rome the university the better its medical school; and as we shall see, Rome itself had the best medical school in the world for two centuries, while its greatest rival, often ahead of it in scientific achievement, always its peer, was the medical school of Bologna in the Papal States, directly under the control of the Popes since the beginning of the sixteenth century.

Dr. White has said just the opposite of this in a well-known passage of his book, in which he assures his readers that "in proportion as the grasp of theology upon education tightened, medicine declined; and in proportion as that grasp relaxed, medicine has been developed." The reason for such a statement is that he knew nothing about the history of medicine and surgery in these medieval centuries and thought there was none. This is a characteristic example of his mode of writing the History of the (Supposed) Warfare of Theology with Science in Christendom. This much will give some idea of the value of his book as a work of reference.

After knowing something of these wonderful developments of medieval medical science, it is to be hoped that no one will listen hereafter to the ignorant assertions of those who talk of the suppression of medical knowledge at this time. ***William of Salicet and Lanfranc were both of them clerics,*** that is, they belonged to the ecclesiastical body and had taken minor orders, though they were not priests, as priests were for obvious reasons not allowed to do surgical operations, it being

as repugnant to human feelings in the Middle Ages as it is now, that the messenger of Divine Mercy should handle the knife and spill blood, or that the pastor of souls should come straight from the operating room to bring consolation to the afflicted and the dying.

Much more might be said about the wonderful medical teaching of the thirteenth century. The men who made the universities what they have continued to be down to the present time, had open minds for any great advances that might come. Accordingly, when the histories of anesthesia tell us that there was a form of anesthesia introduced during the thirteenth century by Ugo da Lucca, and that even some method of inhalation was employed for this purpose, it will be a surprise only to those who have never properly realized all that our educational forefathers of the early university days succeeded in accomplishing.

Down at Montpelier, Gilbert the Englishman taught that small-pox patients should be treated in rooms with red hangings, red curtains being especially advised for the doors and windows. This is what Finsen re-discovered in the nineteenth century, and for it was given the Nobel prize in the twentieth century. He found that small-pox patients suffered much less, that their fever was shorter, and that the after effects were much less marked when only red light was admitted to them. One may well ask what drugs did they employ, and perhaps conclude that because they knew very little of drugs, therefore they knew little of medicine. It is in the use of drugs, however, that medicine has always been at its weakest, and we scarcely need Oliver Wendel Holmes's declaration, that if all the drugs men used up to his time had been thrown into the sea, they would be better rather than worse off for it; nor Professor Osier's many emphatic protests with regard to our ignorance of drugs, to make the world of the present day realize that a generation's use of them as a test would tell quite as severely against the eighteenth or the nineteenth century, as against the thirteenth or the fourteenth. They did use opium, however, the drug having been introduced into general practice, it is said, by a distinguished Papal physician, Simon Januensis. Mandrake was employed, and has not as yet gone entirely out of use. Various herbal decoctions were employed, and though these were used entirely on empiric grounds, some at least of them have continued in use with no better reason for their employment during most of the centuries since.

The relation of the Popes to these advances in medicine may be best appreciated from the interest which they took in the hospitals. It was only in hospitals that cases could be properly studied, and the medieval hospitals were conducted with very nearly the same relations to the universities of that time as those that exist at the present day. In the chapter on the Foundation of City Hospitals we show that these institutions are all, as Virchow, who is surely an authority above suspicion in any matter relating to the Popes has declared, due to one great Pope. This is the best possible demonstration of supreme humanitarian interest in human ills, and their treatment. Innocent III., as we shall see, at the beginning of the thirteenth century summoned Guy from Montpelier, where he had been trained in the care of patients, and where the greatest medical school of the time existed, to come to Rome and organize the Hospital of the Holy Ghost in the Papal City, which was to be a model for hospitals of the same kind in every diocese throughout the Christian world. Literally hundreds of these hospitals were founded during the thirteenth century as the result of this initiative. Patients were not left to die, with only the hope of prayers to relieve their sufferings, but they were cared for as skilfully as the rising science of the time knew how and with the tenderness that religious care has always been able to give. For added consolation in the midst of their sufferings and as a fortifier against the thought of death, they had religion and all its beautiful influences, for which even Virchow, himself utterly unbelieving, cannot suppress a tribute.

At the beginning of the fourteenth century, the University of the City of Rome was founded by Pope Boniface VIII. Only a year or two later the Popes removed their capital to Avignon. It has often been thought that, because of this removal of the Papal capital, this University of the City never came into existence; but we have definite records of salaries paid out of the Papal revenues to professors of law and medicine about the end of the first quarter of the fourteenth century.

Down in the South of France, at Avignon itself, the Popes had for one of their chamberlains the famous Guy de Chauliac, who is always spoken of as the Father of Modern Surgery. One of the Popes of the Avignon period founded the College of Twelve Physicians at Montpelier, the foundation being sufficient to support twelve medical students, and by adding the prestige of the Pope's patronage to the reputation of the University, greatly encouraged attendance at it.

Another of the Popes of the Avignon period, Pope John XXII., who is said by President White to have been most bitter in opposition to every form of science, actually helped in the foundation of two medical schools. One of these was at Cahors, his birthplace, and the other was at Perugia, at that time in the Papal States. In founding the medical school at Perugia, Pope John insisted that its standards must be as high as those of Paris and Bologna, and required that the first teachers there should be graduates from Paris or Bologna, where were the two greatest medical schools of the time. Seven years of study, three in the undergraduate department and four in the graduate schools, were to be required, according to this bull of foundation (given in full in the appendix), before the degree of Doctor of Medicine could be conferred. If it is recalled that this standard of three years of undergraduate work and four in the graduate school, or at least of seven years of University work, is the ideal toward which our universities are struggling, and, it must be said, not with the entire success we would like, at the beginning of the twentieth century, then, it is surprising to think that the president of a modern university, deeply interested in education in all its features and himself a professor of history, should know so little of, and be so lacking in sympathy with these men who laid the deep foundations of our modern education.

Perhaps the most striking feature of the relation of the Popes to medicine remains to be mentioned. If they really were the bitter opponents of things medical that Dr. White would have us believe, then we should expect that either there were no such officials as Papal physicians, or else that the men who occupied these posts were the veriest charlatans, who knew very little of medicine, and certainly did nothing to develop the science. As a matter of fact, there is no list of physicians connected by any common bond in history who are so gloriously representative of scientific progress in medicine as the Papal physicians. The faculty of no medical school presents such a list of great names as those of the men who were chosen to be the official medical attendants of the Popes, and who were thus given a position of prominence where their discoveries in medicine had a vogue they otherwise could not have attained. The list of the Royal physicians of any reigning house of Europe for the last seven centuries looks trivial beside the roll of Papal physicians. Could the Popes possibly have done anything more than this for medicine, or shown their interest in its progress, or made people realize better, that while prayer might be of service, every possible human means must be taken to secure, maintain and recover health.

To read even the headings of Dr. White's chapter on from Miracles to Medicine, in which he tells of how "the medieval miracles of healing checked medical science," how "pastoral medicine held back scientific effort," how "there was so much theological discouragement of medicine," and finally, how "the study of Anatomy was considered a sin against the Holy Ghost," in the light of this plain, matter-of-fact story of the wonderful development of medical science in the ecclesiastically founded and ruled universities of the thirteenth century, makes one realize into what a farcical state of mind as regards the realities of history such writers have forced themselves, and unfortunately have led many readers, by their excursions into the history of medicine and science. Probably there was never a more pretentious exhibition of ignorance of the facts of history than is displayed by these expressions and by the whole drift of this chapter. Dr. White would have us believe that the thirteenth and fourteenth centuries were so backward in medicine and surgery that they practically have no history in these departments, or so little as not to be worth talking about. The simple facts show us that this is one of three or four great periods in human history in which there was the most wonderful development of medicine and surgery.

As we shall see in the course of this book, there was no bull or any other document issued by the Popes forbidding dissection or hampering the development of anatomy in any way. As a matter of fact, the ecclesiastics, instead of being behind their age in liberality of spirit with regard to the use of the human body after death for anatomical purposes, were always ahead of it. There has always existed a popular horror of dissection, and this has manifested itself from the earliest times in history down to and within the last half century, in refusal to enact such secular legislation as would properly provide for the practice of dissection. This was as true in the United States until within the memory of men still alive as it had always been hitherto in European history. Dissection came to be allowed so freely in the medieval universities founded under ecclesiastical influence and ruled by ecclesiastics, as the result of the intelligent realization on the part of churchmen that the study of the human body was necessary for a proper recognition and appreciation of the causes of the ills to which flesh is heir. They realized that the only way to lay the foundation of exact medical knowledge was not only to permit, but to encourage the practice of dissection, and accordingly this was done at everyone of a dozen medical schools of Italy during the fourteenth, fifteenth and sixteenth centuries, and nowhere more so than at the Papal University at Rome itself during the sixteenth century, at a time when, if we would believe Dr. White, the Church authorities were doing everything in their power to prevent dissection.

None of the other sciences allied to medicine were hampered in any way, but, on the contrary, fostered and encouraged; and the devoted students of science were prominent churchmen, some of whom were honored with the title of saint after their deaths. In spite of declarations to the contrary, chemistry was not forbidden by a Papal decree or other document, though the practice of certain alchemists of pretending to make gold and silver out of baser metals and thus cheating people was condemned, just as we condemn the corresponding practice of selling "gold bricks" at the present time. As will be made very clear, the Pope who issued the decree that forbids such sharp practices was a distinguished and discriminating patron of medical education at the beginning of the fourteenth century, doing more for it than any ruler for three centuries after his time; yet in doing so he was only carrying out the policy which had been maintained by the Popes before his time and was to continue ever afterwards.

Strange as it may appear when we recall how much has been said with regard to Papal, and Church, and theological opposition to science, the story that we have just told with regard to the Papal relations to medicine and medical schools must be retold with regard to science in every department, and the scientific studies at the great medieval universities. Most people will find it even more difficult to accept this than to reach a calm consideration of the Papal relations to the medical sciences. Medicine is supposed to be the sort of practical subject that, in spite of prejudice, the ecclesiastical authorities could not neglect and were not able to suppress. Science in general, however, is supposed to be so distinctly opposed to what was at least considered religious truth, that the Church could not very well do anything else than prevent its development, or at least hamper its progress to such an extent that it was only with the lifting of the ecclesiastical incubus in our own day, that any great scientific advances came in the physical sciences. This is an entirely false impression emphasized by the ridiculous intolerance of writers who knew practically nothing of the real history of science in the Middle Ages, wrote their own prejudices large into the story of the times, and did great positive harm to the cause of truth by a pretense of knowledge they did not have, but which so many confidingly believed them to possess.

But it will at once be said, what of Galileo? Does not his case show the anti-scientific temper of churchmen? Nearly half a century ago, Cardinal Newman in his Apologia characteristically observed that this very case sufficed to prove that the Church did not set herself against scientific progress, for this is the "one stock argument" to the contrary, "the exception which proves the rule." Commenting upon the Galileo incident, Professor Augustus de Morgan, in his article on the Motion of the Earth

in the English Encyclopedia, has expressed exactly the same conclusion. He is an authority not likely to be suspected of Catholic sympathy. He says:

> "The Papal power must upon the whole have been moderately used in matters of philosophy, if we may judge by the great stress laid on this one case of Galileo. It is the standing proof that an authority which has lasted a thousand years was all the time occupied in checking the progress of thought(!) There are certainly one or two other instances, but those who make most of the outcry do not know them."

There is no doubt that Galileo was prosecuted by the Roman inquisition on account of his astronomical teachings. We would be the last to deny that this was a deplorable mistake made by persons in ecclesiastical authority, who endeavored to make a Church tribunal the judge of scientific truth, a function altogether alien to its character which it was not competent to exercise. The fact that this was practically the only time that this was done serves to show that it was an unfortunate incident, but not a policy. The mistake has been to conclude that this was a typical case–one of many, more flagrant than the others. This single incident has indeed made it impossible that anything of the same kind should ever occur again. It was rather because of the way in which Galileo urged his truths than because of the truths themselves that he was condemned. Even Professor Huxley, in a letter to Professor St. George Mivart, November 12th, 1885, said: "I gave some attention to the case of Galileo when I was in Italy, and I arrived at the conclusion that the Pope and the College of Cardinals had rather the best of it."

Before as well as after Galileo's time scientific research was carried on ardently in the universities, especially in Italy. In the chapter on Science at the Medieval Universities, we call attention to the many advances then made with regard to scientific questions in which the world is very much interested at the present time. A hundred years before Galileo's time Copernicus went down to Italy to study astronomy and medicine, and when his book was published it was dedicated to a Pope. Copernicus himself was a faithful churchman all his life, came near being made a bishop once, and kept the diocese in which he lived, and in which his personal friend was bishop, in the fold of the Church in spite of Luther and the religious revolt all around it in Germany. One of the great scientists of the seventeenth century whose name is stamped deeply on the history of science, Father Kircher, the Jesuit, was invited to Rome the very year after Galileo's condemnation, and for thirty years continued to ***experiment*** and write in all branches of science, not only with the approbation of his own order, the Jesuits, which helped him in every way by the collection of specimens for his museum, but also with the hearty good will of many cardinals who were his personal friends, and with the constant patronage of the Popes, whose generous liberality enabled him to make Rome the greatest centre of scientific interest during this century.

At this time and during the preceding century the Roman University had the greatest medical school in the world. The names of its professors during the preceding century need only be mentioned in order to emphasize this. They include such distinguished men as Eustachius and Varolius, whose names are forever enshrined in the history of anatomy; Columbus, who discovered and described the lesser or pulmonary circulation half a century before Harvey's publication with regard to the general circulation; Caesalpinus, to whom the Italians attribute the discovery of the greater circulation before Harvey. In the next century Malpighi was tempted to come to Rome to teach at the Papal University, and the great Father of Comparative Anatomy ended his days in the Papal capital, amidst the friendship of all the high ecclesiastics and with the social intimacy of the Pope. From the beginning of the sixteenth century Bologna is a Papal city, but its medical school, far from declining after it came under Papal jurisdiction, was even more brilliant than before, and soon came even to outshine its previously successful rival, Padua.

What we would say then, is that the story of the supposed opposition of the Church and the Popes and the ecclesiastical authorities to science in any of its branches, is founded entirely

on mistaken notions. Most of it is quite imaginary. Much of it is due to the exaggeration of the significance of the Galileo incident. Only those who know nothing about the history of medicine and of science continue to harbor it. That Dr. White's book, contradicted as it is so directly by all our serious histories of medicine and of science, should have been read by so many thousands in this country, and should have been taken seriously by educated men, physicians, teachers, and even professors of science who want to know the history of their own sciences, only shows how easily even supposedly educated men may be led to follow their prejudices rather than their mental faculties, and emphasizes the fact that the tradition that there is no good that can possibly come out of the Nazareth of the times before the reformation, still dominates the intellects of many educated people who think that they are far from prejudice and have minds perfectly open to conviction.

We would not leave the impression, moreover, that it was in medicine alone that the misunderstood Middle Ages made distinct progress in science. This is true in every department of what we now call natural science. The reason for the false impression that science was not studied in the Middle Ages at the universities, is that the supposed historians of education and of science who have made such declarations have never taken the trouble to look into the works of the great writers of this period. Anyone who does so, at once changes his opinion in this matter. Humboldt, for instance, the great German natural philosopher, has given ample credit to these colleagues of his, who lived some six centuries before him, yet did such wonderful work in spite of their inadequate means and the fact that they were as yet only groping in the darkness of the beginnings of science. Whewell, the English historian of the inductive sciences, has also proved sympathetic to these old philosophers, and especially to Albertus Magnus and Roger Bacon. Those who so ignorantly but with a pretense of knowledge make little of the science of the Middle Ages, know nothing of the real accomplishments of such men as Bacon, Albertus Magnus, Thomas Aquinas, Arnold of Villanova, nor Vincent of Beauvais, the encyclopedist. As is always the case, however, the ignorance of supposed historians of science and education in this matter, has only served to emphasize the presumptuous assurance of their declarations as to the intolerance of the Middle Ages toward scientific progress. It is ever the ignorant man who has the least doubt about his opinions.

Unfortunately many students of science followed these writers apparently without a hint of the deception that was being practiced on them. Not infrequently the prestige or institutional position of the writers has been enough to carry their works into a vogue which has been heightened by the existence of religious prejudice and intolerance. Usually such motives are supposed to be far distant from the scientific mind. In this case they have been, to some degree at least, unconsciously present. There has unfortunately been a definite persuasion that there could be nothing good in the Middle Ages, and therefore there has been no surprise that evil should be found there. Perhaps there is nothing sadder in present day education, than the fact that serious students and professors of science should thus have been led astray. Nothing shows more clearly the superficiality of our education than the fact that these unfounded statements with regard to the greatest period of education in history have been so universally accepted with so little question.

A moment's consideration of the conditions in which the universities developed will show how unreasonable is the thought that the Church or the Popes were opposed to any phase of education.

It has come to be universally conceded in recent years that the Church was the great patron of art and of letters during these centuries. Without the inspiration of her teachings there would have been no sublime subjects for artists; without the lives of her saints there would have been much less opportunity for artistic expression; without the patronage of the cathedral builders, the high ecclesiastics, and above all the monastic orders, on whom, with so little reason, so much contempt has been heaped, there would have been none of that great art which developed during the centuries before what is called the Renaissance. In literature, everyone of the great national poems that lie at the basis of modern literature is shot through and through with sublime thoughts that owe their origin to the Church. We need only mention the Cid in Spain, the Arthur Legends in England, such works

of the Meistersingers as Perceval and Arme Heinrich, the Golden Legend, the Romance of the Rose, and Dante,–all written during the thirteenth century alone, to illustrate Church influence in literature. This is, as we have said, admitted by all. It is supposed, however, that while the Church encouraged this side of human development, it effectually prevented the evolution of man's scientific interests.

As a matter of fact, however, the Church did quite as much for science as for literature and art and charity, There has never been any question that under her fostering care philosophy developed in a very marvelous way. The scholastic philosophers are no longer held in the disrepute so ignorantly accorded them in the last century. It is recognized that scholastic philosophy represents a supremely great development of human thinking with regard to the relations of man to his Creator, to his fellow man, and to the universe. Even those who do not accept its conclusions now, if themselves educated men, no longer make little of those wonderful thinkers, but sympathize with their magnificent work. Only those who are ignorant of scholastic philosophy entirely, still continue to re-echo the expressions of critics whose opinions were founded on second-hand authorities and who confessedly had been unable to make anything out of the scholastics themselves. This field of philosophy was the real danger point for faith and the Church, yet its study was encouraged in every way, provided the philosophers kept within the bounds of their subject.

Just exactly the same thing was true in the realm of natural science. Strange as it may seem to those who have allowed themselves to be led into thinking that only for the last century or a little more have men made observations on nature, and only comparatively recently have the conclusions which they reached with regard to natural phenomena been of any real significance, there is no doubt at all that men made great achievements in physical science in the Middle Ages, some of which unfortunately were lost sight of later, but many of which remained to form the basis on which our modern scientific knowledge has been built. In order to obtain a proper appreciation of this, all that is necessary is to study the works of the investigating scholars of the early history of the universities, and see how much that is considered very modern they anticipated in their writings. They must be read for themselves, not be judged by excerpts chosen by prejudiced readers, much less by critics who were bent on not finding anything good in the Middle Ages. There is need of sympathetic interpretation to replace the ignorant contempt which has so far dominated this period of the history of education. The precious lesson that men may learn from the unfortunate misunderstanding, however, is how much old-time prejudice still dominates the attitude even of scholars–nay, even of scientists and educators, with regard to certain periods in history.

To most people it will be utterly uncomprehensible, however, that after all that they have heard about Church opposition to science and Papal discouragement of education as dangerous to faith, there should now be an absolute denial of the supposed grounds for the assertions in this matter. Most readers, even among educated people, will be very prone to think that their impressions in these matters cannot be entirely wrong, and that previous writers on the subject cannot have been either deceiving or deceived. In all that relates to the Roman Catholic Church, however, before the date of the so-called reformation, it is important to remember that there came into existence a definite body of Protestant tradition, the creation of the reformers who wished to blacken the memory of the Old Church as much as possible to justify their own apostasy, and who therefore spared no means to pervert the facts of history or to exaggerate the significance of historical details so as to produce this false impression. Subsequent generations were oftener deceived themselves than deceiving. They were sure that the Church was opposed to education and to science, and consequently it was not hard for them to read in certain incidents and documents a meaning quite other than their actual significance, because this added meaning agreed with their prejudices on these subjects.

Every advance in modern history, every modification of view that has been brought about by the critical historical method of recent times, has emphasized this point of view almost without exception. The distinguished philosophic and historical writer, the Comte de Maistre, in his Soirées of St. Petersburg about a century ago, declared that "History for the last three centuries (1500-1800)

has been a conspiracy against the truth." Just about a century later the editors of the Cambridge Modern History, in the preface to the first volume of their monumental work, re-echoed the words of the Comte de Maistre almost literally in a pregnant paragraph which deserves to be in the note-book of everyone who is trying to get at the real truth of history. They said:

> "Great additions have of late been made to our knowledge of the past; ***the long conspiracy against the revelation of truth has gradually given way,*** and competing historians all over the civilized world have been zealous to take advantage of the change. The printing of archives has kept pace with the admission of enquirers; and the total mass of new matter, which the last half-century has accumulated, amounts to many thousands of volumes. In view of changes and of gains such as these, it has become impossible for the historical writer of the present age to trust without reserve even to the most respected secondary authorities. The honest student finds himself continually deserted, retarded, ***misled by the classics of historical literature***, and has to hew his own way through multitudinous transactions, periodicals and official publications in order to reach the truth.
>
> "Ultimate history cannot be obtained in this generation; ***but, so far as documentary evidence is at command, conventional history can be discarded, and the point can be shown that has been reached on the road from one to the other.***"

The italics in this passage are ours, but the ideas they emphasize will serve to show how necessary it is for most of us to give up the supposed historical truth of the preceding generations and have an open mind for the newer ideas that are coming in as the result of the renewed consultation of original documents and primal sources of information. The present volume is written entirely with the idea of bringing out the facts of the relations of the Popes and the Church and the ecclesiastics, especially of the centuries before the reformation, to science and to scientific education. My own position as a professor of the history of medicine has necessarily made medical science very prominent in the book. This, however, far from being a disadvantage, is really an advantage, since the physical sciences of the medieval times gathered mainly around medicine, and it was chiefly physicians and medical students who devoted most time to them. After a detailed study of the history of medical science in the Middle Ages as well of its allied sciences, it becomes very clear that there was no trace of Papal or Church opposition to science as science, and, on the contrary, liberal patronage, abundant encouragement, and even pecuniary aid for the development of scientific education in every way.

What we have tried to give in this book, then, is the authoritative refutation of the supposed prohibition of the cultivation of certain departments of medical and allied sciences by the Popes, and sufficient information to enable students and teachers of science to realize that the ordinarily accepted notions with regard to opposition to science in the Middle Ages are founded on nothing more substantial than sublime ignorance of the facts of the history of science at that time. There was no bull against anatomy or dissection; no bull against chemistry; the Popes were the patrons of the great medical scientists and surgeons; the Papal Medical School was one of the best in the world and was sedulously fostered; the great scientists of the Middle Ages were clergymen, and many of them when they died were declared saints by the Church. The opposite impression is entirely a deduction from false premises with regard to the supposed attitude of the Church and churchmen. We shall furnish abundant authorities of the first rank and of value as absolute as there can be in present day history as to these questions. The consultation of these will furnish further material for those who desire to have real knowledge of the history of science in a magnificently original and greatly fruitful period.

# THE SUPPOSED PAPAL PROHIBITION OF DISSECTION

There is a very general impression that the Roman Catholic Church was, during the Middle Ages, opposed to the practice of dissection, and that various ecclesiastical regulations and even Papal decrees were issued which prohibited, or at least limited to a very great degree, this necessary adjunct of medical teaching. These ecclesiastical censures are supposed to be in force, to some extent at least, even at the present time. The persuasion as to the minatory attitude of the Church in regard to dissection is so widespread among even supposedly well-educated professional men, that, as we have said in the introductory chapter, when there was question some time ago of opening a medical school in New York City under Catholic auspices as a department of Fordham University, a number of more than ordinarily intelligent physicians asked: What would be done about the study of anatomy, since in the circumstances suggested dissection would not be allowed? This false impression has been produced by writers in the history of science who have emphasized very strenuously the supposed opposition of the Church to science, and as these writers had a certain prestige as scholars their works have been widely read and their assertions have been unquestioned, because it would naturally be presumed that they would not make them without thorough investigation of such important questions. Professional men are not to blame if they have taken such statements seriously, even though they are absolutely without foundation. That statements of this kind should have been made by men of distinction in educational circles and should have passed current so long, is only additional evidence of an intolerant spirit in those who least suspect it in themselves and are most ready to deprecate intolerance in others.

Take a single example. Most of what is said as to the opposition of the Church to medicine during the Middle Ages in A History of the Warfare of Science with Theology in Christendom, by Andrew D. White (Appleton's, New York), is founded on a supposed Papal prohibition of anatomy and on a subsequent equally supposed Papal prohibition of chemistry. These two documents are emphasized so much, that most readers cannot but conclude that, even without further evidence, these are quite enough to prove the contention with regard to the unfortunate opposition of the Church to medical science. Without these two presumably solid pillars of actual Papal documents, what is said with regard to the Church and its relations to medical science in the Middle Ages amounts to very little. Much is made of the existence of superstitions in medicine as characteristic of the Middle Ages and as encouraged by clergymen, but medical superstitions of many kinds continue to have their hold on even the intelligent classes down to the present day in spite of the progress of education, and in countries where the Church has very little influence over the people. Dr. White quotes with great confidence and absolute assurance a Papal decree issued in the year 1300 by Pope Boniface VIII., which forbade the mutilation of the human body and consequently hampered all possibility of progress in anatomy for several important centuries in the history of modern science. Indeed, this supposed Papal prohibition of dissection is definitely stated to have precluded all opportunity for the proper acquisition of anatomical knowledge until the first half of the sixteenth century, when the Golden Age of modern anatomy set in. This date being coincident with the spread of the movement known as the Protestant Reformation, many people at once conclude that somehow the liberality of spirit that then came into the world, and is supposed at least to have put an end to all intolerance, must have been the active factor in this development of anatomy, and that, as Dr. White has indeed declared, it was only because the Church was forced from her position of opposition that anatomical investigation was allowed.

Since so serious an accusation is founded on a definite Papal document, it cannot but be a matter of surprise that those who have cited it so confidently as forbidding anatomy, and especially

dissection, have never given the full text of the document. It is practically impossible for the ordinary reader, or even for the serious student of the history of medicine, to obtain a copy of this decree unless he has special library facilities at his command and the help of those who are familiar with this class of documents. Many references have been made to this prohibition by Pope Boniface VIII., but no one has thought it worth while to give, even in a footnote, the text of it. The reason for this is easy to understand as soon as one reads the actual text. It has nothing to say at all with regard to dissection. It has absolutely no reference to the cutting up of the human body for teaching purposes. Its purpose is very plain, and is stated so that there can be no possible misapprehension of its meaning. Here we have an excellent illustration of what the editors of the Cambridge Modern History declared to be the breaking up of the long conspiracy against the truth by the consultation of original documents.

Through the kindness of the Rev. D. A. Corbett, of the Seminary of St. Charles Borromeo, Overbrook, Pa., I have been able to secure a copy of Pope Boniface's decree, and this at once disposes of the assertion that dissection was forbidden or anatomy in any way hampered by it. Father Corbett writes:

> "The Bull De Sepulturis of Boniface VIII. is not found in the Collectio Bullarum of Coquelines, nor is it incorporated in the Liber Sextus Decretalium Divi Bonifacii Papae VIII., though it is from here that it is quoted in the Histoire Litteraire de la France (as referred to by President White). It appears in an appendix to this sixth book among the Extravagantes, a term that is used to signify that the documents contained under it were issued at a time somewhat apart from the period this special book of decretals was supposed to cover. The Liber Sextus was published in 1298. This 'Bull De Sepulturis' was not issued until 1300. It is to be found in the third book of the Extravagantes, Chapter I."

Even a glance at the title would seem to be sufficient to show that this document did not refer even distantly to dissection, and this makes it all the harder to understand the misapprehension that ensued in the matter, if the document was quoted in good faith, for usually the compression necessary in the title is the source of such errors. The full text of the bull only confirms the absolute absence of any suggestion of forbidding dissection or discouraging the study of anatomy.

> "Title–Concerning Burials.[Footnote 2] Boniface VIII. Persons cutting up the bodies of the dead, barbarously boiling them, in order that the bones, being separated from the flesh, may be carried for burial into their own countries, are by the very act excommunicated.
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> [Footnote 2: See Latin text in full in appendix.]
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> "As there exists a certain abuse, which is characterized by the most abominable savagery, but which nevertheless some of the faithful have stupidly adopted. We, prompted by motives of humanity, have decreed that all further mangling of the human body, the very mention of which fills the soul with horror, should be henceforth abolished.
>
> "The custom referred to is observed with regard to those who happen to be in any way distinguished by birth or position, who, when dying in foreign lands, have expressed a desire to be buried in their own country. The custom consists of disemboweling and dismembering the corpse, or chopping it into pieces and then boiling it so as to remove the flesh before sending the bones home to be buried–all from a distorted respect for the dead. Now, this is not only abominable in the sight of God, but extremely revolting under every human aspect. Wishing, therefore, as the duty of our office demands, to provide a remedy for this abuse, by which the custom,

which is such an abomination, so inhuman and so impious, may be eradicated and no longer be practiced by anyone, We, by our apostolic authority, decree and ordain that no matter of what position or family or dignity they may be, no matter in what cities or lands or places in which the worship of the Catholic faith flourishes, the practice of this or any similar abuse with regard to the bodies of the dead should cease forever, no longer be observed, and that the hands of the faithful should not be stained by such barbarities.

"And in order that the bodies of the dead should not be thus impiously and barbarously treated and then transported to the places in which, while alive, they had selected to be buried, let them be given sepulture for the time either in the city or the camp or in the place where they have died, or in some neighboring place, so that, when finally their bodies have been reduced to ashes or otherwise, they may be brought to the place where they wish to be buried and there be interred. And, if the executor or executrix of the aforesaid defunct, or those of his household, or anyone else of whatever order, condition, state or grade he may be, even if he should be clothed with episcopal dignity, should presume to attempt anything against the tenor of this our statute and ordination, by inhumanly and barbarously treating the bodies of the dead, as we have described, let him know that by the very fact he incurs the sentence of excommunication, from which he cannot obtain absolution (unless at the moment of death), except from the Holy See. And besides, the body that has been thus barbarously treated shall be left without Christian burial. Let no one, therefore, etc. (Here follows the usual formula of condemnation for the violation of the prescriptions of a decree.) Given at the Lateran Palace, on the twelfth of the calends of March, in the sixth year of our pontificate."

The reason for the bull is very well known. During the crusades, numbers of the nobility who died at a distance from their homes in infidel countries were prepared for transportation and burial in their own lands by dismemberment and boiling. The remains of Louis IX., of France, and a number of his relatives who perished on the ill-fated crusade in Egypt in 1270, are said to have been brought back to France in this fashion. The body of the famous German Emperor, Frederick Barbarossa, who was drowned in the river Saleph near Jerusalem, was also treated thus in order that the remains might be transported to Germany without serious decomposition being allowed to disturb the ceremonials of subsequent obsequies. Such examples were very likely to be imitated by many. The custom, as can be appreciated from these instances from different nations, was becoming so widespread as to constitute a serious source of danger to health, and might easily have furnished occasion for the conveyance of disease. It is almost needless to say to our generation that it was eminently unhygienic. Any modern authority in sanitation would at once declare against it, and the custom would be put an end to without more ado. There can be no doubt at all then that Pope Boniface VIII. accomplished good, not evil, by the publication of this bull. So anyone with modern views as to the danger of disease from the foolish custom which it abolished would at once have declared, and yet, by a perversion of its signification, it came to be connected with a supposed prohibition of dissection. For this misunderstanding Pope Boniface VIII. has had to suffer all sorts of reproaches and the Church has been branded as opposed to anatomy by historians(!)

Is it possible, however, that this bull was misinterpreted so as to forbid dissection, or at least certain forms of anatomical preparation which were useful for the study and teaching of anatomy? That is what Dr. White asserts. He shows, moreover, in his History of the Warfare of Science with Theology, that he knew that the document in question was perfectly inoffensive as regards any prohibition of dissection in itself, but insists that by a misinterpretation, easy to understand as he considers, because of the supposed opposition of ecclesiastics to medical science, it did actually prevent anatomical development. President White says: "As to the decretal of Pope Boniface VIII.,

the usual statement is that it forbade all dissections. While it was undoubtedly construed universally to prohibit dissection for anatomical purposes, its declared intent was as stated in the text; that it was constantly construed against anatomical investigations cannot for a moment be denied."

If a misinterpretation were subsequently made, surely Pope Boniface VIII. must not be held responsible for it; yet in spite of the fact that Dr. White shows that he knew very well that this bull did not forbid the practice of dissection, he does not hesitate to use over and over again expressions which would imply that some formal decision against dissection itself had been made, though this is the only Papal document he refers to. He even goes so far as to say that "anatomical investigation was made a sin against the Holy Ghost." He frequently repeats that for three centuries after the issuance of this bull the development of anatomy was delayed and hampered, and insists that only that Vesalius at great personal risk broke through this Church opposition, modern anatomy would never have developed. He proceeds constantly on the theory that it was always this bull that was in fault, though he confesses that if so, it was by a misunderstanding; and the only fault he can find to attribute to the Pope is a lack of infallibility, as he calls it, because he was not able to foresee that his bull would be so misunderstood.

I suppose we are to understand from this that Dr. White considers that he knows the meaning of the word infallibility. It is not a hard word to understand if one wishes to understand it. The meaning that he gives it in this passage is so entirely different from its accepted meaning among Catholics, that any schoolboy in any of our parochial schools would tell him that the word was never used by Catholics in the sense in which he here employs it. It is so misunderstood popularly outside of the Church, and this Dr. White doubtless knew very well. When a man uses a term in medicine in a different sense to that which is ordinarily accepted, we consider him ignorant; but when he deliberately uses it in another sense for his own purposes because of a false significance attached to it in the popular mind, we have a special name for him.

The whole matter, however, resolves itself into the simple question, "Was dissection prevented and anatomical investigation hampered after the issuance of the bull?" This is entirely a question of fact. The history of anatomy will show whether dissection ceased or not at this time. Now if those who so confidently make assertions in this matter had ever gone to a genuine history of anatomy, they would have learned at once that, far from this being the time when dissection ceased, the year 1300 is almost exactly the date for which we have the first definite evidence of the making of dissections and the gradual development of anatomical investigation by this means in connection with the Italian universities. This is such a curious coincidence that I always call it to the attention of medical students in lecturing on this subject.

The first dissection of which we have definite record, Roth tells us in his life of Vesalius, was a so-called private anatomy or dissection made for medico-legal purposes. Its date is the year 1302, within two years after the bull. A nobleman had died and there was a suspicion that he had been poisoned. The judge ordered that an autopsy be made in order to determine this question. Unfortunately we do not know what the decision of the doctors in the case was. We know only that the case was referred to them. Now it seems very clear that if this had not been a common practice before, the court would not have adopted this measure, apparently as a matter of judicial routine, as seems to have been the case in this instance. Had it been the first time that it was done instead of having the record of the transaction preserved only by chance, any mention of it at all would have appeared so striking to the narrator, that he would have been careful to tell the whole story, and especially the decision reached in the matter.

After this, evidence of dissection accumulates rapidly. During the second decade of the century Mondino, the first writer on anatomy, was working at Bologna. We have the records of his having made some dissections in connection with his university teaching there, and eventually he published a text-book on dissection which became the guide for dissectors for the next two centuries. Within five years after this we have a story of students being haled to court for body-snatching for anatomical

purposes, and about this time there was, according to Rashdall in his History of the Universities, a statute of the University of Bologna which required the teacher in anatomy to dissect a body, if the students brought it to him. More than ten years earlier than this, that is, within ten years after the supposed Papal prohibition, there are records of dissections having been made at Venice in public, for the benefit of the doctors of the city, at the expense of the municipal treasury. During the first half of this century money was allowed at Bologna for wine, to be given to those who attended the public dissections, and if we recall the state in which the bodies must have been at a time when the use of preservatives was unknown, we can well understand the need for it. All this shows, as I have said, that the date of Boniface's bull (1300), far from representing the eclipse of anatomy, actually fixes the date of the dawn of modern practical anatomical study.

The most interesting question in this whole discussion is as to how much dissection Mondino actually did during the second decade of the fourteenth century. His book became the manual of dissection that was in practically every dissector's hands for several centuries after. Probably no book of its kind has ever been more used, and none maintained its place as the standard work in this department for so long. No less than 25 printed editions of it appeared altogether. It would seem to be utterly improbable that the author of a text-book of this kind could have made only a few dissections. There are a number of historians who have claimed, nevertheless, that at most he did not dissect more than three or four bodies. This is all that we have absolute evidence for, that is to say, only these dissections are recorded. It is easy to understand, however, that a professor of anatomy might make even hundreds of dissections, and yet have something to say only about a very few which happened to present some special peculiarities. The absence of further records may readily be accounted for also in other ways. The art of printing was not yet invented; paper had only just been discovered and was extremely expensive, and many factors conspired to destroy any records that may have been made.

Outsiders dipping into the history of medicine have made much of our paucity of documentary evidence with regard to what Mondino actually did, and have, when it suited their purpose, insisted that this first author of a dissector's manual did but the three or four dissections explicitly mentioned. Those who are more familiar with the history of medicine, and especially of anatomy, are persuaded that he must have done many. In the first class of writers is Prof. White, for instance, who declares positively that Mondino did not dissect more bodies than those of which we have absolute records. According to his emphatically expressed opinion, the reason why the father of dissection did not dissect more was because of ecclesiastical opposition. Even these few dissections were due to some favoring chance or the laxity of the ecclesiastical authorities, or Mondino might have paid dear for his audacity. No one else, according to Prof. White, dared to encounter the awful penalties that might have been inflicted on Mondino until Vesalius, more than two centuries later, broke through "the ecclesiastical barrier" and gave liberty to anatomists. Prof. Lewis S. Pilcher, of Brooklyn, who has made a special study of Mondino and his times, who has consulted that author's original editions, who has searched out the traditions with regard to him in the very scene of his labors in Bologna, thinks quite differently. Prof. White has a purpose, that of minimizing the work done in anatomy during the fourteenth century; Prof. Pilcher's only purpose is to bring out the truth with regard to the history of anatomy. In the Medical Library and Historical Journal for December, 1906, Prof. Pilcher has an article entitled The Mondino Myth, by which term he designates the idea that Mondino dissected but a few bodies. He says with regard to this subject:

> "The changes have been rung by medical historians upon a casual reference in Mondino's chapter on the uterus to the bodies of two women and one sow which he had dissected, as if these were the first and the only cadavers dissected by him. The context involved no such construction. He is enforcing a statement that the size of the uterus may vary, and to illustrate it remarks that, 'a woman whom I anatomized in the month of January last year (1315 Anno Christi), had a larger uterus than one whom I anatomized in the month of March of the same year.' And further, he says,

> 'the uterus of a sow which I dissected in 1316 (the year in which he was writing) was a hundred times greater than any I had seen in the human female, for she was pregnant, and contained thirteen pigs.' These happen to be the only references to specific bodies that he makes in his treatise. But it is a far cry to wring out of these references the conclusions that these are the only dissections he made. It is quite true that if we incline to enshroud his work in a cloud of mystery, and to figure it as an unprecedented, awe-inspiring feature to break down the prejudices of the ages, it is easy to think of him as having timidly profaned the human body in his anatomizing zeal in but one or two instances. His own language, however, throughout his book is that of a man who was familiar with the differing conditions of the organs found in many different bodies–a man who was habitually dissecting."

As I think must be clear to any one who knows Mondino's book, no other conclusion than this suggested by Prof. Pilcher can be drawn. This opinion has been frankly stated, by every historian of anatomy in recent years. Puschmann says it very clearly. Von Töply is evidently of the same opinion. These are the latest authorities in the history of anatomy. No other conclusion than this could well be reached by anyone who has studied the question seriously. Pilcher confirms this in the article already quoted in the following paragraph:

> "Salernum was not alone in its legalization of the dissection of human bodies before the first public work of Mondino, for, according to a document of the Maggiore Consiglio of Venice of 1308, it appears that there was a college of medicine in Venice, which was even then authorized to dissect a body once every year. Common experience tells us that the embodiment of such regulations into formal law would occur only after a considerable preceding period of discussion, and in this particular field, of clandestine practice. It is too much to ask us to believe that in all this period, from the date of the promulgation of Frederick's decree of 1241 to the first public demonstration by Mondino at Bologna in 1315, the decree had been a dead letter and no human body had been anatomized. It is true there is not, as far as I am aware, any record of any such work, and commentators and historians of a later date have, without exception, accepted the view that none was done, and thereby heightened the halo assigned to Mondino as the one who ushered a new era. Such a view seems to me to be incredible. Be that as it may, it is undeniable that at the beginning of the fourteenth century the idea of dissecting the human body was not a novel one; the importance of a knowledge of the intimate structure of the body had already been appreciated by divers ruling bodies, and specific regulations prescribing its practice had been enacted. It is more reasonable to believe that in the era preceding immediately that of Mondino, human bodies were being opened and after a fashion anatomized. All that we know of the work of Mondino suggests that it was not a new enterprise in which he was a pioneer, but rather that he brought to an old practice a new enthusiasm and better methods, which, caught on the rising wave of interest in medical teaching at Bologna, and preserved by his own energy as a writer in the first original systematic treatise written since the time of Galen, created for him in subsequent uncritical times the reputation of being the restorer of the practice of anatomizing the human body, the first one to demonstrate and teach such knowledge since the time of the Ptolemaic anatomists, Erasistratus and Herophilus."

In order to show that Mondino did not perform only the two or three dissections which he himself for special reasons mentions, but many more, Professor Pilcher has made a series of quotations from the Bolognese anatomist's manual of dissection. It is after all quite easy to understand

that if dissections were common, there would be no records of most of them, as they would be too commonplace for chroniclers to mention. Only those that have some special feature are by chance mentioned in some accounts of doings at the university. The records of the actual number of dissections at most medical schools, even a century ago, are not now available in most cases. On the other hand, no one can read these quotations from Mondino's book without realizing that the man who wrote these passages had made many dissections, and that it was a common practice for him to make anatomical preparations in many different ways, under many different circumstances and for many different purposes.

The second quotation shows, in fact, that Mondino had the custom sometimes of boiling his bodies before dissecting them when he wished to demonstrate special features, and he promises to make such an anatomy for his students at another time. If the bull of Pope Boniface VIII. was misinterpreted in any way to prohibit dissection, this would surely be the practice supposed to fall under its provisions. Here we find Mondino, less than twenty years after the promulgation of the bull, writing about this very practice, however, and calmly suggesting that he follows it as a routine, in a book that was published without let or hindrance from the ecclesiastical authorities, and that became for the next two centuries the most used book in the teaching of anatomy in educational institutions that were directly under ecclesiastical authorities. If the bull was misinterpreted so as to forbid dissection, as has been said, surely this flagrant violation of it would not have been permitted. It is clear that, if there was a misinterpretation, it must have come later in the history of anatomy. But of that we shall find no trace any more than at this time.

Here are the quotations from the Anatomy of Mondino which show that he practiced not one but many methods of making dissections, according to the purposes he had in view. The leaf and line references are to the Dryander Edition, Marburg, 1541. (Taken from Prof. Pilcher.)

> "I do not consider separately here the anatomy of component parts, because their anatomy does not appear clearly in the fresh subject, but rather in those macerated in water." (Leaf 2, lines 8-13.)
>
> ".... these differences are more noticeable ***in the cooked*** or perfectly dried body, and so you need not be concerned about them, as perhaps ***I will make an anatomy upon such a one at another time*** and will write what I observe with my own senses, as I have proposed from the beginning." (Leaf 60, lines 14-17.)
>
> "What the members are to which these nerves come cannot well be seen in such dissection as this, but it should be liquified with rain water, and this is not contemplated in the present body." (Leaf 60, lines 31-33.)
>
> "After the veins you will note many muscles and many large and strong cords, the complete anatomy of which you will not endeavor to find in such a body, but in a body dried in the sun for three years, as I have demonstrated at another time; I also declared completely their number, and wrote the anatomy of the muscles of the arms, hands and feet in a lecture which I gave over the first, second, third and fourth subjects."

As must be clear to anyone, many of these expressions are, as Professor Pilcher insists, intelligible only if we accept the conclusion that their author had done many dissections, under many and varying circumstances, during his career as an anatomist before writing this volume. We have other evidence, of a much more direct character, for this fact. Mondino uses the expression, that he had demonstrated many times a certain anatomical feature which could only be the subject of demonstration after dissection. The expression occurs in a description of the hypo-gastric region which he calls the sumen. Through this region, he says, there pass to the surface certain veins which transmit fluid in the fetus during the time of its life in utero. For this reason they are better studied in

the unborn than in the fully developed, since they lose their function as soon as complete development is reached. In this description Mondino uses the words "ego hoc modo multitotiens monstravi."

As with regard to this, so as to another bit of evidence of Mondino's frequency of dissection, Professor Pilcher has supplied the material. He says in his article on the Mondino Myth, already cited:

> "Shortly after his (Mondino's) death, the young Guy de Chauliac, of Montpelier, came to Bologna to study anatomy under the tuition of Mondino's successor, Bertrucius. When he wrote his own treatise, 'La Grande Chirurgie,' thirty years later, he prefaced it with an appreciation of the study of anatomy, saying: 'It is necessary and useful to every physician to know first of all anatomy'; and that a knowledge of anatomy was to be acquired by two means; 'these are,' he says, 'the study of books, a means useful indeed, but not sufficient to explain those things which can only be appreciated by the senses; the other, experimentally on the dead body, according to the treatise of Mondinus, of Bologna, which he has written, and which (experimental anatomy on the cadaver) he (Mondinus) has done many times'–'***et ipsam fecit multitoties.***'"

Besides this evidence we have details of the lives of two of Mondino's assistants which furnish further proofs of the frequency of dissection at the University of Bologna during these first two decades of the fourteenth century, which, it will be recalled, are also the first two decades after the promulgation of Pope Boniface's bull. Curiously enough, one of these assistants was a young woman who, as was not infrequently the custom at this time in the Italian universities, was matriculated as a student at Bologna. She took up first philosophy and afterwards anatomy under Mondino. While it is not generally realized, co-education was quite common at the Italian universities of the thirteenth and fourteenth centuries, and at no time since the foundation of the universities has a century passed in Italy without distinguished women occupying professors' chairs at some of the Italian universities. This young woman, Alessandra Giliani, of Persiceto, a country district not far from Bologna, took up the study of anatomy with ardor and, strange as it may appear, became especially enthusiastic about dissection. She became so skilful that she was made the prosector of anatomy, that is, one who prepares bodies for demonstration by the professor.

According to the Cronaca Persicetana, quoted by Medici in his History of the Anatomical School of Bologna:

"She became most valuable to Mondino because she would cleanse most skilfully the smallest vein, the arteries, all ramifications of the vessels, without lacerating or dividing them, and to prepare them for demonstration she would fill them with various colored liquids, which, after having been driven into the vessels, would harden without destroying the vessels. Again, she would paint these same vessels to their minute branches so perfectly and color them so naturally that, added to the wonderful explanations and teachings of the master, they brought him great fame and credit." This whole passage shows a wonderful anticipation of all our most modern methods–injection, painting, hardening–of making anatomical preparations for class and demonstration purposes.

Some of the details of the story have been doubted, but her memorial tablet, erected at the time of her death in the Church of San Pietro e Marcellino of the Hospital of Santa Maria de Mareto, gives all the important facts, and tells also the story of the grief of her fiance, who was himself Mondino's other assistant. This was Otto Agenius, who had made for himself a name as an assistant to the chair of Anatomy in Bologna, and of whom there were great hopes entertained because he had already shown signs of genius as an investigator in anatomy. These hopes were destined to grievous disappointment, however, for Otto died suddenly, before he had reached his thirtieth year. The fact that both these assistants of Mondino died young and suddenly, would seem to point to the fact that probably dissection wounds in those early days proved even more fatal than they occasionally did a century or more ago, when the proper precautions against them were not so well understood.

The death of Mondino's two prosectors in early years would seem to hint at some such unfortunate occurrence.

As regards the evidence of what the young man had accomplished before his untimely death, probably the following quotation, which Medici has taken from one of the old chroniclers, will give the best idea. He said:

> "What advantage indeed might not Bologna have had from Otto Agenius Lustrolanus, whom Mondino had used as an assiduous prosector, if he had not been taken away by a swift and lamentable death before he had completed the sixth lustrum of his life!"

Further absolute proof that dissections were very common about the time that Mondino made those which are recorded, and the mention of which has led to the false assumption as to the rarity of dissection, is to be found in the legal prosecution for body-snatching, which I have already mentioned and which took place within five years after Mondino made the public demonstrations in dissection that are the subject of discussion. It will be conceded by everyone that such prosecutions for body-snatching are not likely to occur when only one or two graves are violated a year, but are usually the result of a series of such outrages, which arouse the community against them. We prefer to give this bit of history once more in the words of Professor Pilcher, who has argued this whole case for ***the frequency of dissection within twenty years after the bull that is supposed to have forbidden it*** better than anyone else, and whose knowledge of Mondino and his times is such as to make him an authority on the subject. He has no interest in them, as I have said, either for or against the Popes. His only idea is to bring out the real meaning of whatever data we possess for the history of anatomy and dissection at this time.

> "An instructive and interesting side-light on the conditions attending the study of practical anatomy in the days of Mondino may be found in a record, still extant, of a legal procedure which occurred in Bologna in the year 1319, four years after Mondino had begun his public demonstrations and at a time when Otto and Alessandra were doubtless enthusiastically working with him. According to the record, four students, three from Milan and one from Piacenza, were accused of having gone at night time to the cemetery of the church of San Barnada, outside the San Felice gate, and to have sacrilegiously violated the grave in which was buried the body of a certain Pasino who had been hung on the gallows near the Ponte di Reno. It was charged that the students had taken up the body and carried it to the school of the parish of San Salvatore, near the pharmacy of Giacomo de Guido, where Master Alberto (Zancari) was teaching. There were witnesses who affirmed that they had seen the body of Pasino in the school and the students and others intent upon dissecting it. It was the sixth of December when the arrests were made, but the final outcome of the trial is not stated."

Surely all this must be considered sufficient evidence to show that Pope Boniface's bull neither forbade dissection, nor was misinterpreted as prohibiting any practice in connection with anatomical investigation. It is not enough for President White, however, for after the publication of my original article in the Medical Library and Historical Journal on The Popes and Anatomy, and another article on Pope John XXII. and the Supposed Bull against Chemistry, President White wrote thus in reply: "Dr. Walsh takes up the decretal of Boniface VIII., in 1300, and endeavors to show that, so far from forbidding dissection, it had quite a different tenor, and that at sundry universities in Italy and at the University at Montpelier, in France, dissection was permitted and most openly practiced. This seems to me very disingenuous. The decretal of Boniface was construed universally as prohibiting dissections for any purpose whatever."

For President White, then, the publication of the text of the bull is only an ***endeavor*** to show that, so far from forbidding dissection, it had quite a different tenor. This endeavor seems to him very disingenuous(!) It matters not what evidence there may be for dissection, or lack of evidence as to ecclesiastical opposition, the decretal of Boniface was ***construed universally*** as prohibiting any dissections for any purpose whatever. All history must yield before the reiteration of the assertion that the Popes did forbid dissection, and that there was no anatomy during the thirteenth, fourteenth and fifteenth centuries, except such as by chance, in some way or other, succeeded in evading the Church regulations. It simply must have been so. President White has said it. For anyone to deny it is to question his historical infallibility. Only those who are disingenuous will dare to do so.

It is true, he grants there were some permits to dissect given, but these were wrung from the unwilling hands of the ecclesiastical authorities, and are only proofs of their opposition, not at all of their toleration of dissection. There is no limit to which Professor White will not go in order to maintain his proposition that the Popes did forbid anatomy, and that there was no anatomical investigation during the thirteenth, fourteenth and fifteenth centuries. Here, for instance, is a paragraph from Professor White's answer which shows very strikingly one method of arguing with regard to a question of major significance in the history of education as well as of science, and especially of medicine, during the Middle Ages. Comments on it are entirely unnecessary:

> "And now, as to Dr. Walsh's statement that dissection was permitted by Popes and ecclesiastical authorities in universities. His argument in the matter is an excellent example of Jesuitism. It is true that under the pressure of the developing science of medicine, sundry civil and ecclesiastical authorities did, from time to time, issue permits allowing an occasional dissection, at rare intervals, here and there; as, for example, the permission given to the University of Lerida, in 1391, to dissect one dead criminal every three years, and to sundry other universities to dissect one or two human bodies each year. It is a fact of which we have ample testimony, that Mundinus, the great anatomist preceding Vesalius, only dissected three human bodies with his classes during his entire career. So far from effectually helping anatomy, these permissions served really to fasten the idea upon the European mind that dissection to any considerable extent by anatomical investigators ought not to be allowed, and, as a matter of fact, it was not until Vesalius, ***in spite of theological opposition, braved calumny, persecution, and possibly death, that this ecclesiastical barrier to investigation was broken through.***" (Italics ours.)

Since Professor White has insisted so much on the significance of these permissions, a discussion of them will not be out of place. There are records of a certain small number of permissions to dissect having been granted by the Popes to various universities during the fourteenth and fifteenth centuries. These are so few, however, that it would seem that if they represented the only opportunities afforded for dissection, then the development of anatomy must have been much hampered.

With regard to this, it may be said that if the Popes gave permission for dissection, then this practice was not forbidden by them. Here is the proof of it out of the mouths of those who say the opposite. Why should a permission be necessary, however, will be asked?

At the present moment such formal permissions are required quite as much in all civilized countries as they were during the Middle Ages. In certain parts of the United States a bond has to be filed by applicants before permission to dissect will be given. Dissection is recognized generally as a practice that needs definite regulation. Without such regulation all sorts of abuses would creep in. During the Middle Ages popular feeling was all against dissection. It was difficult, in many places, for the university authorities to obtain permission for dissection from their immediate political rulers. As a consequence of this they reverted to the theory, very generally accepted at that time, that the university was independent of the political authorities of the place in which it was situated, in

educational matters, and an appeal was made directly to the ecclesiastical authorities for permission to dissect, as coming under their jurisdiction in education. They had thus obtained many other educational privileges that would not have been allowed them by municipalities, and they were successful also in this. Anyone who knows the details of the struggle of the universities to maintain the rights of their students and faculties against the encroachments of municipal and state authorities, will appreciate how much this possibility of appeal to the Pope meant for the universities of that time.

The permission to dissect was only another, but a very striking example, of ecclesiastical authority granting privileges to universities beyond those which they could have obtained from the local governments under which they existed. Such permissions, far from showing that the Popes were hampering or prohibiting dissection, prove, on the contrary, that they were securing for educational institutions what local popular prejudice would not have allowed them. That this is the proper way to view this question will be best appreciated by a review of the history of anatomy during the two centuries and a half in which ecclesiastical authorities are said to have prevented or discouraged its development. From this it will be seen very clearly that the nearer to Rome the medical schools were, the more dissection was done in them; that dissection was most common in Rome, at least during the latter part of this period; that the golden age of anatomy developed most luxuriantly in Bologna when that was a Papal city, and in Rome itself; and that in general the Popes must be looked upon as having fostered and patronized the medical sciences and anatomy in every possible way, while there is not the slightest hint anywhere to be found of the ecclesiastical opposition that is supposed to have dominated these centuries of medical history.

In concluding this chapter it has seemed worth while to trace the origin of the misinterpretation of Pope Boniface's decretal, which makes it forbid dissection for anatomical purposes as well as the cutting up and boiling of bodies in order to facilitate their removal for long distances for burial. Prof. White quotes with great confidence in the matter the Benedictine Literary History of France as his authority, which he declares to be a Catholic authority. Under ordinary circumstances, this would be quite sufficient to establish the fact that such a misinterpretation must have taken place, for the Benedictines were extremely careful in such matters and were not likely to admit an assertion of this kind, unless they had good foundation for it. The quotation on which Prof. White depends for his declarations in the matter is found in the Sixteenth Volume of the Histoire Litteraire de la France, which runs as follows:

> "But what was to retard still more (than the prohibition of surgery to the clergy mentioned in the preceding paragraph) was the very ancient prejudice which opposed anatomical dissection as sacrilegious. By a decree inserted in Le Sexte, Boniface VIII. forbade the boiling of bodies in order to obtain skeletons. Anatomists were obliged to go back to Galen for information, and could not study the human body directly, and consequently could not advance the human science of bodily health and therapeutics."

Had this been written by the Benedictines, there would have been every reason to think that though Boniface's decretal itself did not forbid dissection it had unfortunately been so misinterpreted. While the Histoire Litteraire de la France, however, was begun by the Benedictine Congregation of St. Maur, their work, like many another magnificent undertaking of the monks, was interrupted by the French Revolution. What they had accomplished up to this time showed the necessity for such work, and accordingly in the early part of the nineteenth century a continuation of it was undertaken by the members of the Institute of France. The Sixteenth Volume from which the quotation just cited comes was mainly written by Pierre Claude François Daunou, the French historian and politician. His life had not been such as to make him a sympathetic student of the Middle Ages. He had been a deputy to the Convention, 1792-1795, was elected the first President of the Council of 500 in this latter year, and became a member of the Tribunate in 1800. His contributions to history were made

near the close of his life. While he is usually considered an authority in the political details of these centuries, it is easy to understand that he was not favorably situated for familiarity with the medical history of these times.

Once it is understood that the paragraph in question was written by M. Daunou and not by the Benedictines, its adventitious prestige as a Catholic historical authority, to which we shall see presently it has absolutely no right, vanishes. A word about M. Daunou will serve to show how carefully any declaration of his with regard to the Popes must be weighed. He belonged to that French school of Catholics who try to minimize in every way the influence of the Papacy in the Church, and who, as students of history know very well, do not hesitate even to twist historical events to suit their prejudices and give them a significance detrimental to the Popes. This was the principal purpose of Daunou's historical writing. There is a little volume called Outlines of a History of the Court of Rome and of the Temporal Power of the Popes, declared by the translator to be by Daunou, which was published in Philadelphia in 1837. The American edition was issued as a Protestant tract, and the translator states frankly that M. Daunou's purpose in composing it was to prove that "the temporal power of the Roman Pontiffs originated in fraud and usurpation; that its influence upon their pastoral ministry has been to mar and degrade it, and its continuation is dangerous to the peace and the liberties of Europe; and that its constant influence to these effects is to retard the advancement of civilization and knowledge." M. Daunou's title for the work as issued originally in French was An Historical Essay on the Temporal Power of the Popes and on the Abuses which they have made of their Spiritual Ministry. [Footnote 3]

> [Footnote 3: The time at which this little book was published furnishes the best possible commentary on its purpose. It was originally issued in 1810, the year after Pope Pius VII. had been carried off from Rome, and when Napoleon was using every effort to discredit the Pope and bring about a state of affairs in which the pontiff would be compelled to accept a Concordat that would deprive the Church of many of her former rights. It was then really a political pamphlet meant to curry favor with Napoleon, and issued anonymously, because even Daunou did not care to put his name to it under the circumstances. This will give a better idea of how much credence may be given to Daunou's assertions with regard to the Popes of the Middle Ages, than any reflections that we could make.]

Everything that M. Daunou has to say with regard to the Popes is tinged by his political and Gallican prejudices. This is why he states so definitely in the Histoire Litteraire de la France that the bull of Pope Boniface VIII., if it did not actually forbid dissection, at least was responsible for hampering the practice for two centuries. That M. Daunou's expressions on this subject have been taken so seriously, however, is to me at least a never-ending source of surprise. He himself must have known nothing at all of the history of dissection, while those who accepted his opinion must have carefully avoided consulting authorities on the history of anatomy, for it is actually just after this bull that the history of public dissection begins. It is clear to me, then, that this absurd assertion of M. Daunou never would have been swallowed so readily only that writers were over-anxious to find material to use against the Popes and the Church.

Daunou found this bull of Boniface an excellent opportunity to discredit the Popes in their relations to science. It is true, the bull itself says nothing about dissection, nor is there anything in it that would tend to create even a distant impression that it was directed against anatomical preparations of any kind. We might expect, then, that his assertion in this matter would have been contradicted at once by some one who would read the bull. The bull is, however, not easy to find for consultation purposes. It does not occur, as we have said, in Le Sexte itself, that is, in the ordinary Sixth Book of Papal Decretals, published by Boniface VIII., though Daunou quotes it as from there and without a hint as to where it may be really found. It is in an appendix to this work, added after Boniface's death.

It would be rather difficult, then, and would require some special knowledge and no little patience on the part of a subsequent collator of historical sources to find the bull, unless he were determined on getting at the bottom of this whole question. As a consequence Daunou's assertion has remained practically unchallenged for the better part of a century, though many scholars who were familiar with Boniface's sixth book have doubtless realized its falsity, but owing to the fact that they would not ordinarily come across the bull in their direct reading of Boniface's famous volume, would not be in a position to contradict its misquotation. If looked at in this way, Daunou's passage in the Histoire Litteraire would seem to be a deliberate and very clever and, unfortunately, successful perversion of history.

Daunou, who was a deep student of Papal affairs and whose knowledge of the history of the Papacy would not be likely to have missed so important a detail, might very well have known, that about a half a century before the time when he wrote asserting that this bull of Boniface VIII. had prevented dissection, someone who had a doubt on the subject asked the ecclesiastical authorities at Rome, whether this Papal document was to be considered as referring in any way to the practice of dissection, or the cutting up of human bodies for anatomical purposes. In reply to this question Pope Benedict XIV. made a very direct answer, absolutely in the negative. This is the only hint that I know of in serious history that Pope Boniface's bull was ever considered to have any reference to dissection for anatomical purposes. At the time when Pope Benedict XIV.'s answer was published the Papal Medical School had been in existence for some five centuries and a half. For about two centuries and a half it had been distinguished in the annals of medicine, and as we shall see in the chapter on The Papal Medical School, some of the most distinguished anatomists of their time had been investigating and teaching by means of dissections, and their demonstrations had been attended by many of the high ecclesiastics, even many autopsies had been made on Cardinals.

Pope Benedict's reply is quoted in full in Puschmann's Handbuch der Geschichte der Medizin. Vol. II., page 227, in Robert Ritter Von Töply's article on the History of Anatomy. It occurs in the midst of an abundance of material of great historical importance which shows the place that the Popes occupy as patrons of anatomy for several centuries. Von Töply has no illusions with regard to any supposed opposition of the Popes to medical science. He even says, that while the older writers have always told the story of the development of anatomy as if the Popes tried to prevent the study of it, as a matter of fact, there is scarcely any evidence for this, and copious evidence for their having done much to foster this branch of medical science which they consider so important for the healing of the ills of mankind. His reference to Boniface's answer with regard to the relation of Boniface's bull to dissection runs as follows:

> "Under the heading, Concerning the Dissection of Bodies in Public Institutions of Learning, and in reply to the question whether the bull of Boniface VIII. forbids the dissection of human bodies, Benedict XIV. said (Institute 64):
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> "By the singular beneficence of God the study of medicine flourished in a very wonderful manner in this city (Rome). Its professors are known for their supreme talents to the remotest parts of the earth. There is no doubt that they have greatly benefited by the diligent labor which they have devoted to dissection. From this practice beyond doubt they have gained a profound knowledge of their art and a proficiency that has enabled them to give advice for the benefit of the ailing as well as a skill in the curing of disease. Now such dissection of bodies is in no way contrary to the bull of Pope Boniface. He indeed imposed the penalty of excommunication, to be remitted only by the Sovereign Pontiff himself, upon all those who would dare to disembowel the body of any dead person and either dismember it or horribly cut it up, separating the flesh from the bones. From the rest of his bull, however, it is clear that this penalty was only to be inflicted upon those who took bodies already buried out of their graves and by an act horrible in itself, cut them in pieces in order that

they might carry them elsewhere and place them in another tomb. It is very clear, however, that by this, the dissection of bodies, which has proved so necessary for those exercising the profession of medicine, is by no means forbidden." [Footnote 4]

[Footnote 4: The original Latin taken from Puschmann runs thus: "De cadaverum sectione facienda in publicis Academiis, utrum constitutio Bonifacii VIII. sectioni humanorum cadaverum adversetur. Singulari dei beneficio medicinae studium in hac civitate (Roma) magnopere floret cujus etiam professores ob eximiam virtutem in remotissimis terrae partibus commendantur. Ipsis sane maxime profuit, quod incidendis mortuis corporibus diligentem operam contulerint, ex qua procul dubio praeclaram artis scientiam, in consultationibus obeundis pro aegrotorum salute praestantiam, morbisque eurandis peritiam consecuti sunt . . . . Porro haec membrorum incisio nullo modo adversatur Bonifacii Institutioni . . . . Ille quidem poenam excommunicationis indicit Pontifici solo remittendam, iis omnibus qui audeant cuiuscumque defuncti corpus exenterare, ac illud membratim vel in frustra immaniter concidere ab ossibus tegumentum carnis excutere. Tamen ex reliquis ejusdem constitutionis partibus clare deprehenditur, hanc poenam illis infligi qui sepulta corpora e tumulis eruentes ipsa nefario scelere in frustra secabant ut alio deferrent, alioque sepulchro collocarent. Quamobrem membrorum incisio minime interdicitur, quae adeo necessaria est medicinae facultatem exercentibus."]

This whole subject of the Supposed Papal Prohibition of Anatomy is typical of a certain form of controversial writing against the Church. A document of some time or other from the Middle Ages is taken, twisted from its original meaning and set up as a serious stumbling block to the development of science or education in some way. It is quoted confidently by some one without much authority. Others who are glad of the opportunity to have such an objection to urge against the Papacy, take it up eagerly, do not look it up in the original, absolutely fail to consider the circumstances in which it was issued, and then spread it broadcast. Of course it is accepted by unthinking readers, whose prejudices lead them to believe that this is what was to be expected anyhow. It maybe that history, as is the case in anatomy, absolutely contradicts the assertion. That makes no difference. History is ignored and treatises are written showing how much science would have developed only for Papal opposition, by people who know nothing at all about the real story of the development of science. The real history of anatomy, showing very clearly how much was done for the science by the Popes and ecclesiastics, will be told in the following chapters.

# THE STORY OF ANATOMY DOWN TO THE RENAISSANCE

We have seen that the supposed prohibition of anatomy by the Popes has no existence in reality. In spite of this fact, which it was easy for anyone to ascertain who wished to consult the documents asserted to forbid, a number of historical writers have insisted on finding religious or ecclesiastical, or theological, opposition to anatomical studies. Professor White has been most emphatic in his assertions in this regard. He admits that the supposed bull of prohibition had quite a different purport, yet he still continued to assert its connection with the failure of anatomy to develop during the Middle Ages. This presumed failure of anatomy during the Middle Ages is a myth. It continues to secure credence only in the minds of those who know nothing of the history of medical science during the thirteenth, fourteenth, and fifteenth centuries and who have not consulted the serious histories of medicine that treat of this time, but flourishes vigorously in the minds of those who have a definite purpose in making out a story of theological or Church opposition to science in general.

To counteract the false impression that has gained such wide acceptance in this matter, it has seemed advisable, in order to settle the question definitely once and for all, to trace the history of anatomical science from its beginning in the Middle Ages down to modern times. It will not be hard to show that there was a constant development and an unfailing interest in this subject. This can be understood even more clearly from the story of the development of surgery in the Middle Ages and its relations to anatomy than from the history of anatomy itself. As is well known, materials with regard to practical and applied science interest men more at all times, and documents with regard to them are more likely to be preserved, and so the history of surgery is very full, while the history of anatomy may prove not quite so satisfactory. It is true of all sciences, that there are periods when they have much less attraction than at other times, and the success of investigators and original workers is not always the same. As in nearly everything else, the real advances in all science come when genius makes its mark, and not merely because a large number of men happen to be interested in the subject. This will be found as true in anatomy as in other sciences, and so there are periods when not much is doing, but nowhere is there a trace of ecclesiastical opposition to account for these variations of interest.

There is no doubt at all that there was much popular opposition to the practice of dissection in the Middle Ages; that has existed at all times in the world's history. It was very pronounced among the old Pagans in Rome as well as in Greece, and it prevented anatomical study to a very great degree. It continued to exist in modern times until almost the present generation. Indeed, it has not yet entirely disappeared, as any physician who has tried to secure autopsies on interesting cases knows very well. The New York Academy of Medicine is only a little over a half century old, and yet nearly every one of its early presidents had thrilling experiences in body-snatching as a young man, because no proper provision for the supplying of anatomical material had as yet been made by law, and bodies had to be obtained. The feeling of objection to having the bodies of friends anatomized is natural and not due to religion. It exists quite as strongly among the ignorant who have no religion as among the religiously inclined. It has not disappeared among the educated classes of our own time, religious or irreligious. If this is borne in mind, the history of the development of anatomy will be easier to understand.

The first definite evidence in modern history for the existence of the practice of dissection is a famous law of the German Emperor, Frederick II., from the first half of the thirteenth century. This law was promulgated for the two Sicilies, that is, for Southern Italy and Sicily proper, very probably in the year 1240. It has often been vaguely referred to, but its actual significance can only be understood from the terms of the law itself, which has been literally translated by Von Töply in his Studien Zur Geschichte der Anatomie in Im Mittelalter. [Footnote 5]

[Footnote 5: Deuticke Leipzig und Wien, 1893]

The paragraph with regard to dissection runs as follows:

> "As an enactment that will surely prove beneficial to health, we decree that no surgeon will be allowed to practice, in case he has not a written testimonial, which he must present to the teachers in the medical faculty, that he has for at least a year applied himself to that department of medicine which is concerned with the teaching and practice of surgery, and that he has, above all, learned the anatomy of the human body in this manner, and that he is fully competent in this department of medicine, without which neither surgery can be undertaken with success nor sufferers cured." [Footnote 6]
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> [Footnote 6: The complete text of this law, which is a marvelous anticipation of all our efforts for the regulation of the practice of medicine down even to the present day, will be found in the appendix.]

Such a regulation, as pointed out by Professor Pilcher in an article on the early history of dissection, [Footnote 7] and as we know by modern experience, does not come into force as a rule before the actual practice of what is prescribed, has been for some time the custom and its usefulness proved by the results attained. It seems very probable, then, that even at this early day the Emperor Frederick was only making into a law what had been at least a custom before this time. Lest anyone should think that this is a far-fetched assumption, certain other paragraphs of this law, which show very definitely the high degree to which the development of medical teaching had reached, must be recalled. Frederick declared that medicine could only be learned if there was a proper groundwork of logic. Only after three years devoted to logic, then, under which term is included the grammar and philosophy of an ordinary undergraduate course, could a man take up the study of medicine. After three years devoted to medicine, to which it is again specifically declared another year must be added if surgery were to be practiced, a man might be given his degree in medicine, but must spend a subsequent full year in the practical study of medicine under the supervision of an experienced physician.

> [Footnote 7: The Mondino Myth, Medical Library and Historical Journal, 1906]

The law further decreed definite punishments for the practice of medicine without due warrant and violation of its regulations, and also regulated the practice of apothecaries. It is rather interesting to find that these were forbidden to share their profits with physicians, and the physicians themselves were not allowed to distribute their own medicines. In a word, practically every one of the problems in the practice of medicine which medical societies are trying to solve at the present moment, were also occupying the attention of the civil authorities about seven centuries ago. Anyone who reads this law will not be loath to believe that it represents the culmination of a series of efforts to regulate medical practice, and especially medical education, and that it was not merely a chance legal utterance that happened to touch a single important question for the first time. One of the paragraphs of the law even contains some clauses that would prevent fake medical schools and that establishes a board of medical examiners. This consisted of certain state officials and some professors of the art of medicine. In a word, medical education had reached a high grade of development, and medical practice was legally established on a high plane of professional dignity.

Salerno had already enjoyed a high reputation as a medical school for more than two centuries when Frederick's law was promulgated. It is true that we have no definite records of dissections done in the school. If these were not an uncommon occurrence, however, but came as did dissections later on, quite as a matter of course, the absence of such records, when we recall how liable to destruction were the meagre accounts of the university transactions of the time during the long period that has intervened and because of the many vicissitudes they were liable to, is not surprising. During the century following this decree there seems to be no doubt that dissections were done regularly, though

perhaps not very frequently from our modern standpoint, at Salerno. Salerno, as we shall see in the chapter on The Papal Medical School, was always closely in touch with the ecclesiastical authorities, and especially with the Papacy. There was no hint of friction of any kind, either before or after this law of Frederick's. The question of ecclesiastical interference with dissection does not seem to have arisen at all, much less to have proved an obstacle to the development of medical science.

At the beginning of the fourteenth century the center of interest in anatomy and the matter of dissections shifts to Bologna. We have already discussed the question whether Mondino was the first to do public anatomies, and as to whether he performed only the few that by a narrow misunderstanding of certain of his own words have sometimes been ascribed to him. Professor Pilcher, in the article The Mondino Myth, already cited, is of the opinion, and gives excellent reasons for it, that Taddeo, the great Bolognese physician of the thirteenth century, who was Mondino's master, had done at least some dissections in Bologna. Personally I have long felt sure that Taddeo or Thaddeus, as he is sometimes called in the Latin form of his name, did not a few, but a number of dissections.

Professor Pilcher's account of him does not exaggerate his merits. I may say that he was one of the great Papal physicians of whom we shall have more to tell hereafter.

> "Any comprehensive attempt to trace the real influences to which was due so great a step as a return to the practice of dissections of the human body, seems to me must be very defective if it failed to take into consideration the influence of such a man as Thaddeus (Italian Taddeo). That he was able to impress himself in the way in which history records that he did, both upon the general public and upon the scholastic foundations of Bologna, shows a strength of character and a mastery of the peculiar conditions of the moment in the fields of science and philosophy which made him a master and an inspirer. If he is to be considered in his proper historical light, as one who declares that the knowledge of the structure of the human body to a most minute degree is the foundation upon which all rational medicine and surgery must be built, then it is impossible to exaggerate the importance of the pivotal moment when, in the development of science, the human body began to be anatomized. Nor is any fault to be found with the custom which has crowned with the laurels of universal appreciation the names of those men who began and who continued anatomical study, who vulgarized the practice of dissection.
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> "In my own investigations and reflections upon the conditions which led up to this happy renewal of scientific search into the composition of the body of man, it has seemed to me that writers have hitherto fallen short of tracing through to its ultimate source, the earlier spirit of enthusiasm for knowledge, of insight into the problems of disease, and of contempt for traditionary shackles, to the influence of which, as shown by the master, Taddeo, the latter work of the pupil, Mondino, was in great measure due."

Medici, in his History of the School of Anatomy at Bologna, [Footnote 8] quotes Sarti on The Distinguished Professors of the University of Bologna for proof of Taddeo's familiarity with dissection. Von Töply does not think that this quotation is enough absolutely to prove that Taddeo had done dissections, yet it would be hard to understand it unless some such interpretation is made. Taddeo was asked to decide a medico-legal question with regard to a pregnant woman. He refused, however, with a modesty that might well be commended to medico-legal experts of more modern times, to answer the question decisively, because he had never made a dissection of a pregnant woman. Sarti argues that it is evident from this that he had dissected other bodies more easy to obtain than those of pregnant women, or else that he had had the opportunity to make observations on them when dissected by others.

[Footnote 8: Medici Compendio Storico Della Scuola Anatomica de Bologna, Bologna, 1857. ]

Certain of Taddeo's contemporaries must have had the incentive of his example to help them to a knowledge of human anatomy, for they surely could not have accomplished all that they did in surgery without experience in dissection, yet Taddeo was looked up to as a master by all of them.

Anyone who has read the contributions to surgery of William of Salicet and his great pupil Lanfranc, even if only what we give with regard to them in our chapter on Surgery during the Middle Ages, cannot but be impressed with the idea that they must have done human dissections. They do not mention this fact explicitly, but portions of their surgical works are taken up with the consideration of applied anatomy. They discuss the relations of various structures to one another, especially with reference to the surgery of them. Von Töply, in his Studies on the History of Anatomy in the Middle Ages, says that the anatomies written before William's chapters on applied anatomy, were most of them purely theoretic discussions meant to be guides for internal medicine, or else they were very short directions for those who undertook the practical work of the dismemberment of bodies, usually, however, with reference to animals rather than to human bodies. In William of Salicet we encounter, he says, for the first time a treatise on anatomy made with the deliberate purpose of its application to practical surgery. Everywhere William gives hints for surgical operations with special reference to the anatomical relations.

Puccinotti quotes from William of Salicet's surgery, written about 1270, a passage that shows how familiar this surgeon must have been with dissection. The nephew of Count Pallavicini received an arrow wound in the jugular vein and died within an hour. During his death agony he suffered from a peculiar form of rattle in his throat. It was thought that this might be due to the fact that the arrow had been poisoned. William was called in to decide this question, and found that there was nothing responsible for his death except the wound itself. He describes how he found the blood in the lungs and in the heart, and considers that the conditions that were present were due to the wound. Von Töply has suggested that William would have given more details had he actually examined these organs, but when the autopsy report is negative, such descriptive details are not usual even at the present time. If he had found reason for thinking that there was poison in the case, a careful description of the other organs would be necessary. The fact, however, that he was asked to decide such a question, would seem to indicate that he was supposed to have a knowledge of the normal appearances of human tissues when examined by dissection.

In everything else Lanfranc went farther than his master William, and he did so also in anatomy. Some of the details of his work will be found in our chapter on Surgery in the Middle Ages. He could not have been able to give the detailed instructions that he has for the treatment of every portion of the body only that he knew them by actual contact in the cadaver as well as the patient. His outlook upon scientific medicine and surgery would satisfy even the most exacting of modern experimental scientists. The famous aphorism of his runs as follows: "Every science which depends on operation is greatly strengthened by experience." More than anything else, however, surgery owes to Lanfranc the distinct advantage that he carried into the West as far as Paris, the methods which had come into existence in Italy, and were ever after to prove a precious heritage in the great French University. As Salicet's work was carried on by Lanfranc, at least as well was Lanfranc's work further advanced by his pupil and successor in the chair of surgery, Henri de Mondeville. This subject of surgical development will be treated in the chapter on Surgery in the Middle Ages. Here it is introduced only to emphasize the opportunity there must have been for anatomical study through dissection in the thirteenth century, or these men would not have made the marvelous progress they actually accomplished in this department.

With regard to Mondino, Taddeo's successor at Bologna, enough has been said already in the preceding chapter. About this time, however, very definite evidence begins to accumulate of the

frequent practice of dissection. Roth, whose life of Vesalius is a standard work in the history of anatomy, has summed up most of what we know with regard to dissections in the early part of the fourteenth century, in his chapter on Dissection Before Vesalius's Time. Roth's work is well known and is frequently referred to in Dr. White's History of the Warfare of Science with Theology. There can be no question, then, but that in taking what Roth has to say I shall be quoting from a work with regard to which there can be no hint even of partiality. Roth himself was a Swiss, with no leaning toward the Church. There are certain portions of his book, indeed, in which he is inclined not to allow that the Church did as much for education in these times as she actually did. His study of the rise of anatomy can be accepted with absolute assurance, that it is at least not written from the standpoint of one who wants to make the situation with regard to anatomy more favorable than it actually was during the fourteenth century, for the sake of showing any lack of opposition on the part of ecclesiastics.

Some of the material that Roth has made use of has already been referred to in the preceding chapter, but it has seemed proper to repeat it here because this gives a connected account from a definite authority in the history of medicine, and especially of anatomy, with regard to the century immediately following the promulgation of Boniface's bull. Besides, it gives an opportunity for such comments on various features of the history of anatomy, as he details it, as will bring out the significance of his remarks. His account will make it very clear that, far from the Papal bull in question having been universally construed as prohibiting dissections, as Dr. White says it was, it never entered into the minds of medieval anatomists to consider it as having any such signification. The bull was never thought of in that sense at all. It does not refer to anatomy or dissection and it never had any place in the history of anatomy until dragged into it without warrant by Daunou and other nineteenth century writers. Roth says:

> "In the pre-Vesalian period the dissection of the human body was practiced, according to the terms of Frederick's law, for the instruction of those about to become physicians and surgeons. The natural place for this school anatomy–for a dissection was called anatomia, or, erroneously, anatomia publica–was at the universities and the medical schools. Apart from teaching institutions, however, public anatomies were held in Strasburg and in Venice. Their purpose was the instruction of the practicing medical personnel of these towns. Dissections which were not made for general instruction were called private anatomies. They were performed for the benefit of a few physicians, or students, or magistrates, or artists. Private anatomies began to have special importance only toward the end of the pre-Vesalian period (this would be about the end of the fifteenth and the first quarter of the sixteenth century). It is a play of chance that the first historical reference to a dissection concerns a private anatomy, one undertaken for the purpose of making a legal autopsy. This was made in Bologna in the year 1302 (two years after the decretal supposed to forbid dissection). A certain Azzelino died with unexpected suddenness, after his physicians had visited him once. A magistrate suspected poison and commissioned two physicians and three surgeons to determine the cause of death. It was found that death resulted from natural causes. (As I have said, it would appear that this was not an unusual procedure, for unless medical autopsies had been done before, it does not seem probable that this method of determining the cause of death would have been so readily taken up.)
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> "Thirteen years later there is an account of the dissection of two female bodies, in January and March of the year 1315, performed by Mundinus." (We have already seen that the fact that the two female bodies should be especially mentioned, though taken by some historians of medicine to indicate that Mundinus had done but few dissections, will not stand such an interpretation, in the light of the evidence that he had dissected many male bodies at least, as his text-book of anatomy indeed

makes very clear. These two dissections of females happened only to have special features that made them noteworthy.) "A few years later (1319) there is a remarkable document which tells the story of body-snatching for dissecting purposes." (This would seem to be sufficient of itself to show that a number of dissections were being done, and, indeed, as I have already said, Rashdall, in his History of the Universities, states that, according to the University statutes teachers were bound to dissect such bodies as students brought to them.) Roth concludes with the words (italics are mine): "***These are a few, but weighty testimonies for the zeal with which Bologna pursued anatomy in the fourteenth century.***" (I may add that all of these concern the twenty years immediately following Pope Boniface's supposed prohibition.)

Nor was the custom of making dissections any less active during the rest of the half century after the time when, if we are to believe Professor White, the decree of Boniface had been universally interpreted to forbid it. In a note to his history of dissection during this period in Bologna, Roth says: "Without doubt the passage in Guy de Chauliac which tells of having very often (multitoties, many times, is the exact word) seen dissections must be considered as referring to Bologna." This passage runs as follows: "My master, Bertruccius, conducted the dissection very often after the following manner: The dead body having been placed upon a bench, he used to make four lessons on it. First, the nutritional portions were treated, because they are so likely to become putrified. In the second, he demonstrated the spiritual members; in the third, the animate members; in the fourth, the extremities." (Guy de Chauliac was at Bologna studying under Bertruccius just before the middle of the fourteenth century. It is evident beyond all doubt, from what he says, that dissections were quite common. This is during the first fifty years after the decree. I shall show a little later that there are records of dissections during the second half of this century. Roth, however, goes on to tell next of the fifteenth century.)

Roth says nothing about the decree of Boniface VIII., nor of any possible effect that it had upon anatomy. The real historian, of course, does not mention things that have not happened. Roth confesses, as I have said, that he takes the material for his sketch of anatomy before Vesalius's time from Corradi. [Footnote 9] Corradi being an Italian, and knowing of the slander with regard to the Papal decree, explicitly denies it. Surely, here is material enough to convince anyone that all that Professor White has said with regard to the supposed effect of the misinterpretation of Boniface's decree is without foundation in the history of anatomy. Within twenty years after the bull was issued dissection was practiced to such an extent, that body-snatching became so common that there were prosecutions for it, and public dissections seem to have been held every year in the universities of Italy during most of the fourteenth century.

[Footnote 9: Corradi Dello Studio e dell' Insegnamento dell' Anatomia in Italia nel Medio Evo ed in parte del Cinquecento, Padova, 1873.]

De Renzi [Footnote 10] gives an interesting account of the methods by which material was obtained for dissection purposes before governments made any special provision for this purpose. Naturally, the rifling of graves was resorted to by students intensely interested in the subject of anatomy. The first criminal prosecution for body-snatching on record is in 1319, when some students brought a body to one Master Albert, a lecturer in medicine at the University at Bologna, and he dissected it for them. At this time, according to the statutes of the university, teachers of anatomy were bound to make a dissection if the students supplied the body. The whole party were brought to trial for this offence, though they do not seem to have suffered any severe penalty for their violation of the laws. At this time, according to De Renzi, there was a rage for dissection and many bodies were yearly obtained surreptitiously for the purpose.

[Footnote 10: De Renzi Storia della Medicina in Italia, Napoli. 1845-49, Vol. II., p. 247.]

With regard to the bodies of condemned criminals, people began to countenance the procedure, and while unwilling as yet to give them freely, allowed the bodies to be taken. Corradi, quoted by Puschmann, says "that laws against the desecration of graves, without being abolished, became a dead letter. The authorities interfered only if decided violence had been used or a great scandal raised. Such consequences were likely to follow only if, in the ardor of their enthusiasm for anatomical knowledge, students rifled the graves of well-known persons or took the bodies of those whose relatives discovered the desecration and proceeded against the marauders by legal measures."

At the Italian universities after the middle of the fourteenth century there is abundant evidence for perfect freedom with regard to dissection. We have already shown by our quotation from Roth that Bertrucci was very active in dissection work and did many public dissections. He was followed by Pietro di Argelata, who died toward the end of the fourteenth century. These men followed Mondino in the chair of anatomy at Bologna, and Julius Pagel, in his chapter on Anatomy and Physiology in Puschmann's Handbuch der Geschichte der Medizin (Vol. I., p. 707), says that "the successors of Mondino were in a position, owing to the gradual enlightenment of the spirit of the time and the general realization of the importance of anatomy as well as the fostering liberality of the authorities, ***to make regular, systematic dissections of the human body.***" This would bring us down, then, to the end of the fourteenth century.

To return now to Roth, who takes up the next century. He says:

> "For the fifteenth century, the university statutes of Bologna for the year 1405 furnish many sources of information. There is a special division which is concerned with the ***annual anatomy or dissection*** that had to be made and the selection of the persons to be present, the payment of the expenses and other details. An addition to the statutes, made in the year 1442, determines the arrangement of the delivery of the body from the city to the university authorities. Every year two bodies, one male and one female, must be provided for the medical school dissections. In default of a female body, a second male body was to be provided. In the presence of such detailed regulations, the absence almost entirely of details as to the actual performance of dissections can mean very little. Bologna reached its highest development as a medical school at the beginning of the sixteenth century when Alexander Achillinus and Jacob Berengarius had charge of the public dissections there. Of these I shall speak later." (All this is at the University of Bologna, where ecclesiastical influence was supreme and where the Popes exercised their jurisdiction as the ultimate authority to be appealed to in all disputed educational questions.)
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> Roth continues: "Padua had, like Bologna, dissection in the fourteenth century. There is the record of a dissection made in the year 1341, in which Gentilis made the discovery of a gall-stone." (It is evidently not because the dissection was unusual, but because the discovery was unusual, that this incident is mentioned. The dissections were such ordinary occurrences as not to deserve special mention except for some particular reason.)
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> "Much more is known about dissection at Padua in the fifteenth century, when the city had become Venetian." [Footnote 11] (It is significant to note that the previous occurrence was in pre-Venetian days, for Professor White insists that it was the Venetian authorities, in opposition to the Pope, who allowed dissection at Padua. Here is the rebuttal of any such theory.) "Bertapaglia, in his Surgery, has the record of the dissection of a criminal made under the direction of Master Hugo De Senis, on the 8th of February, 1429. On the 4th of April, 1430, the dissection of

a woman was made. In 1444 Professor Montagnana speaks of fourteen dissections at which he had been present." (This would seem to indicate that dissections were quite common and that the occasional records of them give no proper idea of their actual number.)

[Footnote 11: Note that this is a full century before Vesalius's time, who, Professor White insists, reintroduced dissection.]

I would not wish to produce the impression, however, that Italy was the only place in Europe in which dissections were freely done during the fourteenth and fifteenth centuries. There is no doubt that anatomy and surgery and every branch of medicine was cultivated much more assiduously and with much better opportunities provided for students down in Italy, than anywhere else in the world. This of itself alone shows the utter absurdity of the declarations that the Church was opposed to medical progress in any way, since the nearer the center of Christendom, the more ardor there was for investigation and the more liberty to pursue original researches. Other countries also began to wake up to the spirit of progress in medical education that was abroad. In France there were two centers of interest in anatomy. One of these was at Montpelier, the other at Paris. It is interesting to note, however, that the men to whom anatomical progress is due at these universities obtained their training, or at least had taken advantage of the special opportunities provided for anatomical investigation to be had, in the Italian cities. Guy de Chauliac I have already mentioned. He is spoken of as the Father of Modern Surgery, and there is no doubt that he did much to set surgery on a very practical basis and to make anatomy a fundamental feature of the training for it. He declared that it was absurd to think that surgeons could do good work unless they knew their anatomy.

Under his fostering care the study of anatomy flourished to a remarkable degree at the University of Montpelier. The difficulty hitherto had been that it was very hard to procure bodies for dissecting purposes. It is easy to understand that friends of the dead would always prevent dissections as far as they could. They do so even at the present moment, and there are not many of us who find it in our hearts to blame them over much for it. Few of us are ready to make the sacrifice of our own dead. Even the poor in those days had friends who prevented the cutting up of their remains; for large alms-houses were not presided over by paid officials, but by religious, to whom their poor in their friendlessness appealed as kindred. There were not many prisons, and they were not needed because all felonies were punished by death. Guy de Chauliac realized that here was the best opportunity to procure bodies. Accordingly it was mainly through his instrumentality that a regulation was made handing over the dead bodies of malefactors to the medical school for dissecting purposes. It must be recalled that when he did this the Papal court was at Avignon, in the South of France, and exerted great influence over the University of Montpelier, situate not far away.

The reputation of the University of Paris is such that we should not expect her to be backward in this important department of education. As a matter of fact, there is abundant evidence of dissection having been carried on here at the end of the thirteenth century, and the practice was not interrupted at the beginning of the fourteenth century. Lanfranc, the famous surgeon who had studied with William of Salicet in Italy (we have already mentioned both of them and we shall have much to say of them hereafter), taught surgery from a very practical standpoint in Paris, and illustrated his teachings by means of dissections. Lanfranc was succeeded in Paris by Mondeville, whose name is also associated with the practice of dissection by most historians of medicine, and whose teaching was of such a practical character that there can be no doubt that he must have employed this valuable adjunct in his surgical training of students. In general, however, the records of dissecting work and of anatomical development are not near so satisfactory at Paris as in the Italian universities. As is the case in our own day and has always been true, universities were inclined to specialties in the Middle Ages, and the specialty of Paris was Philosophy and Theology. This was choice, however, not compulsion, any more than similar conditions in our own time. The medical school continued to be in spite of this one of the best in the world, though it was not famous for its original work, except in surgery, which

is, however, the subject most nearly related to anatomy and the one whose development would seem necessarily to demand attention to anatomy.

With the Renaissance, which is usually said to begin after the fall of Constantinople in 1453, and the consequent dispersion of Greek scholars throughout Italy, a new spirit entered into anatomy as into every other department of intellectual life at this time. The reason for it is not easy to explain. Perhaps the spread of Greek texts with regard to medicine inspired students and teachers to try out their problems for themselves, and so a new impetus was given to anatomical investigation. Whatever it was that caused it, the new movement came unhampered by the Church, and Italy continued to be even to a greater degree than before the Mecca for medical students who wished to do original work in anatomy. During the last fifty years of the fifteenth century anatomy began its modern phase, and original work of a very high order was accomplished. There are five names that deserve to be mentioned in this period. They are Gabriele Zerbi, Achillini, Berengar of Carpi, Matthew of Gradi and Benivieni. Each of these men did work that was epoch-making in anatomy, and each has a place in the history of the science that will never be lost.

Zerbi, who did his work at Verona, traced the olfactory nerves and describes the nerve supply of the special senses more completely than it had ever been done before. After his time it was only a question of filling in the details of this subject. Achillini added much to our knowledge of the anatomy of the head, being the first to describe the small bones of the ear and also to recognize the orifices of Wharton's ducts. Besides this, which would have been quite enough to have given him a place in the history of anatomy, he added important details to what had been previously known with regard to the intestines, and described very clearly the ileocecal valve and suggested its function. Matthew of Gradi, or De Gradibus, was the first, according to Professor Turner in his article on Anatomy in the Encyclopaedia Britannica, who represented the ovaries in the correct light as regards their anatomical relations and their function.

The most important of these fifteenth century investigators in pure anatomy, however, is Berengarius or Berengar of Carpi, who did his work at Bologna at the end of the fifteenth and the beginning of the sixteenth century. His commentaries on Mondino's work show how much he added to that great teacher's instruction. If he had no other distinction than that of having been the first to undertake a systematic view of the several textures of which the body is composed, it would have been sufficient to stamp him as a great original worker in anatomy. He treats successively of the anatomical characters and properties of fat, of membrane in general, of flesh, of nerve, of villus or fibre, of ligament, of sinew or tendon, and of muscle in general. Almost needless to say, he must have made many dissections to obtain such clear details of information, and, as we shall see, he probably did make many hundreds. If he had done nothing else but be the first to mention the vermiform appendix, it would have been quite sufficient to give him a distinction in our day. Everything that he touched, however, he illuminated. His anatomy of the fetus was excellent. He was the first to note that the chest of the male was larger than in the female, while the capacity of the female pelvis was in the opposite ratio. In the larynx he discovered the two arytenoid cartilages. He recognized the opening of the common biliary duct, and was the first to give a good description of the thymus gland. All this, it must be remembered, before the end of the second decade of the sixteenth century, that is, almost before Vesalius was born.

Berengar's work was done at Bologna. Some five years before his death Bologna became a Papal city. There is no sign, however, that this change in the political fortunes of the city made any difference in Berengar's application to his favorite studies in anatomy. As we shall see in the chapter on The Papal Medical School, already the Popes were laying the foundations of their own great medical school in Rome, in which anatomy was to be cultivated above all the other sciences, so that there would be no reason to expect from other sources of historical knowledge any interruption of Berengar's work, and it did not come.

A fifth great student of anatomy during the fifteenth century was Benivieni, who has been neglected in the ordinary histories of anatomy because his work concerned itself almost exclusively with pathological, not with normal anatomy. In our increasing interest in pathology during the nineteenth century, he has very properly come in for his due share of attention. Professor Allbutt, in his address on the Historical Relations of Medicine and Surgery down to the Sixteenth Century, declares that Benivieni should be revered as the forerunner of Morgagni and as one of the greatest physicians of the late Middle Ages. Benivieni's life occupies almost exactly the second half of the fifteenth century, as he was born probably in 1448, and died in 1502. Allbutt says:–

> "He was not a professor, but an eminent practitioner in Florence, at a period when, in spite of its Platonism, Florence on the whole was doing most for science; for as Bologna turned to law, Padua turned to humanism and philosophy. He was one of those fresh and independent observers who, like Mondeville, was oppressed by the authority neither of Arab nor Greek."

We are not interested, however, at the present time in what he accomplished for surgery, though there are a number of features of his work, including the crushing of stone in the bladder and his puncture of the hymen for retained menses, as well as his methods of division and slow extension of the cicatricial contractions resulting from burns near the elbow, which place him among the most ingenious and original of surgical thinkers. It is his interest in dissection that commends him to us here. He must have done a very great number of autopsies.

His interest in the causes of disease was so great that he seems to have taken every possible opportunity to search out changes in organs which would account for symptoms that he had observed. His place in anatomy and the history of pathology has not been properly appreciated in this matter, and Professor Allbutt claims for him the title of Father of Pathology, rather than for those to whom it has been given, and demands for his work done in Florence during the second half of the fifteenth century the credit of laying the real foundation-stones of the great science of pathological anatomy. Unfortunately, he died comparatively young and without having had time properly to publish his own contributions to medical science. Professor Allbutt says:–

> "The little book ***De abditis causis morborum*** (brief title), was not published in any form by Antony Benivieni himself, but posthumously by his brother Jerome, who found these precious notes in Antony's desk after his death, and with the hearty cooperation of a friend competent in the subject, published them in 1506 in a form which no doubt justly merits our admiration. Benivieni's chief fame for us is far more than all this; it is that he was the founder of pathological anatomy. So far as I know, he was the first to make the custom and to declare the need of necropsy to reveal what he called not exactly "the secret causes," but the hidden causes of diseases. Before Vesalius, before Eustachius, he opened the bodies of the dead as deliberately and clear-sightedly as any pathologist in the spacious time of Baillie, Bright and Addison. Virchow, in his address at Rome, said Morgagni was the first pathological anatomist who, instead of asking What is disease? asked Where is it?"
>
> But Benivieni asked this question plainly before Morgagni: "Not only," says he, "must we observe the disease, but also with more diligence search out the seat of it." The precept is so important, I will quote the original words: "Oportet igitur medicum non solum morbum cognoscere, sed et locum in quo fit, diligentius perscrutari."

Among the pathological reports are morbus coxae (two cases); biliary calculus (two cases); abscess of the mesentery, thrombosis of the mesenteric vessels; stenosis of the intestine; some remarkable cardiac cases, several of "polypus" (clot, which was a will-of-the-wisp to the elder pathologists); scirrhus of the pylorus, and probably another case in the colon; ruptured bowel (two

cases); caries of ribs with exposure of the heart. He gives a good description of senile gangrene which even Paré did not discriminate. He seems to have had remarkable success in obtaining necropsies; concerning one fatal case he says plaintively, "Sed nescio qua superstitione versi negantibus cognatis," etc. Of another he says, "cadavere publicae utilitatis gratia inciso" (the case of cancer of the stomach). With this admirable and original leader, Italian medicine of the fifteenth century closes gloriously, to slumber for some fifty years, till the dayspring of the new learning. Of his work Malpighi says, and apparently with truth, "up to now it is the only work in pathology which owes nothing to anyone."

This should be enough, it seems to me, to settle the question that anatomy was permitted very freely before Versalius's time. I have said it in other places, but it may be well to recall here, that Berengar did his dissection at Bologna just before and after the time it became a Papal city and when Papal influence was very strong. In spite of the fact that in 1512 Bologna passed under the dominion of the Popes, there is no question of any interruption or hampering of Berengar's work in anatomy, and as a matter of fact, this great anatomist did not succeed to the professorship of anatomy, which had been held up to this time by Achillini, until in the very year when Bologna came under Papal sway, and had his opportunity to do his independent work only after this. Professor Turner can scarcely find words strong enough to set down his admiration for Berengar and his work. Besides what we have already quoted he says that, "the science of anatomy boasts in Berengar of one of its most distinguished founders."

The distinguished Edinburgh anatomist harbors no illusions with regard to any supposed opposition of the Church to dissection or to the development of anatomy. As a life-long student of anatomy who knew the history of his favorite science, he appreciated very well just who had been the great workers in it and where their work had been done. He says that "Italy long retained the distinction of giving birth to the first eminent anatomists in Europe, and the glory she acquired in the names of Mondino, Achillini, Berengar of Carpi, and Massa was destined to become more conspicuous in the labors of Columbus, Fallopius and Eustachius." These are the greatest names in the history of anatomy down to the beginning of the seventeenth century, with the single exception of Vesalius.

All this of anatomical development in Italy at universities that were directly under the ecclesiastical authorities would seem to settle all question of interference by the Popes or the Church with any phase of anatomical development. It does not seem sufficient for Dr. White, however. When I called attention to all these details of the history of anatomy, long before the reformation and before Vesalius, Dr. White's response was the following paragraph in which he explains how dissection came to be practiced at all, and reiterates not only his belief that Pope Boniface's bull prevented dissection, but even insists on what cannot but seem utterly absurd to any one who has read even the brief account I have given here, that except at one or two places, and then only to a very limited degree, dissection was not practiced at all. Here is how the history of dissection must be viewed according to Dr. White:–

> "But Dr. Walsh elsewhere falls back on the fact that shortly after the decree of Pope Boniface VIII., which struck so severe a blow at dissection, the Venetian Senate passed a decree ordaining that a dissection of the human body should be made every year in the city of Venice, and he leaves his readers to conclude that this effectually proves that dissection had not really been discouraged by the Pope. The very opposite conclusion would be deduced by anyone familiar with the relations between the Republic of Venice and the Papacy. These two powers were always struggling against each other; again and again the Venetian Republic, in maintaining its rights, braved the Papal interdicts. The fact that it allowed dissections, so far from proving that the Pope allowed them, would seem to prove that in this case, and in so many other cases, and especially that of Vesalius of Padua, the Venetian Senate sought to show the Vatican that it would yield none of its rights to clerical control. This very fact–that Venice refused to be bound with regard to anatomical investigation by an order from the Vatican–seems to be entirely in the line with all

> the other facts in the case, which show that the Roman court had committed itself, most unfortunately, against the main means of progress in anatomy and medicine."

Here then is the answer that a modern historian and educator makes to all the representations with regard to the development of anatomy and the practice of dissection during the Middle Ages. If the practice of dissection was permitted it was in spite of the Popes. The fact that there were a dozen of medical schools in Italy at which dissection was carried on is ignored. The great anatomists of the fourteenth and fifteenth centuries simply did not exist–Dr. White knows nothing about them. There must be no admission that the Popes permitted dissection or any other form of science. Dr. White makes his last stand by a really marvelous tour d'esprit. It was Venice defying the Vatican that permitted dissection. This, he supposes, may help him, for anatomy did develop very wonderfully at Padua when it was Venetian territory. But, as pointed out by Roth, dissection was practiced very successfully, and the anatomical tradition established at Padua, before it came under the dominion of Venice. At all the other important cities of Italy dissection was carried on. We have given some of the evidence for Verona, for Pisa, for Naples, for Bologna, for Florence, and, be it remembered, even for Rome. Padua was the rival of Bologna in anatomy only for a comparatively short time. Bologna always maintained a primacy in the field of anatomy, and never more so than after she became a Papal city at the beginning of the sixteenth century. Vesalius taught and demonstrated not at Padua alone, but also at Bologna and at Pisa. For two centuries Rome was the most successful rival of Bologna, ***and hundreds of dissections were done in the Papal Medical School***.

Of course, the appeal to Venetian opposition to the Papacy as an explanation for dissection being carried on in Italy in spite of ecclesiastical regulations to the contrary is only a subterfuge. It can only be found in histories written by those who refuse to see facts as they were, because those facts do not accord with pet theories as to Papal Opposition to Science, and the Warfare Between Theology and Science, which must be maintained at all costs, though with an air of apology always for having to tell such unpleasant truths of these old-time religious authorities.

# THE GOLDEN AGE OF ANATOMY VESALIUS

The Golden Age of discovery in anatomy culminated during the first half of the sixteenth century. This will not be surprising if it is but recalled that this period represents the culmination also of that larger golden age of achievement in art and letters, which has been called the Renaissance. Columbus and Copernicus were giving men a new world and a new universe. Raphael, Michael Angelo, Lionardo da Vinci, the Bellinis and Titian were creating a new world of art. Most of these artists were deeply interested in anatomy. Every phase of human thought was being born anew. Unfortunately, this word Renaissance has given rise to many misunderstandings. Many people have taken its significance of re-birth to mean that art and letters, and with them education and thinking, were born again into the modern world at this time with the coming in of the New Learning, just as if there had been nothing worth while talking about in these lines of human accomplishment in the preceding centuries. Taken in this sense, the word Renaissance is entirely a misnomer. Magnificent achievements in art and letters and every form of education preceded the Renaissance by at least three or four centuries. The Gothic cathedrals and the enduring artistic development that took place in their making, the magnificent organization of technical education in the training of artist artisans by the guilds of the time (we would be glad if our technical schools could accomplish anything like the same results, for evidently, though the name technical education is our invention, these medieval peoples had the reality to a high degree), and finally the universities, which have remained essentially the same down to our own day–all these serve to show how much was done for every form of education many centuries before the beginning of the Renaissance so-called.

It is not surprising that with this much of education abroad in the land men succeeded in making enduring literature in every form and in every country in Europe, and in setting examples of style in prose and verse that succeeding generations have nearly always gone back to admire lovingly. Such an amount of education and development of thinking could not have come without profound attention to science, and, as a matter of fact, there was much more anticipation of even what is most modern in our scientific thinking than most scholars seem to have any idea of. Personally, I have found, in writing the history of The Thirteenth the Greatest of Centuries, more that interested me in the science of this century than in almost any other department of its wonderful educational development.

We have already seen that while anatomy had during preceding centuries only the beginning of the development that it was destined to reach during the sixteenth century, it would be a serious mistake to think that the study of anatomy, having died in the old classical days, was not re-born until the sixteenth century. This would be to commit the error that many ardent devotees of the Renaissance make with regard to all the accomplishments of this period. In spite of the contrary almost universal impression, the Renaissance was not original to any marked degree. With the touch of the Greek spirit that had come again into the world, it only carried the preceding work of great original thinkers to a high order of perfection. This happened as well in anatomy as in art and architecture and literature. Anatomical science was a lusty infant of great promise when Vesalius, the Father of Anatomy, came on the scene. The great painters, Raphael and Lionardo and Michael Angelo, owed much to Giotto and Fra Angelico, who had preceded them, but not more than Vesalius and his contemporaries, who did such magnificent work in original anatomical investigation, owed to Mondino, Bertrucci, Zerbi, Achillini, and above all to Berengar of Carpi and Benivieni, who did their work before and just after the sixteenth century opened. There is never a sudden development in the history of any department of man's knowledge or achievement, as there is nothing absolutely new under the sun, though it is still the custom of the young man in his graduation essay to talk of such things, and older men sometimes

fail to realize the truth that in history as in biology, life always comes from preceding life–***omne vivum ex vivo***--and there is no such thing as spontaneous generation.

If the achievements of this earlier period of scientific work, which affected anatomy even more than any of the other sciences, be kept in mind, the discussion of the Golden Age of Anatomy will find its proper place in the history of the relation of the Popes to science. Though the date of the Golden Age in Anatomy follows that of the so-called reformation, there is absolutely no connection between the two series of events, for the one took place in Germany and the other in Italy. The Golden Age of Anatomy was indeed a perfectly legitimate and quite to be expected culmination of the anatomical interest which had been gradually rising to a climax in the Italian universities during the preceding century. It has a definite place in the evolution of science, and is not a sudden or unlooked for phenomenon.

If there was any place in the world at the beginning of the sixteenth century in which the ecclesiastical authorities had much to say with regard to what should not be taught and what should not be studied in the universities, it was Italy. In spite of this fact, all medical men who wanted to do post-graduate work in medicine went down into Italy. This was especially true for those who desired to obtain ampler opportunities for anatomical study than were afforded by the rest of Europe. In his maturer years as a student of medicine, Vesalius went down to Italy in order to avail himself of the magnificent field for investigation that was provided there. This favorable state of affairs as regards research in anatomy had existed for more than a century before his time. It continued to be true for at least two centuries after his time. As a matter of fact, Italy was to the rest of the world of the fifteenth and sixteenth and seventeenth centuries the home of post-graduate opportunities in all sciences as well as in medicine.

These are not idle words, but are fully substantiated by the lives of the men who stand at the head of our modern medicine. More than a decade before Vesalius was born, Linacre, the distinguished English physician and founder of the Royal College of Physicians, went to Italy to complete his medical studies and incidentally also to round out his education in the midst of the new learning which was so thoroughly cultivated there. When Linacre was leaving Italy, with true classic spirit he set up a little altar on the top of the Alps whence he could get his last view of the Italian plains, and greeted the charming country that he was leaving so reluctantly with the beautiful name of Alma Mater Studiorum. To him, after his return to England, English-speaking medical men owe the establishment of the institution which above all others has helped to uplift the dignity of the medical profession and make the practice of the healing art something more than a mere trade–the Royal College of Physicians.

One of Vesalius's most distinguished fellow students at Padua was Dr. John Caius, who was later to become the worthy president of the Royal College of Physicians of England and the author of certain important medical works. Dr. Caius was the first to introduce the practice of public dissections into England. Caius and Vesalius were roommates, though at the time Vesalius was an instructor at the University, and the inspiration of his originality seems to have had a great effect upon young Caius. They were nearly of the same age, though Vesalius was a precocious genius, and Caius's greatness only showed itself in maturity. Caius was studying in Italy partly because the religious disturbances in England had made it uncomfortable for him to remain in his native country, for he was a firm adherent of the old Church and he hoped they would pass over, but mainly because he coveted the opportunities afforded by that country. Later in life, out of the revenues of his position as Royal Physician to Queen Mary and subsequently for some time to Queen Elizabeth, he founded the famous Caius College at Cambridge, usually called Key's College by Cantabrigians.

Before either of these men there had been a third distinguished English physician who had gone down to Italy for his education. This was the celebrated and learned John Phreas, who was born about the commencement of the fifteenth century. Very little is known of his career, but what we do know is of great interest. He was educated at Oxford and obtained a fellowship on the foundation of

Balliol College. Afterward he seems to have studied medicine with a physician in England, but was not satisfied with the medical education thus obtained. He set the fashion for going down into Italy sometime during the first half of the fifteenth century, and after some years spent at Padua received the degree of doctor in medicine, which in those days carried with it, as the name implies, the right to teach. As not infrequently happens to the brilliant medical student, he settled down for practice in the university town in which he graduated, to take up both occupations, that of teacher and practitioner. He is said to have made a large fortune in the practice of physic. [Footnote 12] The best proof of his scholarship is to be found in some letters still preserved in the Bodleian and in the Library of Balliol College. Personally, I have considered that his career was interesting from another standpoint. I have often looked in history for the cases of appendicitis which occur so frequently in our day and with regard to which people ask how is it they did not occur in the past. The fact is, they did occur, but were unrecognized. People were taken suddenly ill, not infrequently a short time after a meal, and after considerable pain and fever, swelling and great tenderness in the abdomen developed, and they died with all the signs of poisoning. They were actually poisoned, not by some extraneous material, but by the putrid contents of their own intestines which found a way out through the ruptured appendix. These cases were set down as poisoning cases, and usually some interested person was the subject of suspicion. Dr. Phreas's learning had obtained for him an appointment to a bishopric in England, a curious bit of evidence of the absence of opposition between medical science and religion in his time. He died shortly after this, under circumstances that raised a suspicion of poisoning in the minds of some of his contemporaries–but raises the thought of appendicitis in mine,–and one of his rivals was blamed for it.

> [Footnote 12: Like the other distinguished physicians of this time, John Phreas did not devote himself to medicine alone. He had a taste for literature, and besides being an accomplished scholar he was a poet.]

Nor did the custom for English medical students to go down to Italy to complete their education cease with the so-called reformation. Some two generations after Vesalius's time another distinguished Englishman, Harvey, went down to Italy to complete the studies he had already made and eventually to lay the foundation of that knowledge on which he was twenty years later to construct his doctrine of the circulation of the blood. This doctrine, however, remained merely a theory until the distinguished Italian anatomist, Malpighi, after another half century, demonstrated the existence of the capillaries, the little blood vessels which connect the veins and arteries, and by thus showing the continuity of both the blood systems, proved beyond all doubt the certainty of the teaching that the blood does circulate.

Students came, moreover, from even the distant North of Europe to the Italian schools of medicine during these centuries. Neil Stensen, or as he is perhaps better known by his Latin name, Nicholas Steno, the discoverer of the duct of the parotid gland, which has been named after him, and of many other anatomical details, especially of the fact that the heart is a muscle, which stamp him as an original investigator of the highest order, after having made extensive studies in the Netherlands and in France to complete the medical education which he had begun in his native city of Copenhagen, went down into Italy to secure freer opportunities for original research than he could obtain anywhere else in Europe. [Footnote 13]

> [Footnote 13: It may perhaps be of interest to say that while doing investigation in anatomy and certain other sciences allied to medicine, Steno became a convert to the Catholic Church and after some years became a priest. Before his ordination, however, though after his conversion, he received the call to the chair of anatomy at Copenhagen. He accepted this and worked for several years at the Danish University, but was dissatisfied with the state of affairs around him as regards religion and went back to Italy. Eventually he was made a bishop–hence the curious picture of him

> in a Roman Catholic Bishop's robes in the collection of pictures of professors of anatomy at the University of Copenhagen. Not long after, at his own request, he was sent up to the Northern part of Germany in order to try to bring back to the Church as many of the Germans as might be won by his gentleness of disposition, his saintly character, his wonderful scientific knowledge, and his winning ways. He is the Father of Modern Geology as well as a great anatomist, and his little book on geology was published after he became a priest, yet did not hamper in any way his ecclesiastical preferment nor alienate him from his friends in the hierarchy. He was honored especially by the Popes. In a word, his career is the best possible disproof of any Papal or ecclesiastical opposition to science in his time.]

We have mentioned that it was while he was pursuing his special investigations in various Italian universities that Stensen was honored with the invitation to become professor of anatomy at the University of Copenhagen. This was not a chance event, but a type of the point of view in university education at the time. Just as at the present time the prestige of research in a German university counts for much as a recommendation for professorships in our American universities, so in the sixteenth and seventeenth centuries was it with regard to study in Italy. It was felt that men who had spent several years there could be reasonably expected to know all that there was to be known in the rising sciences of anatomy and physiology; at the same time there was a very general impression, quite justified by the results observed, that those who did their post-graduate work in Italy were nearly always sure to make discoveries that would add to the prestige of their universities later, and that would be a stimulus to students and to the other teachers around them such as could be provided in no other way. If read in the proper spirit, the history of the universities of those times is quite like our own, only for influence, the name of Italy must always be substituted for that of Germany. Yet Italy, if we were to believe some of the writers on the history of education and science, was at this time laboring under the incubus of ecclesiastical intolerance with regard to anatomy and an almost complete suppression of opportunities for dissection. Those who write thus know nothing at all of the actual facts of the history of science, or else they are blinding themselves for some reason to the real situation.

Fortunately students of the facts of history, especially those who have devoted any serious attention to the history of medicine, make no such mistake. For them it is perfectly clear that there was a wonderful development in anatomy which took place down in Italy, beginning about the middle of the fifteenth century or even earlier, and which led to the provision of such opportunities for dissection and original research in medicine, that students from all over the world were attracted there. For instance, Professor Clifford Allbutt, in the address on the Historical Relations of Medicine and Surgery to the end of the Sixteenth Century, already quoted, has a passage in which, as an introduction to what he has to say about Galen, he sums up the history of anatomy from the return of the Popes from Avignon to Rome, which took place just about the beginning of the last quarter of the fourteenth century, down to the time of Vesalius. This expresses so well what I have been trying to say with regard to the gradual development that led up to the Golden Age of Anatomy and to Vesalius's work, that I quote it.

> "Meanwhile, however, the return of the Popes to Rome (1374) and the displacement of the Albucasis and Avicenna by the Greek texts renewed the shriveling body of medicine, and with the help of anatomy, Italian medicine awoke again; though until the days of Vesalius and Harvey the renascence came rather from men of letters than of medicine. The Arabs and Paris said: "Why dissect if you trust Galen? ***But the Italian physicians insisted on verification; and therefore back to Italy again the earnest and clear-sighted students flocked from all regions.*** Vesalius was a young man when he professed in Padua, yet, young or venerable, ***where but in Italy would he have won, I would not say renown, but even sufferance!***

> If normal anatomy was not directly a reformer of medicine, by way of anatomy came morbid anatomy, as conceived by the genius of Benivieni, of Morgagni, and of Valsalva; the galenical or humoral doctrine of pathology was sapped, and soaring in excelsis for the essence of disease gave place to grubbing for its roots."

A sketch of Vesalius's career will give the best possible idea of the influences at work in science during this Golden Age of anatomical discovery, and will at the same time serve to show better than anything else, how utterly unfounded is the opinion that there was opposition between religion, or theology and science, and above all medical science, at this time. On the other hand, it will demonstrate that the educational factors at work in Vesalius's time were not different from those of the preceding century, nor indeed from those that had existed for two or three centuries before his time; and though his magnificent original research introduced the new initiative which always comes after a genius has left his mark upon a scientific department, the spirit in which science was pursued after his time did not differ essentially from that which had prevailed before. He represents not a revolution in medical science, as has so often been said, though always with the purpose of demonstrating how much the so-called reformation accomplished in bringing about this great progress in anatomy, but only a striking epoch in that gradual evolution which had already advanced so far that his work was rendered easy and some such climax of progress as came in his time was inevitable.

Vesalius's earlier education was received entirely in his native town of Louvain. There were certain preparatory schools in connection with the university at Louvain, and to one of these, called Paedagogium Castri because of the sign over the door, which was that of a fort, Vesalius was sent. Here he learned Latin and Greek and some Hebrew. How well he learned his Latin can be realized from the fact that at twenty-two he was ready to lecture in that language on anatomy in Italy. His knowledge of Greek can be estimated from the tradition that he could translate Galen at sight, and he was known to have corrected a number of errors in translations from that author made by preceding translators. To those who know the traditions of that time in the teaching of the classic languages along the Rhine and in the Low Countries, these accomplishments of Vesalius will not be surprising. They knew how to teach in those pre-reformation days, and probably Latin and Greek have never been better taught than by the Brethren of the Common Life, whose schools for nearly a hundred years had been open in the Low Countries and Rhenish Germany for the children of all classes, but especially of the poor. Other schools in the same region could scarcely fail to be uplifted by such educational traditions. Altogether, Vesalius spent some nine years in the Paedagogium.

As illustrating how men will find what interests them in spite of supposed lack of opportunities, it may be said that from his earliest years Vesalius was noted for his tendency to be inquisitive with regard to natural objects, and while still a mere boy his anatomical curiosity manifested itself in a very practical way. He recalls himself in later years, that the bladders with which he learned to swim, and which were also used by the children of the time as play-toys for making all sorts of noises, became in his hands objects of anatomical investigation. Anatomy means the cutting up of things, and this Vesalius literally did with the bladders. He noted particularly that they were composed of layers and fibres of various kinds, and later on when he was studying the veins in human and animal bodies he was reminded of these early observations, and pointed out that the vein walls were made up of structures not unlike those, though more delicate, of which the bladders of his childhood days had proven to be composed.

His preparatory studies over, Vesalius entered the University of Louvain, at that time one of the most important universities of Europe. At the end of the fifteenth and the beginning of the sixteenth century, Louvain probably had more students than any other university in Europe except that of Paris, and possibly Bologna. There are good grounds for saying that the number in attendance here during the first half of the sixteenth century was always in excess of 5,000. The university was especially famous for its teaching of jurisprudence and philology. The faculty of theology, however, was considered to be one of the strongest in Europe, and Louvain, as might be expected from

its position in the heart of Catholic Belgium, was generally acknowledged to be one of the great intellectual bulwarks of Catholicity against the progress of Lutheranism in the Teutonic countries at this time. Vesalius's parents were, and his family always had been, ardent Catholics, so that, quite apart from his dwelling not far away, it was very natural that he should have been sent here. He seems to have spent five years in the university mainly engaged in the study of philosophy and philology, but also of the classics and languages so far as they were taught at that time.

It may be noted as another instance in his life of how a student will find that which appeals to him even in the most unexpected sources, that Vesalius took special interest in certain treatises of Albertus Magnus and Michael Scotus, which treated of the human body in the vague, curious way of the medieval scholars, and yet with a precious amount of information, that this inquisitive youth eagerly drank in. More interesting for Vesalius himself were certain studies undertaken entirely independently of his university course. One of his biographers tells that he dissected small animals, rats and mice, and occasionally even dogs and cats, in his eagerness to learn the details of anatomy for himself and at first hand.

After graduating at Louvain in philosophy and philology, Vesalius went to Paris to study medicine. At this time at Paris, Sylvius, after whom one of the most important fissures of the brain, the sylvian, is named, was not only teaching anatomy in a very interesting way, but was also providing opportunities for original research in anatomy in connection with his own investigations. The interest that his teaching excited may be gathered from the fact that over 400 students were in attendance at his lectures. Besides Sylvius, Günther of Andernach in Switzerland was also teaching in Paris, and with both of these distinguished professors Vesalius became intimately associated. His deep interest in the subject of anatomy would of itself be quite sufficient to attract the attention of professors, but he had besides the added advantage of being known as the descendant of a family which had occupied prominent posts as medical attendants to the greatest ruling family of Europe.

It was at Paris, then, that Vesalius first was able to devote himself with the intense ardor of his character to the study of anatomy. Nothing less than original research at first hand would satisfy his ardent desire for information and his thirst for accurate knowledge. His practical temper of mind was demonstrated by a revolution that he worked in the method of doing dissections at the time. The dissections in Paris used to be performed by the barber-surgeons, as a rule rather ignorant men, who knew little of their work beyond the barest outline of the technics of dissection. Teachers in anatomy used to stand by and direct the operation and demonstrate the various parts. These teachers, however, considered it quite beneath them to use the knife themselves. The faultiness of this method can be readily understood. Vesalius began a new era in the history of anatomy by insisting on doing the dissections himself. It was not long, however, before he realized that Paris could not afford him such opportunities as he desired. Altogether he did not remain there more than a year, and then returned to the Low Countries.

At Louvain he continued his anatomical work, finding it difficult enough to procure human material, but using such as might come to hand. The story is told of his first attempt to get a complete skeleton. A felon had been executed just outside the walls of Louvain, and his remains were, as was the custom at that time, allowed to swing on the gibbet until the birds of the air had eaten his flesh and the wind and rain had bleached his bones. As might be thought, these bones were a great temptation to Vesalius. Finally, one night he and a fellow student stole out of the town and robbed the gibbet of its treasure. In order to accomplish their task–no easy one, because the skeleton was fastened to the beams of the scaffold by iron shackles–they had to remain out all night. They buried it and later removed it piecemeal, and when they had finally assembled the parts again it was exhibited as a skeleton brought from Paris.

Even this story has been made to do duty as showing the ecclesiastical opposition to dissection and the advancement of anatomical knowledge. It is hard to understand, however, why men will not look at such an incident from the standpoint of our own experience in the modern time. There are

men still alive in certain states of the Union who recall how much trouble they had to go to as medical students in order to procure a skeleton. If we go back fifty years, nearly every skeleton that physicians had in their offices was obtained in some way almost as surreptitious as that just described, or was purchased through some underhand channel. They were dug up from potter's field, or sometimes procured from complacent prison officials, or occasionally stolen from respectable cemeteries. In this respect Vesalius was not much worse off than were his medical colleagues for nearly three centuries and a half after his time in the northern countries. It was easier to procure such material in Italy.

Vesalius had that precious quality that makes the investigator desire to see and know things for himself. He could not get opportunities for definite anatomical knowledge in the western part of Europe, so he gave up his practice, though Louvain, his native town, was a most promising place, having nearly 200,000 inhabitants and business relations with all the world at the moment, and went down into Italy where he knew that he could pursue his anatomical studies to his heart's content. The tradition of the work that Zerbi and Achillini had done, and especially what Benivieni and Berengar had accomplished within a few decades before this time, was commonly known in all the medical schools of Europe, and many an ardent young anatomist in the West yearned for the opportunities and the incentive that he could obtain down there. Church influence was predominant; the ecclesiastics were the actual rulers of the universities, but medical science, and above all anatomy, was being studied very ardently. Vesalius thus prompted, came and found what he looked for. At the end of ten short years of work down there, he had completed his text-book of anatomy which was to earn for him deservedly the title of Father of Anatomy.

At first Vesalius seems to have spent some time in Venice, where he attracted considerable attention by his thorough, practical anatomical knowledge and independent mode of thinking. After only a short period in Venice, however, he proceeded to Padua, where he spent some months in preparation for his doctor's examination. It is known that, having completed his examination in the early part of December, 1537, he was allowed within a few days to begin the teaching of anatomy, and, indeed, was given the title of professor by the university authorities.

The next six years were spent in teaching at Padua, Bologna and Pisa, and in fruitful investigation. Every opportunity to make dissections was gladly seized, and Vesalius's influence enabled him to obtain a large amount of excellent anatomical material. He began at once the preparations for the publication of an important work on the anatomy of the human body. This was published in 1543 at Basel, at a time when its author was not yet thirty years of age. It is one of the classics of anatomical literature. Even at the present day it is often consulted by those who wish to see the illustrative details of Vesalius's wonderful dissections as given in the magnificent plates that the work contains. It has become one of the most precious of medical books, and is eagerly sought for by collectors.

For ten years more Vesalius devoted himself to his favorite studies in anatomy and physiology, for it must not be forgotten that he was constantly applying his knowledge of form and tissue to function, and came to be looked upon as the leading medical investigator of the world. It is apparently sometimes not realized, however, that Vesalius was no mere laboratory or dissecting room investigator. After the publication of his great work on anatomy he set himself seriously to the application of what he had discovered to practical medicine and surgery. He was an intensely practical man. As a consequence, it was not long before consultations began to pour in on him, and he came to be considered as one of the greatest medical practitioners of his time. Ruling princes in Italy, visitors of distinction, high ecclesiastics–all wished to have Vesalius's opinion when their cases became puzzling. This is a side of his character that many of his modern biographers have missed. Even Sir Michael Foster, whose knowledge of the history of medicine, and especially of physiology, makes one hesitate to disagree with him, seems not to have appreciated Vesalius's interest in practical medicine. A laboratory man himself, he was apparently not able to appreciate why Vesalius should

have given up his scientific research in Italy to accept the post of Royal Physician to the Emperor Charles V.

Professor Foster thinks it necessary, then, to find some other reason than the temptation of the importance of the position to account for Vesalius's acceptance of it. He concludes that it was because of discouragement in his purely scientific studies as a consequence of the opposition of the Galenists. Opposition on the part of the old conservative school of medicine there was, and some of it was rather serious. This was not enough, however, to have discouraged Vesalius. Professor Foster goes so far as to wax almost sentimental over the fact that the acceptance of the post of physician to Charles V. ended Vesalius's scientific career; "for though in the years which followed the Father of Anatomy from time to time produced something original, and in 1555 brought out a new edition of his Fabrica, differing chiefly from the first one, so far as the circulation of the blood is concerned, in its bolder enunciation of its doubts about the Galenic doctrines touching the heart, he made no further solid addition to the advancement of knowledge. Henceforward his life was that of a court physician much sought after and much esteemed–a life lucrative and honorable and in many ways useful, but not a life conducive to original inquiry and thought. The change was a great and a strange one. At Padua he had lived amid dissections; not content with the public dissections in the theatre, he took parts, at least, of corpses to his own lodgings and continued his labors there. No wonder that he makes in his Fabrica some biting remarks to the effect that he who espouses science must not marry a wife; he cannot be true to both. A year after his arrival at the Court he sealed his divorce from science by marrying a wife; no more dissections at home, no more dissections indeed at all; at most, some few post-mortem examinations of patients whose lives his skill had failed to save. Henceforth his days were to be spent in courtly duties, in soothing the temporary ailments, the repeated gouty attacks of his imperial master, in healing the maladies of the nobles and others round his throne, and doubtless in giving advice to more humble folk, who were from time to time allowed to seek his aid. Whither his master went, he went too, and we may well imagine that in leisure moments he entertained the Emperor and the Court with his intellectual talk, telling them some of the fairy tales of that realm of science which he had left, and of the later achievements of which news came to him, scantily, fitfully and from afar."

Professor White has gone much farther than Sir Michael Foster. The English physiologist knew too much about the history of medicine in Italy even to hint at any ecclesiastical opposition with regard to Vesalius. President White, however, has no scruples in the matter. This makes an excellent opportunity to write the kind of history that is to be found in his book. Apparently forgetful of the thought that the Emperor Charles V. was not at all likely to take as his body physician a man who had been in trouble with the ecclesiastical authorities in Italy, he insists that the reason why Vesalius dedicated his great work on anatomy to the Emperor Charles V. was "to shield himself as far as possible in the battle which he foresaw must come." Later he suggests that it was only the favor of the Emperor saved him from the ecclesiastical authorities.

All that has been said by historians with regard to the reasons for Vesalius's acceptance of the post of physician to the Emperor Charles V. can only have come from men who either did not know or had for the moment forgotten the story of Vesalius's ancestry. The family tradition of having one of its members as physician to the Court of the German Emperor was four generations old when Vesalius accepted the position.

Vesalius's great-grandfather occupied the position of physician-in-ordinary to Marie of Burgundy, the wife of the German Emperor Maximilian I., the distinguished patron of letters in the Renaissance period. He lived to an advanced age as a professor of medicine at Louvain. From this time on Vesalius's family always continued in official medical relation to the Austrian-Burgundy ruling family. His grandfather took his father's place as physician to Mary of Burgundy, and wrote a series of commentaries on the aphorisms of Hippocrates. Vesalius's father was the physician and apothecary to Charles V. for a while, and accompanied the Emperor on journeys and campaigns.

What more natural than that his son, having reached the distinction of being the greatest medical scientist alive, should be offered, and as a matter of course accept the post of imperial physician!

The simple facts of the matter are that Vesalius came down into Italy in order to study anatomy, because in that priest-ridden and ecclesiastically-ruled country he could get better opportunities for anatomical study and investigation than anywhere else in Europe. He spent ten years there and then wrote his classical work on anatomy. After that he spent some years applying anatomy to medicine. Then when he had come to be the acknowledged leader of the medical profession of the world, the Emperor Charles V., at that time the greatest ruler in Europe, asked him to become his court physician. Vesalius accepted, as would any other medical investigator that I have ever known, under the same circumstances. His position with Charles V. gave him opportunities to act as consultant for many of the most important personages of Europe, and it must not be forgotten that when the King of France was injured in a tournament Vesalius was summoned all the way from Madrid, and gave a bad prognosis in the case.

In the light of this simple story of Vesalius's life in Italy, and of the reasons for his going there and his departure, it is intensely amusing to read the accounts of this portion of Vesalius's life, written by those who must maintain at all costs the historical tradition that the Church was opposed to anatomy, that the Popes had forbidden dissection, and that the ecclesiastical authorities were constantly on the watch to hamper, as far as possible at least, if not absolutely to prevent, all anatomical investigation, and were even ready to put to death those who violated the ecclesiastical regulations in this matter. Dr. White, for instance, has made a great hero of Vesalius for daring to do dissection. He was only doing what hundreds of others were doing and had been doing in Italy for hundreds of years; but to confess this would be to admit that the Church was not opposed to anatomy or the practice of dissection, and so perforce Vesalius must be a hero as well as the Father of Anatomy. To read Dr. White's paragraph in the History of the Warfare of Science with Theology, one cannot but feel sure that Vesalius must practically have risked death over and over again in order to pursue his favorite practice of dissection and his original researches in anatomy. I would be the last one in the world to wish to minimize in any way Vesalius's merits. He was a genius, a great discoverer–above all an inspiration to methods of study that have been most fruitful in their results, and withal a devout Christian and firm adherent of the Roman Catholic Church. He was not a hero in the matter of dissection, however, for there was no necessity for heroism. Dissection had been practiced very assiduously before his time in all the universities of Italy, especially in Bologna, which was a Papal city from the beginning of the sixteenth century, and also in Rome at the medical college of the Roman University under the very eye of the Popes.

In the light of this knowledge read President White's paragraph with regard to Vesalius:

> "From the outset Vesalius proved himself a master. In the search for real knowledge he ***risked the most terrible dangers, and especially the charge of sacrilege, founded upon the teachings of the Church for ages.*** As we have seen, even such men in the early Church as Tertullian and St. Augustine held anatomy in abhorrence, and the decretal of Pope Boniface VIII. was ***universally construed as forbidding all dissection, and as threatening excommunication against those practicing it. Through this sacred conventionalism Vesalius broke without fear; despite ecclesiastical censure,*** great opposition in his own profession and popular fury, he studied his science by the only method that could give useful results. No peril daunted him. To secure material for his investigations, he haunted gibbets and charnel-houses, ***braving the fires of the Inquisition*** and the virus of the plague." (The italics are mine.)

A very interesting commentary on the expressions of Professor White with regard to Vesalius is to be found in a paragraph of Von Töply's article on the History of Anatomy in the second volume

of Puschmann's History of Medicine, already quoted. "Out of the fruitful soil so well cultivated in the two preceding centuries, there developed at the beginning of the sixteenth century the Renaissance of anatomy, with all the great and also with all the unpleasant features which belong to the important works of art of that period. One has only to think of Donatello, Mantegna, Michel Angelo, and Verochio to realize these. The Renaissance of anatomy developed in a field of human endeavor which, if it did not owe all, at least owed very much to the art-loving and culture-fostering rulers, Popes and cardinals of the time. Older historians have told the story of the rise of anatomy in such a way that it seemed that the Papal Curia had set itself ever in utter hostility to the development of anatomy. As a matter of fact, the Papal Court placed scarcely any hindrances in its path. On the contrary, the Popes encouraged anatomy in every way."

In the page and a half following this quotation Von Töply has condensed into brief form most of what the Popes did for medicine and the medical sciences, though more especially for anatomy, during the centuries from the sixteenth down to the beginning of the nineteenth. Some excerpts from this, with a running commentary, will form the best compendium of the history of the Papal relations to medical education and will show that they are strikingly different from what has usually been said. Von Töply begins with Paul III., who is known in history more especially for his issuance of the Bull founding the Jesuits. It might ordinarily be presumed by those who knew nothing of this Pope, that the Head of the Church, to whom is due an institution such as the Jesuits are supposed to be, would not be interested to the slightest degree in modern sciences, and would be one of the last ecclesiastical authorities from whom patronage of science could possibly be expected. It was he, however, who founded special departments for anatomy and botany and provided the funds for a salary for a prosector of anatomy at Rome.

After this practically every Pope in this century has some special benefaction for anatomy to his credit. Pope Paul IV. (1555-59) called Columbus to Rome and gave him every opportunity for the development of his original genius in anatomical research. Columbus had succeeded Vesalius at Padua and had been tempted from there to Pisa by the duke who wished to create in that city a university with the most prominent teachers in every department that there was in Italy, yet it was from this lucrative post that Pope Paul IV. succeeded in winning Columbus. Quite apart from what we know of Columbus's career at Rome and his successful investigation on the cadaver of many anatomical problems, perhaps the best evidence of the friendly relations of the Popes to him and to his work is to be found in the fact that, first Columbus himself, and then after his death his sons, in issuing their father's magnificent work De Re Anatomica, dedicated it to the successor of Pope Paul IV., the reigning Pope Pius IV. In the meantime Cardinal Della Rovere had brought Eustachius to Rome to succeed Columbus.

Under Sixtus V., who was Pope from 1585 to 1590, the distinguished writer on medicine, and especially on anatomy, Piccolomini, published his lectures on anatomy with a dedication to that Pope. It is well known that the relations between the professor of anatomy at the Papal Medical School and the Pope were very friendly. As was the case with regard to Colombo or Columbus, so also with Caesalpinus. Columbus was the first to describe the pulmonary circulation. Caesalpinus is generally claimed by the Italians to have made the discovery of the circulation of the blood throughout the body before Harvey. Columbus had been at Pisa and was tempted to come to Rome. Caesalpinus had also been at Pisa until Clement VIII. held out inducements that brought him to Rome. Clement is the last Pope of the century, but Von Töply mentions five Popes in the next century who were in intimate relations with distinguished investigators into medical subjects and whose names are in some way connected with some of the most noteworthy teaching and writing in medical matters during the seventeenth century.

It will be readily seen what a caricature of the life of Vesalius is Prof. White's paragraph, if one compares it with the following paragraph taken from so readily available an historical source as the article on the History of Anatomy, by Prof. Turner, of Edinburgh, in the first volume of the

Encyclopaedia Britannica. The distinguished Scotch anatomist who so worthily filled the chair of anatomy at the University of Edinburgh says with regard to Berengar of Carpi, who was the professor of anatomy at Bologna thirty-five years before Vesalius's time, that, "In the annals of medicine Berengar's name will be remembered as one of the most zealous and eminent in cultivating the anatomy of the human body. It was long before the anatomists of the following age could boast of equalling him. His assiduity was indefatigable, and he declares that he dissected above one hundred human bodies." This should be enough, it seems to me, to settle the question that anatomy was permitted very freely before Vesalius's time. Professor Turner's authority in such a matter is above all suspicion. He knew the history of anatomy.

If more evidence be needed, compare with President White's fantastic sketch of Vesalius the following sketch of his great contemporary, Columbus or Colombo, to whose anatomical investigations we owe the discovery of the pulmonary circulation:

> "The fame of Columbus as an anatomical teacher was exceedingly great and widespread. Students were attracted to the universities where he professed, from all quarters and in large numbers. He was an ardent student of his favorite science and was imbued with the genius and enthusiasm of an original investigator. He was not satisfied with the critical examination of mere structure, but extended his researches into the more subtle, difficult and important investigation of the physiological function. He has been most aptly styled the Claude Bernard of the sixteenth century. The work of Columbus is a masterpiece of method and purity of style, as well as on account of its richness in facts and observations. He spent over forty years in these studies and researches. ***He dissected an extraordinary number of human bodies. It must have been an age of remarkable tolerance for scientific investigation, for in a single year he dissected no less than fourteen bodies.*** He also entered the crypts and catacombs of ancient churches, where the bones of the dead had been preserved and had accumulated century after century, and there, with unwearied care, he handled and compared over a half million of human skulls."

This account was written by Dr. George Jackson Fisher in his "Historical and Bibliographical Notes" for the ***Annals of Anatomy and Surgery*** (Brooklyn, 1878-1880). All the material that Dr. Fisher used in his sketch is to be found in Roth's "Life of Vesalius," p. 256. Now, Columbus was a contemporary of Vesalius, and worked with him at Bologna. The years of their lives correspond almost exactly. When Vesalius left Padua to become the royal physician to Charles V., it was Columbus who succeeded him. Later he taught also at Pisa. Then, strange as it may seem for those who have put any faith in Dr. White's excursion into medical science, he was invited to become Professor of Anatomy at the Papal University at Rome, and it was while there that he had as many as three hundred students present at his demonstrations in anatomy and there that he did fourteen dissections in one year. The pretense that there was any ecclesiastical objection to dissection becomes absolutely farcical when one compares the life of Vesalius sketched by President White with a motive, and the life of his contemporary and successor, Columbus, by an unbiased physician, whose only idea was to bring out the facts.

According to Prof. White's opinion, Vesalius dedicated his work to Charles V. to shield himself as far as possible, and after this gave up his anatomical studies in Italy to put himself under the protection of Charles V.

Vesalius's successor, Columbus, did not have to do any such thing. Instead, he went down to Rome, and under the protection of the Popes continued to carry on his anatomical work there.

When Charles V. died, however, according to President White, a new weapon was forged against Vesalius. Vesalius was charged with dissecting a living man. President White hints that "the forces of ecclesiasticism united against the innovators of anatomy, and either from direct persecution

or from indirect influences Vesalius became a wanderer." Just what that means I do not know. President White does not say that he was exiled, though that idea is implied. There is a great deal of doubt about this charge of Vesalius having made an autopsy on a living person. Roth discusses various versions. The whole thing seems to be a trumped-up story; but supposing it true, would it not be only proper that a man who made an autopsy on a living person should be brought before the court? He certainly would in our day in any civilized country. Professor Foster, of the University of Cambridge in England, following the lead of President White in this matter, blames the Inquisition for instituting the prosecution. If this were true, no more proof would be needed that the Inquisition was a civil and not a religious institution, since after all the killing of a man by a premature autopsy is a plain case of homicide.

The fact of the matter seems to be that Vesalius, who had not been very well in the unsuitable climate of Madrid, made the trip to the Holy Land, partly for reasons of health, but partly also for reasons of piety. While returning he was shipwrecked on the island of Zante and died from exposure. Vesalius had been born in Brabant, at that time one of the most faithful Catholic countries in Europe. Like most of the other great men of his time, the reformation utterly failed to tempt him from his adhesion to the Catholic Church. His greatest colleagues in anatomy and in medicine were Italians, most of whom were in intimate relations with the Catholic ecclesiastics of the time and continued this intimacy in spite of the disturbing influences that were abroad. Many of these men will be mentioned in our account of the Papal Medical School and of the Papal Physicians during the next two or three centuries. The distinguished anatomists and physicians of France in Vesalius's time were quite as faithful Catholics as he was. Even Paracelsus, the Swiss, whose thorough-going independence of mind would, it might naturally seem, have tempted him to take up with the reformed doctrines, had no sympathy with them at all. He recognized the abuses in the Church, but said that Luther and the so-called reformers were doing much more harm than good, and that until they were gotten rid of no improvement in ecclesiastical matters could be looked for. When Paracelsus came to die he left his money mainly to the Shrine of the Blessed Virgin in his native town of Einsiedeln and for masses for his soul. Since their time most of the distinguished medical scientists have been quite as faithful in their Catholicity as these two great medical colleagues of the Renaissance period. While medicine is supposed to be unorthodox in its tendencies, the really great thinkers in medicine, the men to whose names important discoveries in the science were attached, were not only faithful believers in the doctrines of Christianity, but were much more often than has been thought even devout Catholics.

At the death of Vesalius the Golden Age of the development of anatomy was not at its close, but was just beginning. Eustachius, Caesalpinus, Harvey and Malpighi were during the course of the next century to make anatomy a science in the strict sense of that word. After Vesalius's time the history of anatomy in Italy centers around the Papal Medical School to a great extent. During Vesalius's lifetime his greatest rival became the professor of anatomy there. The anatomical school of Bologna, in connection with that city, became an important focus of anatomical investigation. At this time Bologna was a Papal city. It was in the dominions of the Popes, then, as we shall see, that anatomy was carried on with the most success and with the most ardor. Far from there being any opposition to the development of the science, every encouragement was given to it, and it was the patronage of the Popes and of the higher ecclesiastics that to a great degree made possible the glorious evolution of the science during the next century.

# SUPPOSED PAPAL PROHIBITION OF CHEMISTRY

A false impression, exactly corresponding to that with regard to anatomy, has been created and fostered by just the same class of writers as exploited the anatomy question, with reference to the attitude of the Popes and the Church of the Middle Ages toward the study of chemistry. This is founded on a similar misrepresentation of a Papal document. When it was pointed out that this Papal document, like Pope Boniface's bull, had no such purport as was suggested, just the same subterfuge as with regard to anatomy was indulged in. If the Papal document did not forbid chemistry directly, as was said, at least it was so misinterpreted, and chemistry failed to develop because of the supposed Papal opposition. These expressions were used, in spite of the fact that, just as in the case of anatomy, it is not hard to trace the rise and development of chemistry, or its predecessor, alchemy, during the years when it is supposed to be in abeyance. Certainly there was no interruption of the progress of chemical science at the date of the supposed Papal prohibition, nor at any other time, as a consequence of Church opposition.

The similarity of these two history lies is so striking as to indicate that they had their birth in the same desire to discredit the Popes at all cost, and to make out a case of opposition on the part of ecclesiastical authorities to scientific development, whether it actually existed or not. The surprise is, however, that the same form of invention should have been used in both cases. One might reasonably have expected that the ingenuity of writers would have enabled them to find another basis for the story on the second occasion. Still more might it have been expected that when the error with regard to the tenor of the Papal document was pointed out to them, a different form of response would be made in the latter instance. The whole subject indicates a dearth of originality that would be amusing if it were on a less serious matter, and does very little credit either to those who are responsible for the first draft of the story, but still less to those who have swallowed it so readily and given it currency.

The story of the Supposed Papal Prohibition of Chemistry was characteristically told by William J. Cruikshank, M. D., of Brooklyn, New York, in an address bearing the title, "Some Relations of the Church and Scientific Progress," published in The Medical Library and Historical Journal of Brooklyn for July, 1905. The writer called emphatic attention to the fact that chemistry, during the Middle Ages, had come under the particular ban of the ecclesiastical authorities, who effectually prevented its cultivation or development. "The chemist," Dr. Cruikshank says, "was called a miscreant, a sorcerer, and was feared because of his supposed partnership with the devil. He was denounced by Pope and priest and was persecuted to the full extent of Papal power. Pope John XXII. was especially energetic in this direction, and in the year 1317 A.D., issued a bull calling on all rulers, secular and ecclesiastical, to hunt down the miscreants who were afflicting the faithful, and he thereupon increased the power of the Inquisition in various parts of Europe for this purpose."

At the suggestion of the editor of the Medical Library and Historical Journal, I answered these assertions of Dr. Cruikshank, pointing out that the Papal document which he mentioned had no such purport as he declared, and that the history of chemistry or alchemy presented no such break as his assertions would demand. Dr. Cruikshank immediately appealed by letter to his authority on the subject, whose words, in the History of the Warfare of Theology with Science in Christendom, though I did not realize it at the time, he had repeated almost literally. In his chapter on From Magic to Chemistry and Physics, Dr. Andrew D. White says: "In 1317, Pope John XXII. issued his bull ***Spondent pariter,*** levelled at the alchemists, but really dealing a terrible blow at the beginning of chemical science. He therefore called on all rulers, secular and ecclesiastical, to hunt down the miscreants who thus afflicted the faithful, and he especially increased the power of inquisitors in various parts of Europe for this purpose." It will be seen that, as I have said, Dr. Cruikshank's words are almost a verbatim quotation from this paragraph. It is true that he has strengthened the expressions quite a little and added some trimmings of his own, still I suppose his expressions could be justified

if those of President White had a foundation in fact. A little comparison of the two sets of phrases will show how a history lie grows as it passes from pen to pen. ***Crescit eundo***--like rumor, it increases in size as it goes.

In defense of this passage in the History of the Warfare of Science with Theology in Christendom, Dr. White wrote a letter of reply to Dr. Cruikshank, which was incorporated into Dr. Cruikshank's response to my article in the Medical Library and Historical Journal. I presume that this was done with Dr. White's permission. In this letter he admitted that Pope John's decretal had no such significance as he originally claimed for it, but he still maintained his previous opinion, that this decretal, like Boniface's bull for anatomy, had actually prevented, or at least greatly hampered the study of chemistry. To this I replied with a brief story of chemistry in the fourteenth century, and though that article was published more than a year ago, no admission has been made and nothing further has been published on the subject. The material of the reply to Dr. White, to which as yet there has been no answer, is comprised in this chapter.

As I have already hinted, the most surprising thing about this citation of a Papal decree forbidding chemistry, is that it proves on investigation to be founded on just exactly the same sort of misinterpretation of a Papal document as happened with regard to anatomy. The bull of Pope Boniface VIII. forbidding the boiling of bodies and their dismemberment for burial in distant lands, did nothing to hinder the progress of anatomy, had no reference to any preparations required for dissection, and was not misinterpreted in any such sense until the nineteenth century, and then only for the purpose of discrediting the Popes and their relations to science. Pope Boniface's bull, far from being harmful in any way to education or to the people, was really beneficial, and constituted an excellent sanitary regulation which doubtless prevented, on a number of occasions, the carriage of disease from place to place.

The decree of Pope John XXII., which has been falsely claimed to forbid chemistry, was another example of Papal care for Christendom, and not at all the obscurantist document it has been so loudly proclaimed. Pope John learned how much imposition was being practiced on the people by certain so-called alchemists who claimed to be able to make silver and gold out of baser metals. In order to prevent this, within a year after his elevation to the pontificate he issued not a bull, but a very different form of document–a decretal–forbidding any "alchemies" of this kind. The punishment to be inflicted, however, instead of being the penalty of death, as Dr. Cruikshank, Dr. White and many others have declared, or at least let it be understood from their mode of expression, was that the person convicted of pretending to make gold and silver and selling it to other people, should pay into the public treasury an amount equal to the supposed amount of gold and silver that he had made. ***The money thus paid into the public treasury was to be given to the poor.***

The best way to show exactly what Pope John intended by his decree is to quote the decree. It does not occur in the ordinary collection of the bulls of John XXII., for it was not, as we have said, a bull in the canonical sense of the term, but a Papal document of minor importance. There is an important distinction between a decree and a bull, the former being but of lesser significance, usually referring only to passing matters of discipline. The decretal may be found in the Corpus Juris Canonica, Tome II., which was published at Lyons in 1779. It is among the decrees or constitutions known as Extravagantes. [Footnote 14]

> [Footnote 14: The meaning of this term we discussed in the previous chapter on Anatomy in relation to the bull of Boniface and Liber VI. The motto of the publisher of the volume in which it occurs deserves quotation because of its apt application in the present circumstance. It is in Latin: "Quod tibi fieri non vis, alteri ne feceris"–"What you would not have done to yourself, don't do to another." If writers about the Popes were as careful to substantiate accusations against them as fully as they would like any accusations against themselves to be corroborated before being accepted and circulated, we should hear much less of Papal intolerance and of

Church opposition to science. Even a dead Pope must be considered as a man whose reputation one should not malign without good reason and substantial proof. I must add that, as with regard to the other Papal documents mentioned, I owe the copy of this decree to Father Corbett, of St. Charles Borromeo Seminary, Overbrook, Pennsylvania, and am indebted to him besides for many helpful suggestions.]

We quote the decree as it is found in Canon Law:

The Crime of Falsification.

"Alchemies are here prohibited and those who practise them or procure their being done are punished. They must forfeit to the public treasury for the benefit of the poor as much genuine gold and silver as they have manufactured of the false or adulterate metal. If they have not sufficient means for this, the penalty may be changed to another at the discretion of the judge, and they shall be considered criminals. If they are clerics, they shall be deprived of any benefices that they hold and be declared incapable of holding others." (See also the Extravagant of the same John which begins with the word 'Providens' and is placed under the same title.) [Footnote 15]

[Footnote 15: The decree referred to here was issued by John XXII. against the counterfeiting of the money of France. The fact that the two decrees should be considered by canonists as connected in subject shows just what was thought to be the purport of the first, namely, to prevent the debasement of the currency by the admixture of adulterate gold as well as to protect the ignorant from imposition.]

"Poor themselves, the alchemists promise riches which are not forthcoming; wise also in their own conceit they fall into the ditch which they themselves have digged. For there is no doubt that the professors of this art of alchemy make fun of each other because, conscious of their own ignorance, they are surprised at those who say anything of this kind about themselves; when the truth sought does not come to them they fix on a day [for their experiment] and exhaust all their arts; then they dissimulate [their failure] so that finally, though there is no such thing in nature, they pretend to make genuine gold and silver by a sophistic transmutation; to such an extent does their damned and damnable temerity go that they stamp upon the base metal the characters of public money for believing eyes, and it is only in this way that they deceive the ignorant populace as to the alchemic fire of their furnace. Wishing to banish such practices for all time, we have determined by this formal edict that whoever shall make gold or silver of this kind or shall order it made, provided the attempt actually follows, or whoever shall knowingly assist those engaged (actually) in such a process, or whoever shall knowingly make use of such gold or silver either by selling it or giving it for debt, shall be compelled as a penalty to pay into the public treasury, to be used for the poor, as much by weight of genuine gold and silver as there may be of alchemic metal, provided it be proved lawfully that they have been guilty in any of the aforesaid ways; for those who persist in making alchemic gold, or, as has been said, in using it knowingly, let them be branded with the mark of perpetual infamy. But if the means of the delinquents are not sufficient for the payment of the amount stated, then the good judgment of the justice may commute this penalty into some other (as, for example, imprisonment, or another punishment, according to the nature of the case, the difference of individuals, and other circumstances.) Those, however, who in their regrettable folly go so far as not only to sell moneys thus made but even despise the precepts of the natural law, pass the bounds of their art and violate the laws by deliberately coining or casting

> or having others coin or cast counterfeit money from alchemic gold or silver, we proclaim as coming under this animadversion, and their goods shall be confiscate, and they shall be considered as criminals. And if the delinquents are clerics, besides the aforesaid penalties they shall be deprived of any benefices they shall hold and shall be declared incapable of holding any further benefices." [Footnote 16]
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> [Footnote 16: The Latin text of this decretal will be found entire in the appendix.]

It is evident that John's decree against "The Crime of Falsification" did not directly forbid chemistry, nor alchemy in the proper sense of the word, nor did it in any way interfere with the study of substances to determine their composition, or the synthesis of materials to produce others, provided there was no pretense of making gold and silver in order to obtain genuine gold and silver from ignorant dupes. There seems to be no doubt that had the famous scheme to obtain gold from sea water, which caused serious loss to so many foolish and even poor people a few years ago, come up during the time of John XXII., he would have prevented it from being so lucrative to its promoters, by publicly denouncing them and promulgating a law for their punishment.

It may be considered that excommunication was not a very severe penalty for such dishonest practices, and that the sharpers who gave themselves to such a profession, which would be about that of the confidence or green goods men of our time, were not likely to be affected much by this merely religious deprivation. It must not be forgotten, however, that in those ages of faith, excommunication became an extremely telling social punishment. It was forbidden that anyone, even nearest and dearest friends, should have anything to do with the one excommunicated until the ban was removed. It was bad enough in a town where everyone belonged to the same church, and all went to church frequently, to be forbidden to go there; it was infinitely worse, however, to have everybody who passed refuse to greet you or have relations of any kind with you. President Hadley, of Yale, said, not long since, that social ostracism is the only effective punishment for such manifest extra legal irregularities, which are yet not so essentially criminal as to bring those guilty of them under legal punishment. The sentence of excommunication was an effective social ostracism–the completest possible. This is an aspect of excommunications usually missed, but well deserving of study by those who resent the use of such an instrument by ecclesiastical authorities. Just as soon as the man repented of what he had done and promised to do so no more, he was received back into the Church, and the ostracism ceased, so long as he did not relapse into his forbidden ways.

When the eminently beneficial character of this Papal document is thus appreciated, it is indeed painful to have to realize, that for its issuance John has been held up more to scorn and ridicule than perhaps has ever been the case for any other single formal document that has ever been issued by an ecclesiastical or political authority. He was simply correcting an abuse in his day, the existence of which we recognize and would like to be able to correct in ours. For this eminently proper exercise of the Papal power, however, his whole character has been called into question, and a distinguished modern educator has used every effort to place him in the pillory of history, as one of the men who have done most to hamper progress in science and education in all world history. The amusing thing is the utter inequality between the document itself and its supposed effects. Of course it had no such effect as President White claims for it, and, indeed, he seems never to have seen the document in its entirety before it was called forcibly to his attention long after his declarations with regard to it were published. The real attitude of Pope John XXII. with regard to education and the sciences, which was exactly the reverse of that predicated of him by his modern colleague in education, will be the subject of the next chapter.

There is another document of John XXII., the bull ***Super Illius Specula***, that has been sometimes quoted, or rather misquoted, and which indeed at first I was inclined to think was the bull referred to by Dr. Cruikshank. This second Papal document, however, was not issued until 1326. It

is concerned entirely with the practice of magic. The Pope knew that many people, by pretended intercourse with the devil or with spirits of various kinds, claimed to be able to injure, to obtain precious information, to interpret the future and the past, and to clear up most of the mysteries that bother mankind. We have them still with us–the palmist, the fortune-teller, the fake-spiritist. In order to prevent such impostures, John issued a bull forbidding such practices under pain of excommunication. It is almost needless to say that this Papal document must have effected quite as much good for the people at large as did the previous one forbidding "alchemies," which must have prevented the robbing of foolish dupes who were taken with the idea that the alchemists whom they employed could make gold and silver. Of this second Papal document, this time really a bull, we shall, because President White has given it an even falser construction than the one we have just been discussing, have more to say in the next chapter.

We must return, however, to the decretal ***Spondent pariter,***--the decree supposed to have forbidden chemistry; for as with regard to the bull of Boniface VIII., previously discussed, it seems that it is necessary not only to show that the decree was not actually intended by the Popes to prohibit chemistry, but also it will have to be made clear that it was not misinterpreted so as to hamper chemical investigation. This is indeed a very curious state of affairs in history. First, it is solemnly declared, that certain bulls and Papal documents were directed deliberately against the sciences of anatomy and chemistry by the Head of the Church, who wished to prevent the development of these sciences lest they should lessen his power over his people. Then, when it is shown that the documents in question have no such tenor, but are simple Papal regulations for the prevention of abuses which had arisen, and that they actually did accomplish much good for generations for which they were issued, the reply is not an acknowledgement of error, but an insistence on the previous declaration, somewhat in this form: "Well, the Popes may not have intended it, but these sciences, as a consequence of their decrees, did not develop, and the Popes must be considered as to blame for that." Then, instead of showing that these sciences did not develop, this part is assumed and the whole case is supposed to be proved. Could anything well be more preposterous. And this is history! Nay, it is even the history of science.

When I called attention to the fact that this decretal contained none of the things it was said to, and published the text of it, Dr. White very calmly replied: "Dr. Walsh has indeed correctly printed it, and I notice no flaw in his translation." Instead of conceding, however, that he had been mistaken, he seemed to consider it quite sufficient to add, "I have followed what I found to be the unanimous opinion of the standard historians of chemistry." He did not mention any of the historians, however. I asked him by letter to name some of the standard historians of chemistry who made this declaration, but though I received a courteous reply, it contained no names, and, indeed, avoided the question of chemistry entirely. It is not too much to expect that an historian shall quote his authorities. Dr. White seems to be above this. Some documents that he quotes are distorted, and prove on examination, as we have seen, to have quite a different meaning to that which he gives them. As might be expected, his supposed facts prove to have as little foundation. It will be remembered that he completely ignored or was ignorant of the history of anatomy. He seems to have been just as ignorant of the history of chemistry, in spite of his confident assurance in making far-reaching statements with regard to it. In order to satisfy myself, I went through all of the standard histories of chemistry in German, English and French that are available in the libraries of New York City, and I failed to find a single one of them which contains anything that might be supposed even distantly to confirm President White's assertion.

I may have missed it, and shall be glad to know if I have. I cannot do more than cite certain of them that should have it very prominently, if Dr. White's assertion is to be taken at its face value. Here are some standard historians whom I have searched in vain for the declaration that all of them should have.

Kopp, who is the German historian of chemistry, mentions the fact that there was much less cultivation of chemistry during the fourteenth century than during the thirteenth, but makes no

mention of the bull of Pope John as being responsible for it. There are curious cycles of interest in particular departments of science, with intervals of comparative lack of interest that can only be explained by the diversion of human mind to other departments of study. This seems to have happened with regard to chemistry in the fourteenth century.

Hoefer, the French historian of chemistry, mentions the fact that Pope John XXII. took severe measures against the alchemists who then wandered throughout the country, seeking to enrich themselves at the expense of the credulity of the people. He evidently knew of this decree then, but he says nothing of its forbidding or being misinterpreted, so as to seem to forbid chemical investigation. Thomson, the English historian of chemistry, has no mention of any break in the development of chemical science, caused by any action of the Popes, though, to the surprise doubtless of most readers, he devotes considerable space to the history of chemical investigation during the thirteenth and fourteenth centuries. Ernst von Meyer mentions the fact that alchemy was abused by charlatans, in order to make pretended gold and silver, and notes that there was not so much interest in chemistry in the fourteenth as in the thirteenth century, but does not ascribe this fact to the bull of Pope John.

I expected at least that I should find something with regard to the question of the possible influence of the bull in Berthelot's "History of Chemistry in the Middle Ages." [Footnote 17] But though there are various historical topics treated that would seem to imply the necessity for saying something about the bull, if it had any such effect as described, yet there is no mention of it. He mentions the Franciscan alchemists of northern Italy, who lived about this time, and discusses the "Rosarium," written very probably after the date of the bull by a Franciscan monk, but there is no suggestion as to any hampering of alchemy by Papal or other ecclesiastical restrictions.

[Footnote 17: Berthelot's Histoire de la Chimie au Moyen Age. Paris, 1893.]

The French Grande Encyclopedie does not mention it, nor does a German encyclopaedia, also consulted. Even the Encyclopaedia Britannica, in its article on alchemy, makes no mention of the prohibition of alchemy by Pope John XXII., and when the Encyclopaedia Britannica does not mention any scandal with regard to the Popes, then the scandal in question must have an extremely slight or no foundation.

Of course this is what might be expected. Anyone who reads the Papal decree can see at once that it has nothing to do with, or say about, chemistry or chemical investigation. Since, however, an aspersion has been cast upon the progress of chemistry during the Middle Ages, and since it will surely be thought by many people that, if chemistry did not happen to interest mankind at that time, it must have been because the Pope was opposed to it (for such seems to be the curious chain of reasoning of certain scholars), it has seemed well to review briefly the story of chemistry during the thirteenth, fourteenth and fifteenth centuries. More will be said about it in the chapter on Science at the Medieval Universities, and here the only idea is to bring out the fact that men were interested in what we now call chemical problems; that whatever interest they had was absolutely unhampered by ecclesiastical opposition; that indeed the very men who did the best work in this line, and their work is by no means without significance in the history of science, were all clergymen; and that most of them were in high favor with the Popes, and some of them have since received the honor of being canonized as saints.

# Конец ознакомительного фрагмента.