HISTORICAL DEVELOPMENT OF MATHEMATICAL EDUCATION IN VENEZUELA DURING THE EIGHTEENTH AND NINETEENTH CENTURIES

By

FREDDY A. MULINO-BETANCOURT

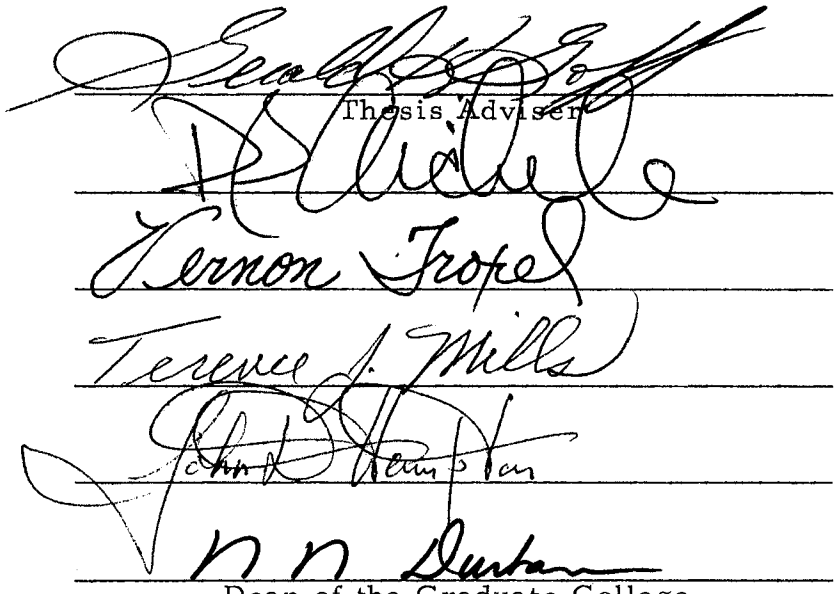
Ingeniero Civil
Universidad del Zulia
Maracaibo, Venezuela
1957

Master en Ciencias
Universidad de Carabobo
Valencia, Venezuela
1971

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF EDUCATION
July, 1974

HISTORICAL DEVELOPMENT OF MATHEMATICAL EDUCATION IN VENEZUELA DURING THE EIGHTEENTH AND NINETEENTH CENTURIES

Thesis Approved:



Thesis Adviser

Dean of the Graduate College

ACKNOWLEDGMENTS

The present dissertation was made possible thanks to the cooperation of several institutions and people which helped at different stages of its development. I wish to express my deep appreciation to all of them. Among the first, the University of Carabobo, Valencia, Venezuela, for its support during the leave of absence required to finish my graduate work, and to Dr. Gerald K. Goff, who spend countless hours on guidance and help. To Dr. Douglas Aichele, Dr. John D. Hampton, Dr. Terence Mills, and Dr. Vernon Troxel for their invaluable advice and kindly assistance and to Dr. Norberto Cuesta Dutari, professor of the University of Salamance for his suggestions and help.

Miss Kathy Goff deciphered the manuscript and made the early draft of the dissertation, and Mrs. Mary Bonner typed the final copy; to both of them my warmest thanks.

Finally, I wish to dedicate this work to my wife, Esther, and our children, Freddy, Carmen Zoila, Esther, Jose, Conchita and Maristela for their understanding, encouragement and support.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Background

During the eighteenth century, the structure of what is now the Republic of Venezuela started to take shape under the influence of crucial events in the economical, political, and cultural realms.

The exploitation of pearl shoals, discovered by Columbus in 1498, near an island, which for that reason, he gave the name of Margarita,[1] had dwindled by the turn of the seventeenth century, and the group of provinces of the actual territory of Venezuela were the most impoverished and backward colonies of the Castilian crown in America. Commerce between Venezuela and Spain was practically non-existent by the end of the 1600's. (According to DePons, Spain sent only two register ships to Venezuela in the second half of that century.)[2] At the same time, the production of cocoa was growing in importance and, since there was no trade with Spain, the contraband of the commodity increased. After the Dutch colonization of Curacao, in 1634, they encouraged the contraband to the extent that, even though Spanish America raised the world's supply of the commodity, Holland dominated the trade well into the eighteenth century.

The ascent of the Bourbons to the Crown of Spain, a dynasty related to the most enlightened court of the day, fostered a change in

the situation. After some previous and unsuccessful attempts,[3] the Real Compania Guipuscoana de Caracas was granted royal privileges on September 25, 1728, for trade with the Province of Caracas, and after supplying Caracas, to sell goods to Cumaná, Trinidad and Margarita. Maracaibo was added to this grant in 1739. Also, the Company had coast guard functions from the Rio de Hacha to the Orinoco, which included the entire Caribbean coast of Venezuela.[4]

The energetic actions of the Guipuscoan Company benefited the agricultural output of the region to such an extent that the backward colony became the most productive non-mining economy of the Spanish Crown in America by mid century,[5] the cocoa crop was more than doubled, cattle were estimated as three times as numerous, and the Company developed the tobacco from Barinas as an export commodity.

It is not surprising that provinces which were developing a unity of commerce became united in government under the Audiencia of Santo Domingo in 1777. In 1786, the Audiencia of Caracas was created by Royal Order, with a territory including the provinces of Caracas or Venezuela, Barinas, Barcelona, Merida, Trujillo and Coro, formerly of the Audiencia of Santo Domingo, and Cumana, Margarita, Guiana, and Trinidad, which belonged to the Audiencia of Santa Fe de Bogota before 1777.[6]

Long before the administrative unification of the provinces, and almost at the same time as when the Guipuscoan merchants began negotiations for the charter of the Company, the Colegio Seminario de Santa Rosa de Lima, of Caracas, was transformed into the University of Caracas. Felips V dispatched a Royal Letter Patent in Lerma, December 22, 1721, authorizing the college to grant degrees and

elevating it to university status with the same rights and privileges as the University of Santo Domingo, one of the oldest of the Continent. Pope Inocent XIII, on December 18, 1722, gave canonical recognition to the University, and, finally on August 9, 1723, Bishop Juan Jose Escalona y Calatayud inaugurated solemnly the Royal and Pontificial University of Caracas.[7]

This conjunction of events makes the eighteenth century an adequate point of departure for the study of the evolution of institutional aspects of Venezuela. One of them is the teaching of mathematics, which is the focus of this dissertation.

Purpose of the Study

The objective of this dissertation is to study the historic development of the teaching of mathematics in Venezuela during the eighteenth and nineteenth centuries, especially in its applied form in engineering, from the early schools in the colonial 1700's to the republican colleges and universities of 1900.

Method

The method employed in this expository dissertation is the historical research of the development of the educational institutions according to contemporary printed sources.

An important part related to pertinent legislation. For the different eras, the Nueva Recopilacion (Madrid, 1775), laws of the Republic of Colombia in the compilation published by the Central University of Venezuela in 1961, and the laws and reglamentary decrees of Venezuela in the official editions, were consulted.

The textbooks used in the schools have also been reviewed. Special reference is made to a textbook on mathematics printed in 1772 for the use of the schools of the Spanish Army, which was probably also used in Venezuela in the last quarter of the eighteenth century.

The Public Services Office of the National Library of Venezuela was very helpful in the elaboration of the Venezuelan bibliography related to the subject and provided a sizable amount of material, in photocopies, which were not available in libraries in the United States. In this way, several publications in Venezuelan magazines and newspapers, manuscripts of libraries catalogs, and a few short books were accessible.

Limitations of the Study

The present study focuses on the historical development of teaching of mathematics in Venezuela during the eighteenth and nineteenth centuries, and specifically between 1760 and 1897. The early date, 1760, marked the beginning of the teaching of mathematics as such, different from the basic elementary rules of the elementary arithmetic in first letters schools. The latter, 1897, was the year in which the engineering schools were separated from the studies of mathematics, and secondary education was structured. This event resulted in the disappearance of the studies of mathematics, as such, in higher education until the 1930's and the embodiment of algebra, geometry, and trigonometry in secondary education.

Organization of the Study

The plan of the study has been divided into two parts corresponding to the two main divisions of the historiography of Venezuela: the Hispanic Period and the Republican Period. The first part includes three chapters to consider the educational institutions in Spanish Colonial America, the teaching of mathematics during this period in Venezuela, and a textbook of this time.

To the Republican Period correspond the following six chapters. In each of them, the general historical setting of the country is considered at first, then the educational panorama of the time is presented with particular emphasis on the teaching of mathematics. The closing chapter summarizes the historical development of the teaching of mathematics and draws some conclusions suggested by the study. Some areas of further interest for future research are also indicated there.

FOOTNOTES

[1]Before 1609 margarita had the meaning of pearl, in Spanish. From Latin margarita, pearl, and Greek margarites. See Joan COROMINAS, Breve diccionario etimologico de la lengua castellana, 2nd ed. (Madrid, 1967), p. 382.

[2]Roland Dennis Hussey, The Caracas Company 1728-1784: A Study in the History of Spanish Monopolistic Trade (Cambridge, 1934), p. 52.

[3]Ibid., pp. 40-48.

[4]Ibid., pp. 60-62.

[5]Ibid., pp. 87-88.

[6]Guillermo MORON, Historia de Venezuela, Vol. V, La Nacionalidad (Caracas, 1971), p. 69.

[7]Ildefonso LEAL, Historia de la Universidad de Caracas: 1721-1827 (Caracas, 1963), p. 34.

CHAPTER II

THE HISPANIC PERIOD

The Educational Institutions

A variety of educational institutions appeared in Venezuela during the hispanic period, which ended in 1821. Their existence was the result of a twofold political interest which pointed to the culturization of the aborigines in one direction and to the preservation of the Spanish culture within the offsprings of the Spaniards in the colony in the other. Both purposes were accomplished by the teaching of the language, customs, and religion and the training of people for public service, the church, and the army in different types of schools. The whole gamut, from elementary to higher education, was present: elementary schools, grammar schools, teaching in convents, religious colleges, seminaries, academies, and universities.

Elementary Schools

The source of political power in the cities was centered in the Cabildo,[1] or City Council, since the remoteness of the Audiencias made it difficult to control this body, as was the case in Lima and Mexico. The Cabildo was at the heart of the social, religious, and economic life of the city. It administrated the city and appointed all the officers in its government. Even the title of city was associated

with the existence of the Cabildo. Elementary education was also its responsibility, and the councilmen were interested in it, at least for the children of the upper class of the population, since one essential requirement to belong to the Cabildo was to be able to read and write. According to the Venezuelan historian, Guillermo Morón, literacy was common in the XVI Century;[2] the growth of the population increased illiteracy, especially in the segment of the population produced by the crossing of races, but at the same time incited a greater effort to organize education.

The Cabildo granted permission to operate schools of "first letters," fomented, and partially supported its operations. In Caracas, Luis Cárdenas Saavedra, in 1591, and Simón de Bazauri, in 1594, established elementary schools to teach students "to read, write, and count." In 1701, there was a gradation in the students of those elementary schools, since in two new schools organized by the Cabildo the parents of the students had to pay "two reales each month for those who read, four reales for those who write, and six for those who count."[3] To "count" was an expression used for the arithmetic needed in the common life and referred to the knowledge of the four basic operations. The curriculum was the traditional three R's, which still form the nucleus of elementary education.

Elementary schools were in no way limited to Caracas. The Cabildos and missionaries opened schools in every city and many towns. In some cases, the schools were only for girls, as the "Jesús, María y José School" initiated by Bishop Baños y Sotomayor in 1694 and endowed by Josefa de Ponte y Liendo in 1754. Others, for indians, were mainly staffed by missionaries. In both schools the

instruction included applied arts such as farming, sewing, weaving. Father Francisco Uzcátegui initiated two schools of mechanical arts in the late XVIII Century, one in Mérida and the other in Ejido, offering at the same time elementary instruction and training in carpentry, iron work, locksmith, masonry, pottery, and tanning.

Grammar Schools

The role now played by secondary education corresponded to Grammar Schools, in which general humanistic studies served as a basis for university work. The objective of the course of study was an adequate command of the Latin language, fundamental for any higher study. In addition to that, notions of religion, history, geography, and arithmetic formed the curricular offering of the grammar school.

The educational philosophy of the Castilian Crown was to leave the elementary schools in local care and to create and endow the other studies.[4] For this reason, by the end of the sixteenth century, the Cabildo of Caracas asked from the King the creation of a grammar school, which was decreed by Royal Order of September 14, 1952 and endowed with 200 pesos each year, for six years. The Cabildo had appointed Pedro de Arteaga as preceptor of grammar, even before the signing of the Order. The school of Caracas absorbed the grammar school of Coro, established by the Bishop Antonio de Alceaga in 1607, and was later annexed to the Seminary of Santa Rosa at the time of its creation in 1673. In the same Province of Caracas, other grammar schools were offering courses during the seventeenth century in Valencia and La Guaira.

In the eighteenth century there was a grammar school in Cumaná, created by Royal Order on December 24, 1759, and another in Barinas, established by the Governor Fernando Miyares González in 1788, which was transformed into the Royal College of San Carlos in 1792.

Religious Schools

The elementary and grammar schools mentioned above were established by the civil government, but also the same instruction was offered by the Church in convents, Jesuit colleges, and seminaries, which in some cases also included advanced courses in Philosophy and Theology.

The convents were centers of missionary activity and educational endeavors. The Franciscan Order had schools in Caracas, Trujillo, Valencia, Barquisimeto, and Maracaibo, to name some cities. Its library in Caracas served as the initial core of what is now the National Library of Venezuela. The Capuchins and the Dominicans were also active in education in their convents.

The Jesuit colleges were established in Mérida, Maracaibo, and, for less than 20 years, in Caracas. The Mérida college was the most important, operating from 1628 until 1767, when the Jesuits were expelled from the realms of the King of Spain. All the Jesuit colleges kept high standards, strictly regulated by the Ratio Studiorum-a curricular and methods guide which appeared in Rome in 1599. According to the Ratio the instruction offered in the grammar school, or faculty letters, was divided into five sections: three grammar classes; humanities, emphasized poetry; and rhetoric. The students

usually pursued their higher studies in the universities of Bogotá or Santo Domingo before the University of Caracas was established.

The seminary was a special type of school dedicated to the formation of the clergy, and by disposition of the Council of Trento (convoked in 1542) it was obligatory for every diocese to erect a seminary. The first diocese in Venezuela was founded in Coro in 1541 and the See transferred to Caracas in 1638. Originally, Caracas was the only diocese in the area that is now Venezuela. Cumaná and Margarita were under the Bishop of Puerto Rico, and Maracaibo belonged to the diocese of Santa Fé de Bogotá. In 1804 Caracas became an archbishopric, with Mérida and Guayana as part of the ecclesiastical province.

The seminaries have special interest in the history of education in Venezuela because the two oldest universities started as seminaries. The College Seminary of Santa Rosa de Lima was created in Caracas by Bishop Antonio González de Acuña on October 9, 1673, incorporating into it the grammar school and initiating the studies of Philosophy and Theology; it was approved by Royal Order of January 23, 1675, and elevated to university status as the University of Caracas in 1721. The first Bishop of Mérida, Fr. Juan Ramos de Lora, established the College Seminary of San Buenaventura on March 25, 1785, and it was formally approved by the King on September 14, 1786. Carlos IV gave it, in 1806, the authority to grant all university degrees in Philosophy, Theology, and Canon Law, and on September 21, 1810, the Superior Junta of Mérida transformed it into a university, which is now known as University of the Andes.

The curriculum of instruction in the seminaries included the study of the Latin language, Philosophy, and Theology. Relating to the teaching of mathematics, we may assume that some attention was given to the subject, since the knowledge of the computus was part of every cleric's training. The computus is the ensemble of rules by which the date of Easter is determined. All the holidays known as Movable Feasts are related to the date of Easter, which falls on the Sunday following the full moon after the vernal equinox, which can be as early as March 22 or as late as April 25. Since the problem of the determination of Easter reduces to the difference between a calendar based on the periodic revolutions of the moon, as the Jewish calendar, and other based in the sun, with the adoption of the Gregorian Calendar, in 1582, a practical system was obtained, based on the epact. The epact is the number of days in which the solar year exceeds the lunar year of twelve lunar months; i.e., the age in days of the December moon on January the first.

Other Schools

In addition to the forenamed types of institutions, other schools were also active. The noted school of music of Chacao was established in 1770, due to the action of Father Pedro Sojo and José Manuel Olivares. In Cumaná, the Chair of Philosophy was initiated by Father Blas de Rivera, and formally created by Royal Order of September 20, 1782. It corresponded to the three initial years of study in the university, and included arithmetic, algebra, and geometry. The order of the King explicitly indicated that the Chair ought to use the

book of Francisco Jacquier, which presented mathematics before the course of physics, usually taught in the second year of studies.

Closely related to the subject of the present dissertation were the schools Academia de Geometría y Fortificación, in Caracas, 1760, the Academia Militar de Matemáticas, in La Guaira, 1761, Academia de Matemáticas of Father Andújar, 1789, and, for a short time and at the beginning of the nineteenth century, the academy of mathematics of Juan Pires in Cumaná. Those schools sprang from the interest of certain officers in the Army to improve the training of their people, and of the civilians to prepare engineers for public works, agriculture, and mechanical arts. The description of the academies of mathematics is the central topic of the next chapter.

Universities

Even though higher education was offered in Cumaná and Mérida during the Hispanic Period, the University of Caracas was the only one fully established at that time that followed the pattern of the Spanish universities.

A peculiar characteristic of the universities of the Iberian Peninsula was their close relation with the Crown. In no other place is this connection found between universities and government before the middle of the fourteenth century. The first university which is known to have been created by an act of government is the University of Palencia in Old Castile, now nonexistent, which was established by King Alfonso VIII of Castile, in 1208-9.[5] The University of Salamanca, the oldest university in Spain, was created by Alfonso IX of Leon, who died in 1230. The exact date of the establishment of the

university is not known, but Fernando II, the Saint, of Castile, granted a charter of privileges to the university in 1243, and is considered as its second founder.[6]

Alfonso X, the Wise, the most illustrious monarch of the Middle Ages in Spain, astronomer and mathematician, as well as alchemist, poet, historian, and lawgiver, made the University of Salamanca one of the best universities of the world. The Royal Patron granted important privileges to the university, and in his famous Siete Partidas[7] a whole section on universities became the first university code in Western Europe. From that time, the University of Salamanca kept a place among the institutions of highest rank for more than three centuries. The university shared a part in the construction of the Astronomical Tables of Alfonso X, known as the Alphonsine Tables. In the fifteenth century, the navigational project of Christopher Columbus was discussed and approved at Salamanca. "In the sixteenth century the University of Salamanca was teaching the Copernican system, while Galileo was in prison."[8]

When Spain discovered and conquered America, Salamanca was in one of the greatest periods of its long history. More than 4,000 students attended its courses and its fame spread far beyond Spain. It was no more than a logical consequence that the universities of Hispanic America were created according to the Spanish tradition by act of government and followed the pattern of the University of Salamanca.

As important as the Royal Charter was the pontifical recognition of universities. Once the Pope imparted his approval to a university, graduates enjoyed the jus ubique docendi which amounted to an

accreditation valid in all of Christiandom. The ecclesiastical authority was represented in the university by the Maestrescuela, the member of the cathedral chapter in charge of schools.

This dual character of Spanish universities was reflected in their official names, Royal and Pontifical Universities, and more dramatically, in the struggle between the Rector and the Maestrescuela. Alfonso X had recognized that masters and scholars of a studium generale formed together a universitas, or guild, which should elect a rector whom all of them shall obey.[9] The rector was then the highest administrative officer, elected in a democratic way and with a limited term: one year, or two years at most. The latter was the case of the University of Caracas where the rector was elected for two years term and could not be re-elected. The position was filled alternatively by a layman and an ecclesiastic, providing he was not a member of a religious order. Persons who hold only a Doctor's degree in medicine or the Master degree in Philosophy were not eligible for the rectorship.

The Maestrescuela of the Cathedral was the Chancellor of the university and represented the authority of the Church in conferring the higher degrees of Licenciate and Doctor or Master. The Chancellor was also empowered by royal delegation as judge in civil and criminal cases of students and teacher and guardian of the constitutions granted by the king for the government of the university.

The universities in America were classified as Major Universities if they had the five facultades of arts, theology, civil law, canon law, and medicine, which were the usual ones in Spain, and Minor Universities if they had two to four of them.[10] The

faculties of Theology, Law, and Medicine were called Superior Faculties because admission to them required the bachelor's degree from the Faculty of Arts or Philosophy. The first degree granted in any faculty was the bachelor's degree, and the higher degrees were licenciate, and doctor or master. (The Faculty of Philosophy was the only one which granted the degree of Master, equivalent to the doctorate in the other faculties.)

In Europe the Faculty of Arts embodied all the studies not specifically related to law, medicine, or theology and was also in charge of a propaedeutic function for the other faculties. This last function, which was really a "secondary" instruction, gradually developed outside the university, except possibly in England, and by the nineteenth century it became a separate branch of formal education.[11] The degree of bachelor, as in use now in France and Latin America, is reserved for this secondary instruction.

The comprehensive concept of the studies in the Faculty of Arts or Philosophy, gave opportunity to Baltasar de los Reyes Marrero to introduce the teaching of mathematics in the University of Caracas in 1778, even if such action started a turmoil which required a decision by the Council of Indias in Spain. The studies in the Faculty were strictly regulated in the Constituciones given by the King to the University of Caracas in 1727. The guiding idea was similar to that of the old trivium and quadrivium, which included: "the arts of saying, and the sciences of what has been said." Prior to his acceptance to the university, the student had three years of latin, with some notions of history, religion, geography, and arithmetic, initially offered by the preceptorados de gramática, or grammar schools. Gradually,

the University assumed the responsibility of this previous instruction with three Chairs of Latin: Minor, Major, and Eloquence. Once able to use the language of the academic world, the student dedicated the first year, three hours a day, to the study of Logic, in order to learn the art of reasoning. In the second year, the subject of study was the tangible world, in the course of Physics; and in the third year, Methaphysics focused on incorporeal things and God. The Constituciones specified in detail which parts of the works of Aristotle were to be used as textbooks for the courses.[12]

By the last quarter of the Century the Aristotelian authority was seriously challenged. In the dissertations required for the degrees and in literary acts, the new philosophers of the Enlightment, the scientific concepts of Newton and Kepler in astronomy and physics, Davy and Lavoisier in chemistry, and Franklin and Volta in electricity, were discussed and studied. Of course, all of these were personal and optional studies, but when Dr. Marrero became titular holder of the Chair of Philosophy in 1788, he went a step further: since the University of Caracas had no chair of mathematics, he inserted after the Logic, in the first year, the studies of arithmetic, algebra, and geometry. Without too much regard for the letter of the Constituciones he made the study of mathematics compulsory for all his students. One of them, son of Dr. Cayetano Montenegro, refused to learn a lesson of algebra and was expelled from classes.

This situation created a great struggle inside the University with teachers and students divided in opposite factions. Dr. Montenegro, the father of the student, appealed to the Chancellor as enforcer of the Constituciones. The Chancellor ordered Dr. Marrero

to accept again the student in class and to abide by the letter of the regulations, under the threat of a fine if he did not agree. Marrero refused, and the Rector supported him, saying that the teaching of mathematics was previously approved by the Rector because mathematics was the logic for physics. The litigation grew and needed to be finally settled by the Council of Indias in Spain, in 1791: the classes of mathematics were to be offered only on a voluntary basis to the students, since they were not required in the Constituciones of the University of Caracas, the student was to be re-admitted to classes, and Dr. Marrero was required to pay only the expenses of the suit.[13]

In the long run, the victory was for Dr. Marrero. He resigned his position as professor in 1791, before the results of the litigation were known, to accept the parish of La Guaira. But in 1801 he was designated Maestrescuela of the Cathedral of Caracas, and consequently Chancellor of the University, until his death in 1809. The professors who followed him continued to teach mathematics and contemporary philosophy, and after the independence of Venezuela, in 1826, the University proclaimed Dr. Baltasar Marrero as the founder of the modern studies of philosophy in the country.[14]

Mathematics got a de facto position in the Venezuelan university in the Hispanic period. The Vicerector in 1792 recorded in the Book of Visits to Chairs this statement: "[the professor] has used more than two months explaining arithmetic and algebra, even though the professor in charge has received instructions to be brief, because of complaints by the parents." Similar advice is given to other professors in 1807. In 1815, an official report from a professor of philosophy to the Secretario of the University stated: "the authors

consulted to write the notes of the course are: in Logic, Lugdunense, Altieria, Baldinot, Verney and Condillac; in Mathematics, Bails and Tosca; in Chemistry, Lavoisier and Chaptal; in Physics, Lugdunense and Altieri, Sigaud, Nollet, the principles and dictionary of Brisson."[15] Marrero initiated an era in the universities studies despite the pressure of regulations.

TABLE I

DEGREES CONFERRED BY THE UNIVERSITY OF CARACAS(*), 1725 - 1810

Faculties	Bachelors	Licenciate	Masters	Doctors	Total
Philosophy	1,028	107	117(**)	——	1,252
Theology	191	128	——	112	431
Civil Law	170	29	——	30	229
Canon Law	203	57	——	49	309
Medicine	33	7	——	9	49
Total	1,625	328	117	200	2,270

(*) From Leal, Ildefonso, Historia de la Universidad de Caracas (1727-1827) Universidad Central de Venezuela, Caracas, 1963, p. 18.

(**) The degree of master was offered only by the Faculty of Philosophy, and was equivalent to the doctor's degree in the others.

Table I contains a summary of degrees conferred by the university in the period between 1725 and 1810. The population of Venezuela

by the end of the eighteenth century was 388,895 inhibitants, with 26% white, 12% indian, 38% mixed, and 24% black two-thirds of whom were slaves.[16] The university was supposed to admit students only from the white segment of the population, but several mixed blood graduates are known. These figures strongly suggest a people interested in studies and culture.

FOOTNOTES

[1]Guillermon MORON, Historia de Venezuela, Vol. IV, La formacion del pueblo (Caracas, 1971), p. 149.

[2]Ibid., p. 339.

[3]Ibid., p. 349.

[4]Ibid., p. 346.

[5]Hasting Rashdall, The Universities of Europe in the Middle Ages, Edited by F. M. Powicke and A. B. Emden (London, 1936), Vol. II, pp. 64, 65.

[6]Ibid., p. 76.

[7]Roger B. Merriman, The Rise of the Spanish Empire in the Old World and the New. Vol. I. The Middle Ages (New York, 1962), pp. 241-244.

[8]Gabriel Compayre, Abelard and the Origins and Early History of Universities (New York, 1969), p. 69.

[9]Rashdall, p. 79.

[10]John Tate Lanning, The University in the Kingdom of Guatemala (New York, 1955), p. 21.

[11]Compayre, p. 198.

[12]Ildefonso LEAL, Historia de la Universidad de Caracas (1727-1827), (Caracas, 1963), p. 362.

[13]Ibid., pp. 144-152.

[14]Ibid., p. 157.

[15] Ibid., p. 153.

[16] Ibid., p. 310.

CHAPTER III

TEACHING OF MATHEMATICS

In the general picture of the educational institutions presented in the preceding chapter, the teaching of mathematics of some relevance was present in the faculties of philosophy -- de jure in Cumaná, de facto in Caracas -- and in the academies.

The chair of philosophy of Cumaná was established in 1782, eleven years after the university reform in Spain, and the influence of the current events of the time reflected the prescribed curriculum. The recommended text was the book Institutiones Philosophicae by the French Jesuit Francisco Jacquier, which was published in Valencia, Spain, in 1769 and its six volumes went through fifteen editions in Latin and three more editions in Spanish after being translated in 1787-88.[1] Jacquier, himself, was a distinguished mathematician. D'Alembert attributes to him the first studies on the lunar apogee, and his other published works deal with mathematics: Isaaci Newtoni Philosophiae Naturalis principia mathematica perpetuis comentariis; Elementi di prospettiva secondo i principi di Brock Taylor, con varie aggiunte spettanti all'otica e alla geometria; Del calcolo integrale; Trattato intorno la sphera.[2] The textbook used in Cumaná dealt with the broad subject of philosophy, including what was called natural philosophy. In this order of ideas, arithmetic, algebra, geometry, and general and particular physics are neatly placed after the initial

portion on logic. The chair of philosophy was using a very respected and popular book written by a solid mathematician.

In Caracas, the faculty of philosophy had two chairs, one established at the founding of the University and the other, later, by the Dominican friars in 1742. The latter one was called "philosophy of religious" and the former came to be called "philosophy of laymen." Both chairs offered the same curriculum and the studies were equally valid.

Dr. Marrero was professor of the chair of philosophy of laymen and the introduction of mathematics in his time was discussed in the preceding chapter. His ideas about the place of mathematics in the course of philosophy was inherent in the chair. An alumnus of the chair, Dr. José de la Cruz Limardo, in his Memorias written in 1841, says:

> We learn by heart the notes of the complete course, in Latin, elegantly written by Dr. Alejandro Echezuria (professor from 1800 to 1804). As he had an excellent assortment of books, we had the opportunity of studying with him, wandering in the different branches of physics and mathematics with instruments. As a matter of fact, we took up a collection to buy spheres for geography, and cosmography, and astronomy; telescope, microscope, thermometers, barometers, electrical machines, and materials for a galvanic pile which we ourselves built. We did not ignore the use of the measuring compass and surveyor's plane table, graphometer, and theodolite. We made a map of Caracas, and I drew it.[3]

The "notes" mentioned by Limardo were prepared by the professors to structure the courses. Dr. Pablo Alavedra, professor of philosophy of laymen from 1813-1817, and Fr. Lorenzo Rivero, of philosophy of religions from 1815-1821, officially declared to the Secretario of the university that the references used to prepare the

notes were, in mathematics, Bails and Tosca; in chemistry, Lavoisier and Chaptal; in physics, Lugdunense, Altieri, Sigaud, Nollet, as well as the Principles and the Dictionary of Brisson. The same declaration states that those were the books that they had already found in use at the University.[4] One of the authors used for the mathematical notes, Benito Bails (1730-1797), was a distinguished Spanish mathematician, graduate of the University of Toulouse, France, who published Elementos de Mathemáticas, 10 vol., 1772-1783; Principios de Mathemáticas, 3 vol., 1776; and Instituciones de Geometría Práctica, 1795. Tomas Vicente Tosca wrote Compendio Mathematico, published in nine volumes between 1707 and 1715, with other editions in 1721, 1757, 1760 and 1784.[5] It is no mystery why the use of notes was imperative in the presence of such massive works.

To have a feeling for the content covered under the designation of mathematics at that time, it is necessary to consider the organization of the book of Tosca. The whole Compendio is divided as follows:

Volume I - Elementary Geometry. Elementary Arithmetic Practical Geometry.

Volume II - Higher Arithmetic. Algebra. Music.

Volume III - Trigonometry. Conic Sections. Applied Mechanics.

Volume IV - Statics. Hydrostatics. Hydrotechnia. Hydrometry.

Volume V - Civil Architecture. Stone Cutting. Military Architecture. Pyrotechnics and Artillery.

Volume VI - Optics. Perspectivity. Catoptrics. Dioptrics. Atmospheric Phenomena.

Volume VII - Astronomy.

Volume VIII - Positional Astronomy. Geography. Nautical Science.

Volume IX - Gnomonics. Study of Time. Astrology.

They are all thick books of about four hundred pages. (One, vol. V, has 610 pages of text, besides several folded plates, as does all the others.) On the whole, they resembled what we now call civil engineering rather than mathematics. Another example in this direction was the case of Francois Jacquier, the mathematician author of the philosophy book. He was also commissioned by the Pope, Clement XIII, to study different projects for the supplying of water to Rome, and one of the four architects to decide on the repair work to be done in Saint Peter's cupola.

A conspicuous absence in the Compendio is the calculus. This is not surprising given the early date of its publication. (Since the first known European textbook on the subject appeared in 1696, when L'Hospital published the lectures of his teacher, Johann Bernoulli. The book was printed without mention of the name of the author under the title of Analyse des infimients petites pour l'intelligeance des lignes courbes.[6]) According to Dr. Norberto Cuesta Dutari, the first professor who taught calculus in Spain was the Jesuit, Father Cerdá, in the University of Cervera. Cerdá, in the dedicatory of his Liciones de Mathematica (Barcelona, 1758) says he was "ready to print the Direct and Inverse Methods of Fluxions, called by others Differential and Integral Calculus."[7] In Spanish America, calculus was probably the first taught at the School of Mines of Mexico by professor Capt.

Andrés Joseph Rodriguez. The public examination records for 1797 registered that

> On the first day (October 23, 1797) Don Joseph Mariano Ximenez, Don Miguel Alvarez Ruiz and Don Joseph María Villasante were examined on Plane Trigonometry, Conic Sections, and Infinitesimal, Differential and Integral Calculus, as far as these subjects are covered in the textbook of Don Juan Justo García.

In the United States, the Military Academy at West Point under Superintendent Sylvamis Thayer can be credited with the introduction of a modern program of mathematics, in 1817. There is mention of the theory of fluxions in a bachelor's thesis at Harvard, as early as 1719,[8] under the title of "Fluxio ex quantitate fluente Invenitur," but the subject probably was not a part of the offered instruction. Forty-five years later John Winthrop explained the program of mathematics at Harvard, quite similar to the outline of Bail's books, as follows:

> My province in the College is to instruct the students in a system of Natural Philosophy and a course in Experimental, in which is to be comprehended Pneumatics, Hydrostatics, Mechanics, Statics, Optics, etc.; in the elements of Geometry, together with the doctrine of Proportion; the principles of Algebra, Conic Sections, Plane and Spherical Trigonometry, with general principles of Mensurations of Planes and Solids; in the principles of Astronomy and Geography, viz. the doctrine of the sphere, the use of the globes; the calculations of the motions and phenomena of the heavenly bodies according to the different hypotheses of Ptolemy, Tycho Brahe, and Copernicus, with the general principles of Dialling; the division of the world into various kingdoms, with the use of the maps, and sea charts; and the arts of Navigation and Surveying.[10]

In Venezuela, aside from the university faculties of philosophy, the academies, both civil and military, started to emerge in mathematics education in the last part of the century. The earliest manifestation in this sense is the Academia de Geometría y Fortificacion established by Colonel of Engineers Nicolás de Castro in 1760. The

engineers were, until the beginning of the seventeenth century, a part of the military personnel without centralized organization for specific program of instruction and were recruited from people who demonstrated knowledge of mathematics and fortification in special examinations held for that purpose. The neglect of specific instruction resulted in an acute shortage of trained men to such an extent that for the campaign of Portugal, in 1704, the King of Spain requested a brigade of engineers from Louis XIV, his grandfather. In 1709 the King brought the Flemish engineer Major Jorge Próspero de Verboom to Spain to organize the corps of engineers according to the French model. One of the activities rendered by Verboom was the establishment, in Barcelona, Spain, of the Royal Military Academy of Mathematics, to prepare candidates for the special exams. The Count of O'Reilly, General Inspector of the Army, extended the academies to the infantry, and ordered the preparation of a special textbook of mathematics for them. The value of the courses was to be proved in public examinations taken every six months. The results served as a merit credential for promotion in the ranks.

When Nicolás de Castro asked for permission to establish an academy of mathematics in Caracas on July 24, 1760, his request was enthusiastically approved by the Governor of Caracas the next day, and by the King on July 16, 1761. As was the custom, Castro wrote several booklets on Fortificacion de Campaña, Fortificacion Regular, and Geometria. Castro was transferred to Panama in 1768, but it is assumed that the Academy continued to operate under the successor of Castro, since in a Royal Order of April 25, 1772, the Governor of

Caracas is instructed to send the payment for the books of mathematics sent to the Cadets of the Batalion of Caracas.

The prescribed curriculum of the Military Academies comprised "the necessary instruction in mathematics for every officer,"[10] the military ordinances, physical exercises, drill, and fire practices. The objective of the instruction was to produce a professional soldier trained in military instruction and discipline, and able to administrate a regiment and with knowledge of mathematics, land surveying, and fortification.

In mathematics, the program was composed of arithmetic, elements of geometry, plane trigonometry, and practical geometry. Arithmetic included the basic operations, common and decimal fractions, ratios, proportions, progressions, and logarithms. The elements of geometry included plane geometry with triangles and circles as well as solid geometry. Plane trigonometry covered the use of tables and resolution of right and oblique triangles. Practical geometry included land surveying and technical drawing.[11]

During the last quarter of the eighteenth century the Spanish American academic world experienced, in the words of John Tate Lanning, "sheer quickening that, in some respects, is still inexplicable."[12] Feijro's thought of educational reform and Jovellanos' ideas of economic improvement spread over the continent. The interest in education brought more students to the universities, which resulted in

> an increase in academic degrees out of all proportion to any possible rise in population. The rate of increase in secular fields, where the Enlightenment was most conspicuously stimulating, was two to five times as fast as the acceleration in theology.[13]

In Caracas two exponents of this movement in the mathematics field were Father Francisco de Andujar, an Aragonese Capuchin, and Juan Agustin de la Torre, the Rector who defended Marreros' reforms. In the middle of Marreros' controversy, Dr. Juan de la Torre published a Discurso Económico: Amor a las letras en relacion con la Agricultura y Comercio, on April 25, 1790, campaigning for a chair of mathematics for the University under his rectorship. He made an arduous defense of mathematics, "which to our disgrace was reputed at one time to be useless science." He added:

> . . . the resources, the substances, the wealth and richness which everyone regards as the family estate for his maintenance . . . , the instruments, the implements, the means and aptitudes necessary to artesans to construct their works, the delineation of towns and buildings, roads, and fortresses and everything which occurs for our defense and civilization, depends in substance or in part on mathematics. [14]

De la Torre finally proposed the establishment of the chair of mathematics in order to end industrial poverty and promote agriculture to extend knowledge, and to stimulate the invention of machinery for the production of coffee, cotton, and indigo. Copies of the Discurso were sent to every important person in Caracas, asking for financial support of the project. The results were meager: only the Count of Tovar offered concrete help and some others made promises providing the chair was approved by the King.

De la Torre went ahead in his campaign for the chair of mathematics even though his term as Rector covered only the biennium 1789-1791. In June 1793, the Real Consulado was established in Caracas as an official corporation integrated by two parts: a court of mercantile justice and the Junta de Gobierno for the promotion of

industries, agriculture, commerce, and public works.[15] De la Torre was designated legal adviser of the Real Consulado and he utilized his position to present his Discurso in 1794, this time stressing the importance of the chair in the instruction of the future builders of roads, bridges, channels, and piers. The Consulado took no action at that time, probably because with only one year of existence it had not enough resources. Three years later, the Rector of the university, Dr. Jose Borges, presented again the project to the Consulado, which on February 3, 1798, proposed to help the chair with an annuity of one thousand pesos for the professor's salary plus an initial contribution of three thousand pesos to buy instruments and books, subject to approval by the Cabildo and the agreement of the university.

On June 6, 1799, the Cabildo unanimously approved the proposal of the Consulado, which was modified in December to increase the salary to two thousand pesos a year. However, the good relations between the university and the Consulado broke down and the proposed chair was no longer favored by the Consulado, which on May 26, 1800, decided on an academy separate from the university.[16] The academy was to extend its activities to the teaching of chemistry and physics as applied to agriculture and mechanical arts. This amplification of the original project was due to Alexander von Humboldt who recommended the engagement of two professors, one for mathematics and the other for physics and chemistry. Humboldt suggested also the names of two advisers in Spain: the Cavalier Betancourt, of well known reputation in France and England, for mathematics and Jose Chay of the Cuerpo Cosmografico for physics and chemistry.

While these lengthy negotiations developed among Consulado, Cabildo, and the university, a short-lived academy of mathematics was established by Andujar.[17] This friar was a son of the Enlightenment and a proponent of a modern system of education where students could acquire knowledge in direct contact with nature, as he had done.[18] In the Archives of Indes, in Sevilla, Spain, there is a copy of his "Curious and Useful Discoveries" on botanics and mineralogy, written after wandering in remote places of Venezuela studying rock, plants, and Indian medicines. Through Andujar it is possible to recognize one of the earliest influences on Venezuelan education of the United States, some twenty years old at the time, when he points to the example of that "blossoming country" in support of his project. The idea of Andujar, supported by the Bishop Antonio de Viana, and approved by the Governor Pedro Carbonell, was to offer instruction in mathematics for three years to be followed by another triannual cycle in natural sciences. The curriculum to be covered in mathematics was first year: arithmetic, algebra, elementary geometry, practical geometry, geography, and the five orders of Greek vases; second year: plane and spherical trigonometry, conic sections, optics, gnomonics, and civil architecture; third year: elements of machinery, hydraulics, navigation, logarithms, astronomy, and the proportions of the human body in art.

According to a Venezuelan researcher, Rafael Dominguez, who investigated in detail the date of the establishment of Andujar's classes, the permit was granted by the Governor in June, 1798,[19] and the classes started as a chair of the College Seminary of Caracas. The building had no space for a classroom and the eighteen students

and Father Andujar met, Monday through Friday from 10 to 11 a.m., in the private home of one of the students, who happened to be the fifteen-year-old boy named Simon Bolivar. They hardly had time to go past the first year of instruction, since in an act of the Real Consulado, dated in 1800, is a reference to the extinguished class of Father Andujar.

The schism between the Real Consulado and the university over the proposed chair, now proposed as an academy of mathematics, widened. Each party wanted to have control and the power of decision, hence they took their arguments to the Council of the Indies. The Crown did not want to favor either of the two highly regarded bodies, as it seems, because it decided to postpone the establishment of the studies under the guise of a supposed shortage of economic resources. At that time, the Consulado had enough revenue and could have supported the expenses of the academy without any problem.[20] The Royal Order of May 18, 1805, reported the decision not to establish the Academy of Mathematics in Caracas because the Consulado had insufficient resources to cover the operational expenses, and that was the last word on the subject.

Meanwhile, the teaching of mathematics continued for the officers of the army. The military engineer Juan Pires taught mathematics briefly in Cumana in the early 1800's. Colonel Tomas Mires headed a school in Caracas with a similar curriculum as Castro's school in 1808. It is not known if the academy established by Castro in 1760, the one which received the mathematical books in 1772, became the academy of Mires at some time during those forty-eight years. What can be assumed is that the teaching of mathematics grew as a tradition

of all the corps of engineers of the Spanish Army until 1803 when a central institution was established in Spain in order to standardize the preparation of military engineers. The Enciclopedia Espasa includes as one of its meanings of the word Academia the following: "a union of officers, sergeants, corporals, or cadets of the ranks to learn military theory and ordinances."[21] And, the Battalion of Engineers of Caracas kept that tradition. The majority of the students of the School of Mires were to serve later in the Corps of Engineers of the Republic and the most distinguished among them was Antonio Jose de Sucre, who defeated the Spanish Army at Ayacucho, the last important battle for the independence of Spanish South America.

Summarizing, in the eighteenth century, the development of the teaching of mathematics in Venezuela was limited primarily to the military academies. To a lesser degree the courses were included in the faculty of philosophy. Courses were also proposed in the long and unsuccessful effort by De la Torre to establish the civil academy. This was, of course, not a specific characteristic of Venezuela, or the Spanish Empire. George S. Emmerson, in his Engineering Education: A Social History says:

> Indeed, until the end of the eighteenth century the practical or applied aspects of mathematical studies were preoccupied with the concerns of the military engineers. Even the mathematics courses of the celebrated Colin Maclaurin at Edinburgh University in the early eighteenth century included surveying, fortification and other practical parts: geography, gunnery and the study of Newton's Principia. A large proportion of Maclaurin's students went on to serve as engineers in the British army.[22]

Even the project of De la Torre was surprisingly modern in its time. In the Americas, in the eighteenth century, only the Tribunal

of the Mining Guild of New Spain (Mexico) sponsored a very advanced institution guided by the same philosophy of application of the sciences to the main industry of the country. That was the School of Mines of Mexico, which started to operate on January 1, 1972.[23] In Mexico mining played the role that agriculture played in Venezuela.

FOOTNOTES

[1]Antonio PALAU DULCET, "Jacquier (Francisco)" Manual del librero hispanoamericano, Vol. 7 (Barcelona, 1954), p. 144.

[2]"Jacquier (Francisco)," Enciclopedia Universal Ilustrada Europeo-Americana, XXVIII, 2nd part (Madrid, 1926), pp. 2373-2374.

[3]Ildefonso LEAL, Historia de la Universidad de Caracas: 1721-1827 (Caracas, 1963), pp. 153-154, citing "Memorias de Jose de la Cruz Limardo," Boletin de la Academia Nacional de la Historia, XXXII (Oct.-Dec., 1949), Caracas, p. 395.

[4]Ibid., p. 145.

[5]PALAU, "Tosca (Tomas Vicente)," Vol. 23, pp. 487-488.

[6]Norberto CUESTA DUTARI, Filosofia Natural y Pugna de Facultades en la Universidad de Salamanca (1779-1796), (Salamanca, 1971), p. 5.

[7]Ibid., p. 25.

[8]D.E. Smith, A History of Mathematics in America before 1800 (New York, 1934), p. 23.

[9]Geronymo de CAPMANY and Benito BAILS, Tratados de Mathematica (Madrid, 1772), p. v.

[10]Smith., pp. 54, 55.

[11]Capmany and Bails, pp. xxi-xxiv.

[12]John Tate Lanning, "Tradition and the Enlightenment in the Spanish Colonial Universities," Cahiers D'Histoire Mondiale, X (1967), p. 712.

[13]Ibid., p. 713.

[14]LEAL, p. 268.

[15]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 94.

[16]LEAL, p. 276.

[17]Rafael DOMINGUEZ, "Rectificaciones historicas. Clase y Academia de Matematicas. Las matematicas del Padre Andujar," Anales Universidad Central de Venezuela (Caracas, 1928), p. 108.

[18]LEAL, p. 272.

[19]DOMINGUEZ, p. 108.

[20]Eduardo ARCILA FARIAS, Historia de la Ingenieria en Venezuela (Caracas, 1961), p. 284.

[21]"Academia," Enciclopedia Universal Ilustrada Europeo-Americana (Madrid, 1907), Vol. I., p. 843.

[22]George S. Emmerson, Engineering Education: A Social History (Newton Abbott, Devon, 1973), p. 28.

[23]Walter Howe, The Mining Guild of New Spain and its Tribunal General: 1770-1821 (Cambridge, 1949), pp. 301-369.

CHAPTER IV

A TEXTBOOK OF THE MILITARY ACADEMIES OF THE XVIII CENTURY

In the first months of 1772, a textbook of mathematics was published in Madrid specifically prepared for use in the schools of the regiments of the infantry, such as the one established by Nicolas de Castro in Caracas. The book was prepared by order of the General Inspector of the Army, Count O'Reilly, and written by Colonel Geronimo de Capmany and Benito Bails. The purpose as declared by the authors was to offer, to the youth, the instruction required for any official in the army and to facilitate, for other interested people, the opportunity of self study.[1] The purpose must have been realistic because copies of the books are not easily found. This suggests that it was extensively used, and the text was written in a direct and simple language, with an abundance of examples.[2]

The text is divided into four sections: Elements of Arithmetic, Elements of Geometry, Elements of Trigonometry, and Practical Geometry. At the end of each of the two last sections is a group of folded plates with the corresponding figures. Once unfolded, the plates present figures in the uncovered part, permitting one to see simultaneously the text material on any page and the figure. The first group is composed of four plates with one hundred eleven figures of plane and solid geometry and the second consists of twelve plates with

one hundred sixty-two figures of practical geometry. The sections are organized under several titles and subtitles, and each definition, rule, example, or observation is numbered in a consecutive way, to permit cross reference at any point. The four hundred pages of the book contain seven hundred forty of these items.

Arithmetic and Practical Geometry are the most extensive parts of the book, the former with two hundred fifty-five items in the first one hundred seventy-nine pages and the latter with two hundred thirty-four items in the last one hundred twenty-three pages. Geometry and trigonometry are presented in a more compact form, since the sixty-seven pages of geometry contains two hundred ten items and trigonometry has one hundred thirty-eight items in thirty-two pages. (See Appendix B.)

Arithmetic begins with a discussion about quantity, defined as anything able to increase or decrease, or to become larger or smaller, and declares that quantity is the subject of mathematics. The branch of mathematics which considers quantity when expressed by numbers is arithmetic. Geometry is defined as the science of extension.[3] "Trigonometry . . . teaches the art of applying arithmetic calculus to geometry, an art absolutely necessary to pass from theory to practices,"[4] and practical geometry has as its purpose to put into practical use the principles contained in the elements of geometry.[5]

The content of arithmetic includes the four basic operations, fractions, denominate numbers, decimal fractions, squares, cubes and square and cube roots of numbers, proportions and progressions, simply and doubled rule of three, fellowship, alligation, and false position. The last part of arithmetic is dedicated to logarithms.

The section on denominate, called "complex" numbers, refers to quantities measures without using a decimal system. It presents four: the monetary system of pesos, reales, and maravedis (1 peso = 15 reales; 1 real = 34 maravedis); weights (pound, marco, ounce, dram, scruple, and grains); lengths (vara, foot, inch, line, point); and time. It is not difficult to realize why a calculus of the price of a given length of fabric, when both systems are not decimal, was called an operation with "complex" numbers.

The arithmetic section is provided with many examples to help in the application of the theoretical principles explained. To illustrate the point, the multiplication of "complex" numbers is presented in items one hundred through one hundred three on pages sixty-three to sixty-six. The rules and one of the examples, are as follows:

> 102 . . . . There are three rules to use when two complex numbers are going to be multiplied one by another. First, it is necessary to reduce both numbers to the minor kind contained in them. Second, one number will be multiplied by the other after the reduction was done. Third, the product will be divided by the number which expresses how many times the larger unity in the multiplier contains the smaller; the quotient is the product desired . . . . The examples will clarify what has been said.
>
> Example I
>
> Find the cost of four varas, two feet, and eight inches when each costs two pesos, three reales, and four maravedis.
>
> I reduce two pesos, three reales, and four maravedis to the minor unity contained in this number, that is maravedis, and it results in one thousand one hundred twnety-six maravedis. I reduce also the four varas, two feet, and eight inches to inches, and it results in one hundred seventy-six inches. Second, I multiply one thousand one hundred twenty-six by one hundred seventy-six, and the product onw hundred ninety-eight thousand one hundred seventy-six results. Third, I divide this product by thirty-six which expresses how many times the largest unity of the multiplier, which is the vara, contains the smaller, which is the inch. It results in five

> thousand five hundred four inches and 32/36 or 8/9 of maravedi, and as it is close to one maravedi, I add a unity to the last digit of the quotient found, which will in consequence be five thousand five hundred five inches. Practicing what we have said before, we will find that these maravedis have the value of ten pesos, eleven reales, and thirty-one maravedis.

The logarithms are defined in an interesting way. The definition is as follows:

> 224. The logarithms are numbers in arithmetic progression, which corresponds, one to its own, to an equal series of numbers in geometric progression. If we have, by example, the following geometric and arithmetic progression:
>
> ÷÷ 2:4:8:16:32:64:128:256:etc.
>
> ÷ 3:5:7:9:11:13:15:17:etc.
>
> each term of the progression in the line below is called the logarithm of the term which occupies the same place in the upper progression.
>
> 226. The geometric progression chosen by the computers of these tables (of logarithms) is the decuple and the arithmetic progression is the natural numbers; I mean that the two progressions are as follows:
>
> ÷÷ 1:10:100:1000:10000:100000:1000000:etc.
>
> ÷ 0:1:2:3:4:5:6:etc.[6]

On pages one hundred fifty-six and one hundred fifty-seven a partial table of logarithms, of simple entry, is presented from the numbers one to three hundred twenty.

Geometry covers the geometry of triangles and circles. In the part on solids, theorems are proved regarding the formulas to compute volumes and surface areas of prisms, pyramids, cylinders, and spheres. Appendix C contains one of the two plates corresponding to solid geometry.

In trigonometry, plane trigonometry is presented in three sections. The first one contains the definition and properties of the

trigonometric lines: sines, cosines, tangents, cotangents, secants, and cosecants. The second section is concerned with the solution of right triangles and the third, of oblique triangles.

The practical geometry is the last part of the book. The purpose of its study can be appreciated in the initial paragraphs about instruments. It says: "To execute the different operations regarding lines, and the other kinds of extension that can occur, either over a paper on in the field, several instruments have been invented . . . ."[7] The subject of this part was, then, to translate to a physical setting, paper or field, the principles learned in geometry. It included what we call now linear and topographical drawing, land surveying, and mensuration. An example from each of these parts is presented to illustrate the facets of the practical geometry:

> Methods for laying lines . . . . 566. When the lines are to be drawn on a paper, the ruler is used, an instrument so well known that we consider it superflous to present it here . . . . To know if a ruler is straight the officers used to apply it over another made of metal, which they are sure is exact. To construct a straight metalic ruler, it is necessary to produce two at the same time, and work on them with great care and dexterity with a file until all their edges adjust exactly, applying one ruler to the side of the other, in every possible way; and more, to be sure that a ruler is really straight, it is necessary to manufacture three.[8]

> 563. III When it is necessary to run a line up hill, it is required that the last rod C (figure 29), which is at the lower part of the slop, be thinner and plumbed. In the slope will be placed close to C another rod D of the same diameter as C, to align the ends of C and D with the foot of B, which must be in the vertical plane containing the line through A and B.[9]

> 561. The line of metals [of the pantometra, a kind of divider] is used: I. to find a globe of any metal of a given weight, knowing a globe of another metal and its diameter . . . .[10] III. To know which amount of a certain metal is required to make an object similar and equal to another made of any other metal.[11]

An example of mensuration was "To find the capacity of a cask."[12]

In Appendix D, plate I of practical geometry with the pantometra is presented. Appendix E contains plate II which included Figure 29 mentioned in one of the above paragraphs.

FOOTNOTES

[1]Geronimo de CAPMANY and Benito BAILS, Tratados de Mathematica, que para las escuelas establecidas en los regimientos de infanteria, por particular encargo de su Inspector General el Excmo. Sor. Conde de O-Reilly, Teniente General de los Exercitos de S. M. y Comendador de Befayan en la Orden de Alcantara, han escrito . . . , (Madrid, 1772), p. v.

[2]A careful revision of the Catalogs of the Library of Congress, the Latin-American Collection of the University of Texas, and The Hispanic Society of America, did not indicate a single copy located in a library in the United States. Palau cities the existence of a copy which was for sale in his bookstore of old and rare books in 1930, and another, which was incomplete with only 178 pages, in the library of the Castle of Perelada. See, Antonio PALAU DULCET, Manual del librero hispanoamericano, Vol. 2 (Barcelona, 1949), p. 14, and Vol. 3 (Barcelona, 1950), p. 141.

[3]CAPMANY and BAILS, p. 180.

[4]Ibid., p. 281.

[5]Ibid., p. 281.

[6]Ibid., p. 153.

[7]Ibid., p. 285.

[8]Ibid., pp. 313-314.

[9]Ibid., p. 317.

[10]Ibid., p. 309.

[11]Ibid., p. 311.

[12]Ibid., p. 401.

CHAPTER V

THE REPUBLICAN PERIOD

The Bolivarian Reform

The nineteenth century brought to Spain and to Spanish America radical changes. The defeat of the joint French-Spanish navy by the British at Trafalgar, in 1804, completely destroyed the maritime power of Spain and shook the precarious alliance with Napoleon. Carlos IV, of Spain, was an amiable person, but an incompetent monarch entangled in a maze of intrigues. The powerful minister, Godoy, was opposed by the heir to the crown, Fernando, who found himself excluded from any part in government by the efforts of Godoy. The popular sentiment was in favor of Fernando and against the minister.

After Trafalgar, Godoy began secret negotiations with England, but Napoleon's victory at Jena made him change his mind and he reapproached the French. They concluded a treaty in Fontainebleau in 1807 by which Spanish troops were to be sent to help the French in Germany, while French troops were to be permitted to cross Spain to attack Portugal, which was harboring English ships. At the same time, Fernando asked the protection of Napoleon and solicited the hand of one of the imperial family in marriage. But Napoleon himself had other designs: to wipe out the Bourbon's dynasty in Spain and place one of his brothers on the throne.

The French Army crossed the peninsula and subdued Portugal, which was supposed to be divided in three kingdoms, one for the son-in-law of Carlos IV in compensation of the lost kingdom of Etruria, one to be exchanged for Gibraltar, Trinidad, and other English possessions, and the third for Godoy himself. But the distribution of kingdoms did not occur; instead, more French troops poured through the Pyrenees and took the fortresses of Guipuzcoa and Catalonia. Carlos IV's court fled to Aranjuez while the French army advanced in the North. Under pressures of the people, who surrounded the palace at Aranjuez, Carlos abdicated in favor of Fernando on March 18, 1808.

Murat occupied Madrid, apparently as an ally of Fernando VII, and secretly recommended Carlos IV to retract his abdication and seek, in Bayonne, the help of Napoleon. Fernando was told that Napoleon was coming to Spain and proceeded to the North to receive him. There he was seized by the French and taken to Bayonne where Napoleon refused to recognize Fernando as King of Spain and forced him to renounce any royal aspirations. Carlos also had arrived at Bayonne where he abdicated again, this time in favor of Napoleon, on May 10, 1808.

The unrest in Spain was increasing, and the departure of the last heir of the royal family, who was called by his father to Bayonne, precipitated a popular revolution on May 2, 1808. The French troops easily controlled the attempt to impede the departure of the Prince and the French occupation started openly. Jose Bonaparte was designated King of Spain. From 1808 to 1813 the War of Independence of Spain was fought with the help of England, and, finally, Napoleon

recognized Fernando VII as King of Spain in the Treaty of Valencay in 1813.[1]

The French Empire did not lose time in trying to secure the Spanish possessions in America. In July, 1808, the Lieutenant Paul de Lamanon was sent to Caracas from French Guiana. He requested, without success, the recognition of Jose Bonaparte as King. In his report he said:

> We arrived in Caracas on the 15th. I delivered the dispatches: talked with the chiefs about the events in Europe, etc., a mutiny starts . . . . The people are in complete insurrection: more than ten thousand insurgents storm the streets.[2]

The English, on their part, made themselves busy trying to inform the colonists of what was happening in Spain. The Governor of Trinidad sent documented information to Caracas ten days before the arrival of de Lamanon and The Times, with the news of the fall of the Bourbons and the designation of Jose Bonaparte, was in the hands of the General Captain of Caracas.

The Governor of Caracas was suspected of French inclinations and the creoles wanted to take over the government locally. On April 19, 1810, after two attempts failed, the Cabildo of Caracas assumed the "interim sovereignty which by the force of the facts had fallen back to the people."[3] The General Captain Emparan was deprived of authority and deported. The augmented Cabildo assumed the government of the provinces under the designation of "Supreme Junta for the Preservation of the Rights of Fernando VII in the Provinces of Venezuela."[4] As the augmented Cabildo had deputies mainly from Caracas, and some from Cumana, Barcelona, and Margarita but without representatives from the other provinces,

elections were held to form a "Body for Preserving the Rights of Fernando VII."[5] This body later was transformed into a Congress and proclaimed the Independence of Venezuela on July 5, 1811.

In the middle of a feverish political activity, The Supreme Junta found time to preserve the teaching of mathematics with the establishment of a Military Academy in Caracas. According to a decree published in the Gazeta de Caracas on September 3, 1810, the instruction in mathematics was to be free for people between twelve and thirty-two years of age; the military was to have preference in the enrollment; and the opening was scheduled for September 3, 1811. The Director of the Academy was the Under-Inspector of the Corps of Engineers, Francisco Jacot.[6]

On April 5, 1811, the Gazeta de Caracas published a notice announcing that the Junta Supreme granted authorization to Jose de Benis to establish a private Academy of Mathematics with the following curricula: (1) Mathematics: arithmetic, geometry, plane trigonometry, spherical trigonometry, algebra; (2) Land Surveying: arithmetic, geometry, plane trigonometry, altimetry, land measurements, land leveling, survey of fields, cities, mountains, etc., wash drawing of planes, expertises, appraisal of liquids and solids; (3) Celestial System and Astronomy: the celestial sphere, Ptolomaic system, Copernican system, regular and irregular planetary motions, eclipses of heavenly bodies: their physical causes and periodic calculus, fixed stars, geography; (4) Foreign Languages: French and Italian.[7] The Academy opened courses for the same month, and by December the first course ended. The Academy did not last long, the First Venezuelan Republic disappeared with the Capitulation of Miranda in

July, 1812, and there were no notices of the private Academy after that year.

The military academy probably continued its function, because in the Battle of la Victoria, 1814, cadets from the Academy are mentioned.[8] The first Director, Francisco Jacot, was executed by a Royalist firing squad on July 18, 1816.[9] Bolivar created an itinerant Military School in Carupano, June, 1816, under the direction of Colonel Smidt. It was dissolved in 1826.[10]

In Merida, the Seminary College of San Buenaventura was transformed into a university on September 21, 1810, by the Patriotic Junta of that province. An academy of mathematics was included in its structure. The academy had a military orientation, similar to the Academy of Caracas.[11]

The War of Independence of Venezuela was fought from 1811 to 1821, a period twice as long as the War of Independence of the United States. The bitterness of the war can be deduced from the population, which decreased about ten percent (See Appendix I, Census of Venezuela). After 1821, a large and powerful Spanish Army was still in control of Peru; 1824 was the year of the final victory of the independentists in South America. During the period of the wars, universities continued to function with the changes in the controlling bodies dictated by the fate of the armies.

Bolivar worked hard to structure the new nation. In 1819 the Fundamental Law was approved by the Congress gathered in Angostura, now Ciudad Bolivar. According to that law, the people of Venezuela and New Granada united to form a new country under the name of Republic of Colombia. The territory comprised what is now

Venezuela, Colombia, Panama, and Ecuador. On October 6, 1821, the Congress of Colombia, assembled in Cucuta, promulgated the Constitution of the new Republic. By its article 55, section 19, Congress was given the exclusive attribution: "To promote through laws, the public education and the progress of sciences, art, and useful establishments; and to grant, for limited periods, exclusive rights for their stimulation and development."[12]

The tenet established in the Constitution was used by the Congress in the Decree of July 28, 1823, and the Law of March 18, 1826. Bolivar applied the latter to reorganize the University of Caracas on June 24, 1827.

To Decree of July 28, 1823 established a Museum and a School of Mines in Bogota to promote and diffuse the natural sciences. The Museum was understood in its original meaning of place inhabited by the Muses, the goddesses in the Greek mythology presiding over song and poetry, the arts and sciences. The Museum was, then, going to be a place of learned occupation, together with the School of Mines, where the scientists contracted in Paris, Mrs. Rivero, Boussingault, Roullin, Boubon, and Gondet, were to render their services in the instruction of the youth. The chiars of the Museum were: mineralogy and geology, general and applied chemistry, comparative anatomy, zoology, entomology, conchology, botany, agriculture, drawing, mathematics, physics, and astronomy. The School of Mines was to have the following chairs: mathematics, mathematics applied to machinery, physics, mineralogy with geology, mine working, analytical chemistry with metalurgy, and descriptive geometry with drawing. Each one of the territorial departments of the Republic was

to send a young man to the school for three or four years, with a scholarship of four hundred pesos a year to be paid by the department. (The territory of the new Republic of Venezuela had four departments: Venezuela, Maturin, Orinoco and Zulia.)

The Law of March 18, 1826,[13] was more general in scope and referred to the organization of public instruction in Colombia. According to this law, public instruction had to be free, common, and uniform in all the Nation. The general instruction would be offered in primary and elementary schools in parishs and capitals of cantons, and in national colleges; the instruction in sciences, either general or specialized, in departmental and central universities.

Elementary instruction was divided into two stages. The first was provided in separated school for boys and for girls, on the principal fundaments of religion and the first principles of morals and decorum, reading and writing, the first rules of arithmetic, a compendium of Spanish orthography and grammar, and the "political constitutional catechism." In the principal cities of the cantons a second elementary education included a "more extensive catechism of religion, a primer on drawing, the elements of arithmetic and geometry related to mechanical arts, and the elements of practical agriculture."[14]

General instruction of higher level was offered in National Colleges or Public Education Houses. The Government had to foment the establishment of at least one of these in each capital of a province, and several in the cities with universities, to teach languages and other fundamental knowledge. When the teaching corresponded to that

offered in the universities, it was possible to obtain academic recognition and degrees after appropriate examination.

The universities were categorized into two classes: central universities and departmental universities or general schools. The latter had three divisions which roughly corresponded to the chairs of Literature, Philosophy, and the Faculties of Law and Theology. The first division had courses of French, English, Greek, an Indian language or other languages, Latin and Spanish grammar, literature, eloquency and poetry. The second division included philosophy with natural sciences, mathematics, physics, geography with chronology, logic, ideology with metaphysics, moral and natural law, natural history, and experimental physics and chemistry. The books for the teaching of the elements of the courses were to be in Spanish, with the exception of the courses of Roman and Canon law, Sacred Scriptures and Theology where Latin was the usual language. Some of these courses were offered also in the National Colleges.

The central universities were established in the capital cities of the departments of Cundinamarca, Venezuela, and Ecuador. At that time, the University of Caracas changed its name to Universidad Central de Venezuela. The courses offered were the same as the other universities with the addition of astronomy, analytical and celestial mechanics, botany and agriculture, zoology, mineralogy, art of mines and structural and mining geology in the division of philosophy and natural sciences, and history of the literature and bibliography in the literature of the first division. The central universities also included a school of medicine, which was to be housed in a separate building. To enroll in Law, Theology, and Medicine it was

not necessary to have the baccalaureate in Philosophy, but an equivalent amount of courses from the divisions of literature and philosophy were prescribed in each case. Law and Theology were to be preceded by courses in Spanish grammar, Latin, mathematics, physics, logic, metaphysics, and natural and moral law. To enroll in medicine, Spanish, Latin, and Greek, philosophy, and experimental physics and chemistry were necessary.

The law of 1826 added a chapter on "other special teachings," where the establishment of schools of navigation, shipbuilding, geodetic engineers, cosmography, hydrography, mines, commerce, agriculture, and fine arts were left to the discretion of the General Direction of Public Instruction to promote when opportune. The Museum established in 1823 was augmented to include descriptive geometry, application of analysis to geometry, general studies of solids and liquids, civil architecture, fortifications, applied physics and chemistry, geodesy with land surveying, and topographical drawing. The School of the Museum was not too different from the proposed Academy of Mathematics of Caracas, but was in no way associated with the University. The French influence of the Grand Ecoles, where applied mathematics and engineering was taught in central institutes separate from the university, was of paramount importance in the conception of the section on special studies in the law.

The Central University of Venezuela, in Caracas, was recognized according to the new Law of Public Instruction in a body of detailed regulations by Bolivar on June 24, 1827.[15] The regulations kept many of the traditional norms of the hispanic universities, but it

also brought important changes to the Institution. The right of the Maestrescuela to act as Chancellor of the University was canceled and, automatically, the University ceased to be Pontifical in character. The Rector assumed the functions of the Chancellor. His term was extended to three years instead of two, as before. More importantly, there is no discrimination against types of doctors who might hold the office, and any doctor, professor or not, could be elected, including the graduates in medicine, who previously were excluded. (This provision was taken to permit Jose Maria Vargas, doctor in medicine from Caracas University, who also studied in Scotland, to be elected Rector.) Also, no descrimination on the basis of race was permitted for enrollment in the University. The patrimony of the University was increased with several rents and properties.

The curriculum of instruction is similar to the old University of Caracas: four faculties--Law, Theology, Medicine, and Philosophy,--preceded by Latin and Literature. Latin was offered at two levels: introductory and advanced. After completing the two courses in Latin the student could enroll in Literature which included rethoric, Latin and Spanish poetry, with ancient and modern literature. The completion of the three courses of Latin and Literature was a requirement for the study of philosophy, either at the University or in another institution. In any case, the students had to pass a special examination in Latin and Literature to be admitted to further studies.

The course of Philosophy was integrated with the Chairs of Metaphysics, Grammar, Logic and Physics, Mathematics, Geography and Chronology, and Ethics and Natural Law, and lasted for three years. In the first year of studies the professor of the first chair

taught metaphysics, grammar and logic in the morning and in the afternoon, the second professor taught mathematics. In the second year the first professor lectured in general and particular physics in the morning and the second on geography and chronology in the afternoon. In the third year, the mathematics professor was to teach ethics and natural law in the morning and a new group of freshmen were admitted to the first year mathematics class in the afternoon. The professor of physics completed the subject in the afternoon and started with the new group in the mornings. In this way, two professors were in charge of the complete course of philosophy and new students were admitted every two years. This administrative arrangement was similar to the former one, where two professors of philosophy of religious and philosophy of laymen, covered the course and admitted new students alternatively.

The courses of philosophy were required before enrolling in any of the three other faculties, and the degree of Bachelor of Philosophy was required for the higher degrees. In the Faculty of Medicine, the degree of Bachelor of Medicine was granted after three years of study, and within three more the Licenciate and Doctor's degrees. Law and theology also required six years of study after the Bachelor's of Philosophy degree, and an intermediate baccalaureate was granted after three years.

The Chair of Mathematics was finally established in the Central University due to the Bolivarian reform of 1827. However, the level of the studies was already known and was similar to that offered in the same University by Marrero and his successors. The subjects covered in the classes of mathematics, (first year) were: arithmetic,

geometry, land surveying and practical geometry. The first professor of mathematics was Jose Feliciano Acevedo y Acal, at that time a young man, twenty-seven years old, with a Bachelor's degree in philosophy from the College Seminary of Santa Rosa, in Caracas, and Licenciate and Master's degrees from the University of Caracas. Acevedo was professor of mathematics in Caracas until 1840; then he was the first Rector of the National College of Cumana in 1841, and Rector of the National College of Carabobo in 1855. He died in 1864. Acevedo was also professor and Under-Director of the Academy of Mathematics established after the seccession of Venezuela from Colombia.[16]

The military academy had continued to operate in the same discrete way, since Acevedo has also cooperated with it in 1826.[17]

The results of the Chair of Mathematics were satisfactory. Rector Vargas wrote, in 1828, to the Minister:

> The class of Mathematics and Geography makes good progress. The youngsters of today have knowledge in this subject that our Roscios, Lindo, and Marrero did not have. I hope to obtain in a couple of months a good supply of instruments for mathematics, and before the end of the year the geography class will be provided with spheres and a set of Brue's maps which I have already ordered.[18]

On October 3, 1830, he made an evaluation of the studies where it was evident that not only the students pursuing a degree profited from the classes, but also other people who availed themselves of the right of auditing and class at the University, according to the Reform. Referring to the Chair of Mathematics, Dr. Vargas said:

> from the time of its installation it has rendered an important service. More than forth students are promoted every two years with a sound instruction

on the subject, and more than twenty-five honest artisans are rendered the same utility, being the ornaments, together with the students of literary careers, of the benches of this useful class.[19]

FOOTNOTES

[1]Catherine Moran, Spain: Its Story Briefly Told (Boston, Massachusetts, 1930), pp. 200-208.

[2]Ibid., p. 203.

[3]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 120.

[4]Ibid., citing the Act of the Cabildo of April 19, 1810, pp. 126-128.

[5]Ibid., pp. 126-128.

[6]Ibid., pp. 132-134.

[7]Eduardo ARCILA FARIAS, Historia de la Ingenieria en Venezuela (Caracas, 1961), pp. 290-291.

[8]Rafael PAREDES URDANETA, Bosquejo historico de la Academia o Escuela Militar de Venezuela desde el 19 de Abril de 1810, (Caracas, 1940), p. 9.

[9]ARCILA, p. 250.

[10]PAREDES, p. 10.

[11]Ibid., p. 9.

[12]Cuerpo de Leyes de la Republica de Colombia (Caracas, 1961), p. 12.

[13]Ibid., pp. 396-405.

[14]Ibid., Art. 21, p. 399.

[15]Simon BOLIVAR, Decretos del Libertador, Vol. II, 1826-1827, (Caracas, 1961), pp. 276-341.

[16]"Senor Rafael Acevedo," El Cojo Illustrado, March 1, 1895, No. 77, p. 130.

[17]PAREDES, p. 11.

[18]Ildefonso LEAL, Los Origenes de la Universidad de Caracas (Caracas, 1967), p. 48.

[19]Ibid., p. 47.

CHAPTER VI

CAJIGAL'S ACADEMY

The union among Venezuela, New Granada, and Quito in the Republic of Colombia was more a stated desire in the Constitutions of Angostura and Cúcuta than a political reality. Even at the time of the oath of the Constitution of Cúcuta, the city council of Caracas accepted it with protests.[1] In November, 1829, an assembly, gathered in Valencia, decided to secede from Colombia, convoked a national convention to establish the basis of the new Republic of Venezuela, and confirmed General Jose A. Páez as head of the government.

The same year of 1829, Juan Manuel Cajigal arrived in Caracas. He was born in Barcelona, province of Cumana, in 1803, and after the death of his father in 1810, remained in the care of a relative, also named Juan Manuel Cajigal, who was General Captain of Venezuela in 1814. Cajigal traveled to Spain in 1816, after his protector resigned his position in Venezuela to accept a similar one in Cuba in 1817. In Spain, the young Juan Manuel was admitted as a cadet in the Regiment of Alcala de Henares where he was initiated to the studies of mathematics. Before graduating as an engineer, he was exiled to Cuba in 1820 when he revealed his sentiments in favor of the Revolution of Riego y Quiroga. His relative, General Cajigal resigned from the government of Cuba in the same year, 1820, but stayed there until his death in 1823, and sheltered him for three years. Shortly before the

death of General Cajigal, the young Juan Manuel, at that time twenty years old, was sent by his protector to Paris in order to finish his studies in mathematics. In 1827, he was looking for a position of teaching mathematics and wrote to his friend and companion in the mathematical studies in Paris, Lino de Pombo, who was in Bogota. Pombo wrote a very enthusiastic recommendation to General Carlos Soublette, who was Minister of War. The negotiations went slowly, and finally Cajigal preferred to risk his savings by returning to Venezuela without any definite employment rather than accept the position offered him in the Military Academy of Alcala de Henares.[2]

When Cajigal returned, he visited with Dr. Vargas, Rector of the Universidad Central who was implementing the Bolivarian Reform, and presented his credentials of study. Vargas asked Cajigal to present a project to fully establish the mathematical studies at the University.[3] The proposal was to be considered by the academic community and submitted to the government in Bogota. The project was approved in the University and sent to the government in July, 1829, less than four months before the secession of Venezuela from Colombia.

With the new organization of the government in the Republic of Venezuela, the Minister of War asked for the creation of a Military School of Mathematics. The Congress commissioned Dr. Jose M. Vargas, General Carlos Soublette, and Licenciado Jose Grau to study the matter. The Commission's report was presented in Valencia on October 3, 1830. In its second and third items it says:[4]

> In second place, the opinion of this Commission is that the existent School of Mathematics in Caracas must be improved. In the University of that city there is a class

> of these sciences, in which a course of arithmetic, algebra, geometry and land surveying or practical geometry is offered . . . . For these reasons, at the middle of last year the Rector of the University of Caracas presented to the Government of Colombia a plan to improve the teaching of this parent science according to a proposal of Senor Juan Manuel Cajigal. The people who know this gentleman deplored, and deplore, that the talents presented by a young Venezuelan with a vast illustration in mathematics, went unused . . . .
>
> Mr. Cajigal proposed to teach the students the first course in pure mathematics, a second one from two to four years long in sublime mathematics, instructing them in the elements of the physic-mathematical sciences, especially in their application to mechanics and the working of machines, and also to the artisans, their adaptation to the different processes in the arts. In this course three kinds of students were to be taught: the students of literary careers who, after the required course in the University, desired to perfect their knowledge in these sciences; the artisans, and, finally, the young military men who, after studying the pure mathematics in the first class, entered this course to prepare themselves to follow the technical branches of the military art in a third course, which he himself offered to teach simultaneously with the second.
>
> It is the opinion of this Commission that it is important to gather the scarce resources existent in Venezuela of teachers, students and funds, in the most adequate city, which is Caracas, and that Mr. J. Manuel Cajigal be granted a monthly salary of one hundred pesos as first professor of the Academy of Mathematics of the University of Caracas, and Mr. Rafael Acevedo, in addition to his salary as proprietary professor in that establishment, fifty-five pesos as second professor.
>
> In the third place, with respect to the Military Academy, the Commission finds it convenient that, for the present time, the first professor of Mathematics fill the position of director . . ."

On October 14, the Congress approved the creation of the Academy in the terms suggested by the advisers, and the following year, on October 26, 1831, President Páez provided the necessary executive action.

The studies were programmed for six years. The first biennium common with the studies of philosophy at the University. The second and third biennium were separated from the faculty of philosophy, and at the end of the first year of the second biennium, the students received the degree of Agrimensor (land surveyor). At the completion of the six years of study they were granted the rank of Lieutenant of Engineers.

The Academy was solemnly established in the salon called Chapel of the University on November 14, 1831. Both professors, Cajigal and Acevedo presented discourses on that occasion, which were published in extenso by the Gazeta de Venezuela.[5] Acevedo presented his speech first, announcing the initiation of the complete course of Mathematics in the University and presented a general picture of the different parts of mathematics and their applications. Cajigal extended the presentation of Acevedo and emphasized the practical application to agriculture, shipbuilding, geography, architecture, and arts.

The Academy was accepted with enthusiasm. The common biennium had the problem of a large number of students, receiving between eighty and one hundred freshmen, since it was required for all. Cajigal recommended its being separated from the course of philosophy. There were twelve students at the end of the first biennium in 1832 who were strictly in mathematics. In 1833, seven of them graduated as Land Surveyors. Only four finished the six years of study in 1837. The Revolution of the Reforms took them to active service and one, Rafael M. Baralt, could not graduate because he was still mobilized at that time.[6]

Cajigal directed the Academy for ten years, until March 1841, when he went to Europe grieved with the first symptoms of mental illness which finally incapacitated him. He was replaced in the position of Director by Olegario Meneses, a graduate of the first promotion. When Cajigal returned to Venezuela in 1843, he was unable to accept again the direction of the institution. He retired to a small town on the east coast of Venezuela and died in 1856.

The Military Academy of Mathematics expired on November 19, 1872.[7] Antonio Guzmán Blanco decreed that all the studies in exact sciences offered in the Academy of Mathematics were to be taught in the University of Caracas in a program of six years. At the end, the graduates should receive the degree of civil engineer. This decree annulled the legislative resolution of October 14, 1830, in which the Congress approved the project presented by the Commission headed by Vargas. In 1888, the astronomical observatory Cajigal was created, and the instruments of the extinguished academy were went there.

The Military Academy, limited to cadets, was reestablished in 1877, and from 1899 to 1910 it was merged with the Artillery Corps. Now, it is the Military School of Caracas. The Naval School was created in 1910 and became a part of the Military School of Caracas in 1931 but separated again on February 15, 1937. The Military School of Aviation was established in 1920.

The Academy of Mathematics projected and directed by Juan Manuel Cajigal was the first institution to offer higher instruction in mathematics. In the second biennium of studies descriptive geometry, analytic geometry, and differential and integral calculus

were prescribed. The first group of students attended from 1833 to 1836.

The Academy was the forerunner of both the military schools and the civil engineering studies in Venezuela. With an abundance of reasons, Cajigal is reputed to be the Father of Mathematical Studies in the country.

FOOTNOTES

[1]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 214.

[2]Willy OSSOTT MACHADO, Los estudios de las matematicas en Venezuela durante los siglos XVIII y XIX (Caracas, n.d.), p. 19.

[3]Ibid., p. 21.

[4]Eduardo ARCILA FARIAS, Historia de la Ingenieria en Venezuela (Caracas, 1961), pp. 312-314.

[5]"Academia de Matematicas; discurso pronunciado por el segundo maestro Jose Rafael Acevedo . . . ," Gazeta de Venezuela, (November 30, 1831), and "Academia de Matematicas, discurso del primer maestro señor Juan Manuel Cajigal," Gazeta de Venezuela, (December 7, 1831).

[6]ARCILA, pp. 317-318.

[7]Venezuela, No. 1776, November 19, 1872, Art. 1, Recopilacion de Leyes y Decretos de Venezuela formada de orden del Ilustre Americano, General Guzmán Blanco (Caracas, 1874), p. 154.

CHAPTER VII

THE INSTRUCTION CODE OF 1843

During the period from 1839 until the election of José Tadeo Monagas in 1848, the controlling force in the political panorama of Venezuela was General Jose Antonio Paez, the hero of the War of Independence and a group of leading cadres mainly composed of civilians. This characteristic may be surprising in a country where war had been the dominating activity for practically a generation. But at that time, most of the prominent military leaders either were loyal to Bolivar and his ideal of unity or had ambitions to seize power. In any case, Paez turned to building a strong and skilled civilian bureaucracy to structure the new nation, even though some of his appointees, such as Cajigal, had in no way participated in the Venezuelan revolution of independence.

Páez was elected President for the first four year term. In 1835, Dr. José María Vargas was elected President. A rebellion, headed by Santiago Mariño, deposed Vargas a few months later and sent him into exile. Páez reacted against the rebellion and with the constitutional army gained control of the country. On August 20, 1835, Vargas returned to Caracas as President, serving until April 1836, when he resigned. General Carlos Soublette, one of the few military leaders of the War of Independence in the Páez party, being the Vice-President, completed the term. During this rebellion, José Tadeo

Monagas was one of the most important opponents of the government. In 1831, he refused to accept the primacy of Páez, ostensibly campaigning for unity with Colombia or the creation of a separate state in the Eastern part of Venezuela. He again proclaimed a separate state, but Páez won control of the eastern part of Venezuela without great problems. On November, 1835, a general amnesty ended the fight, Monagas kept his rank of general and his troops were disbanded.

In 1839, Paez was elected for a second term, which was a more difficult one than his first. During the thirties, Venezuelan agriculture profited by a booming economy based on the cultivation of coffee. In the second administration of Páez this situation changed: the prices of coffee in the export markets declined and an economic crisis crippled the country. The Liberal party was officially established in 1840, and recruited its members from the discontented coffee-growers, old patriots, and adversaries of Paez.

General Carlos Soublette was elected to the Presidency in 1843 and during his term the situation was worse. The Liberal party was more aggressive. The government was also more restrictive, even though always respecting the freedom of the press, Congress, and the judiciary. The Venezuelan historian Guillermo Morón, writing in 1968, classified Soublette's government as the most honest one.[1]

This period of twenty years is usually called the Conservative Oligarchy and the Paecist party was labelled with conservatism. In a depreciating way, the supporters of the Conservative party were denominated godos (Goths). But the accomplishments of those men do not harmonize with the labels that history has attached to them. In the educational field, an important advancement, considered in the

previous chapter, was the establishment of the Academy of Mathematics. The university offerings increased but not exclusively in mathematical sciences. Vargas continued to foster progressive changes in the school of Medicine, in 1832 with the Chair of Surgery and in 1834, the chair of chemistry. Vargas had studied chemistry at Edinburgh which at the time was the fountain of innovative ideas on education for England:

> The force toward formal education and science and technology was to enter England in the nineteenth century from Scotland, and it was Scottish or Scottish-educated professional men and scholars who carried German influence into English Scientific activity in the same period.[2]

The national colleges, prescribed in the Colombian law of March 18, 1826, to provide general studies, sprang up over all the country. Public ones were created in Trujillo in 1832; Margarita, El Tocuyo, Carabobo, Guayana, and Coro in 1833; Cumana, 1834; Barquisimento, 1835, Maracaibo and Guanare in 1837, Calabozo in 1839, and Barcelona in 1842.[3] The first Normal School of Arts for the training of elementary school art teachers, was created on November 19, 1836.[4]

Elementary education was the responsibility of the Provinces and not of the central government; the number of schools and students were at very low levels: two hundred ten schools with seven thousand five hundred ten students in 1831 and four hundred twelve schools with an enrollment of twelve thousand nine hundred ninety-seven in 1844, but even at those levels it meant an increase of almost seventy-five percent in enrollment and one hundred percent in the number of schools.

The overall condition of education was one of interest to the government. In 1839, Dr. Vargas, Cajigal, and P.P. Diaz were the three members of the Dirección General de Instrucción Pública created under the Colombian Law of 1826. They presented an Exposicion to the President of Venezuela, which served as a incitement and blueprint for the Code of Public Instruction issued by the Congress in 1843. Regarding elementary instruction the document said:

> Elementary instruction has not been favored as it deserves from a republican and liberal government. Scarce are the parishes in which the schools operate regularly: the major part of them show a repressed and backward state that is pitiful; in several of them due to shortage of resources, in others, to incompetence of the preceptors, and in some, and this can seem unbelievable, because the parents are reluctant to send their children to school; and there is no lack of cases which overlook and conceal their faults.[5]

The Exposicion recommended the following:

1. Organization of the General Direction of Public Instruction.
2. An additional law on the regulation of the university, to fill the gaps that are there without colliding with its structure.
3. To unify and reform the different decrees of creation of National Colleges consolidating them into one for all the colleges that must remain, after consulting with the community, considering the possibility of independent support, and all of the circumstances which make them useful and beneficial to the province or provinces of the district.
4. About the establishment of normal schools in the colleges of the capital cities in each province, in order that the teachers educated there spread the instruction in their respective cantons.
5. Organization of the elementary school in three categories, to give more extension to the ones in the third category, and adapting all to the local reality. . . .
6. About the girl schools, of parish and canton, to add feminine labors to the first letters and other subjects that now are taught there.

7. The income of schools be established in such a way that they increase with the growth of the population....

Also, the Direction has considered it its duty to retouch the rules and regulations of the other establishments of public instruction, such as the faculty of medicine, the academy of mathematics, the pilotage and nautical schools, and economical societies.[6]

In 1843 the Congress, on the basis of the Constitution of 1830, which attributed to it the responsibility of "promotion, through laws, of public education in universities and colleges; the advancement of sciences and arts and establishments of general usefulness," promulgated a Code of Public Instruction. The Code was composed of fourteen laws, the second and third about National Colleges were approved in 1842. The others were approved on June 20, 1843, when Dr. Vargas was President of Congress. The different titles are:

I. Organization of Public Instruction.

II. Teaching in colleges, organic dispositions (May 12, 1842).

III. Teaching in colleges, academic part (May 12, 1842).

IV. Organization of Universities.

V. Chair-holders at the Universities.

VI. Chair of the Universities and Schedule of Courses.

VII. University Students.

VIII. Degrees, and incorporation of degrees in the University.

IX. University expenses.

X. Administrators of the University.

XI. Relations among the Universities with the authorities of the Republic and with other educational institutions.

XII. Transitory dispositions.

XIII. University income.

XIV. Executive authority over instruction in Universities and National Colleges.

The first law defined the different establishments within the system of public instruction. Elementary education was left to provincial care. The following two and a part of the last referred to the organization of the national colleges, institutions for the secondary teaching of Languages, Philosophical Sciences, and other branches of this education. The eleven remaining are all related to universities. It is interesting to observe here that the title of Maestro (Master) of Philosophy is abolished in the Article 2, of Law XII. The degree of Doctor in Philosophical Sciences was substituted for it. For the first time the expression Civil Engineer was employed in Venezuela in a legal document.[7]

The institutions considered by the Law as part of the educational system were: the elementary schools; the National Colleges for the secondary teaching of languages, philosophical sciences, and related branches; the Universities, for the scientific instruction in Theology, Law, Medicine, and related branches, including also the teaching offered at the colleges; special schools; and academies for continuing studies by the method of fellowship, and the order of certain professions.

The National Colleges began at this time to shape secondary education in Venezuela in a way similar to the rest of Latin America and some countries of continental Europe, but quite differently from the process followed in the United States and England. The first appearance of the colleges, by the Colombian law of March 18, 1826,

was in order to provide "instruction in languages and other elementary knowledge."[8] The courses that could be offered exclusively at the university were those corresponding to the Major Faculties of the Colonial Universities, according to the paragraph three of the article 40, with courses on Literature, Philosophy, and Natural Sciences offered in both. In a rapid development, the colleges offered not only the triennium of the Faculty of Philosophy, or Arts, but by the law of March 15, 1837, also gained the right to grant the bachelor's degree in Philosophy as was the tradition for Jesuit Colleges, Seminary College, and others in Hispanic America. Slowly, the universities concentrated their attention on the "Major Faculties," which required the Bachelor's degree in Philosophy for admission. In 1904, the Bachelor's degree (bachiller) was required for admission to the university, even though universities and colleges may have granted the degree. At that time, the studies for that degree were considered secondary education. The universities only offered the last year of the corresponding curricula.

The universities under this first Code of Education in Venezuela offered instruction in five Faculties: Ecclesiastical Sciences (Theology), Political Sciences (Law), Medical Sciences and Natural History, Mathematical, Physical, and Metaphysical Sciences, and Philology or Humanities. With respect to the election of the authorities of the university, the universities were structured into four parts: (1) Eccleasiastical Sciences, (2) Civil Law, (3) Medicine and Natural History, and (4) Philosophical and Physical Sciences and Humanities.

The studies of Mathematics are specified in article 8 of the Law VI "About the Chairs of the Universities and Schedule of Courses." They included both instruction for the triennium in Philosophy and the three biennium of the Academy of Mathematics, in five groups: arithmetic, algebra, geometry, plane and spherical trigonometry, and land surveying; geography and chronology; experimental physics; analytical geometry, descriptive geometry, and differential and integral calculus; and application of mathematics to mechanics, civil constructions, and military arts. Another group, corresponding to logic, general grammar, ontology, phychology, natural theology and moral philosophy completed the courses offered by the Faculty of Mathematical, Physical and Metaphysical Sciences.

Those courses were arranged to permit studying toward the Bachelor's degree in Philosophy, required for all other degrees in the university; for the Licenciate and Doctor's degrees in Philosophical Sciences; and to qualify for the Commission of Land Surveyor, Civil Engineer, or Lieutenant of Engineers.

The degree of Bachelor required three years of study: the course of elementary mathematics covered one half of the first two years; physics, one half of the two last years. The other half of the freshman curriculum was dedicated to the philosophical part with logic, general grammar, ontology, psychology, natural theology, and moral philosophy. Geography and chronology completed the senior year. To obtain the degree of Licenciate in Philosophy, another three years of studies were required, dedicated to analytic geometry, descriptive geometry, differential and integral calculus, and application of mathematics to mechanics and civil construction, in addition

to a drawing course of one year, which was also a condition for Land Surveyors and degrees in medicine. The aspirant to the doctorate in Philosophical Sciences had to hold the Licenciate degree and show knowledge of the elements of a modern language. Either one of the higher degrees in Philosophy qualified a person for the Commission of Civil Engineer.[9]

In the military academy the courses required also took six years. The first biennium was common with the philosophy students in arithmetic, algebra, geometry, plane and spherical trigonometry, land surveying, geography and chronology, and drawing. The second biennium included analytic and descriptive geometry and differential and integral calculus. The application of mathematics to mechanics, civil constructions, and military art corresponded to the last two years. After three years of study, they received the certificate of Land Surveyors. The military instruction was provided according to special regulations and was separate from the university instruction.

Both branches of mathematical studies had their share of students. In 1838, the enrollment was stabilized after the years in which the fame of Cajigal and the novelty of the studies attracted many people. At that time, the total enrollment in mathematics was thirty-six; of them, twenty were in the military academy and sixteen in the civil engineering courses.[10]

The instruction code continued many of the established traditions of the Hispanic Period. Proof of that was the scarce attention paid by the Central Government to elementary schools. A more important characteristic is the traditional dependency on legislative action for

any improvement or hampering of the educational process, which is still a main feature of Venezuelan education.

The progressiveness of the Code can be assessed by the structure of curricula, which can be favorably compared with others at the time. The curricula for mathematics of the Venezuelan university and three of the early engineering schools in the United States are summarized in Appendix H.

FOOTNOTES

[1]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 248.

[2]George S. Emmerson, Engineering Education: A Social History (Newton Abbott, Devon, 1973), p. 75.

[3]Miguel Angel MUDARRA, Historia de la legislación escolar contemporánea en Venezuela (Caracas, 1962), p. 25.

[4]Ibid., p. 29.

[5]Ibid., p. 28.

[6]Ibid., p. 28.

[7]Venezuela. "Code of Public Instruction, June 20, 1843, Law VI," Art. 17, Leyes y Decretos Reglamentarios de los Estados Unidos de Venezuela, Ministerio de Relaciones Interiores (Caracas, 1943), VII, p. 889.

[8]"Law of March 18, 1826, Art. 40, 1," Cuerpo de Leyes de la Republica de Colombia (Caracas, 1961), p. 401.

[9]Code of Public Instruction, June 20, 1843, Leyes y Decretos . . . , p. 889.

[10]Eduardo ARCILA FARIAS, Historia de la Ingeniería en Venezuela (Caracas, 1961), p. 320.

CHAPTER VIII

1849-1869: TWO DECADES OF STAGNATION

The two decades, from 1849 to 1869, which followed the promising times of structuration of the republic, recorded for Venezuela a period of violent internal dissention, political anarchy, and, finally, civil war. For education, a period of stagnation.

In the presidential elections of 1846 Jose Tadeo Monagas was elected for the term of 1847 to 1851, as the candidate of the Conservative party selected by Paez. Quite soon it was evident that Paez made a mistake in his choice and Monagas decided to run Venezuela as his personal fief. The first step was to slowly change the control of the government from the Conservative party to the Liberal, accomplished by the end of his first year as President. The Congress, controlled by the conservatives, were considering several accusations against Monagas and preparing his removal from the Presidency. In January, 1848, the Congress agreed to move to Puerto Cabello to start the trial against the Executive and discussed the formation of a special force to protect itself. On January 24, a riot broke out between a pro-Liberal mob outside the building and the Congress guards. Several guards, deputies, and senators were killed. The English ambassador, Mr. Wilson, asked Monagas to use federal troops to stop the homicidal action. The President easily controlled the situation. A few days later, the reconvened Congress became a rubber stamp for Monagas,

as it has been for practically all the other Presidents until 1958.[1] This event is known in Venezuelan history as the Murder of the Congress.

Paez again tried to gain control of the situation and started a revolution in Coro. He was defeated, imprisoned, and later, in May, 1850, was exiled to the United States. In the elections of 1850, Monagas imposed his brother, Jose Gregorio Monagas on the country, as President for the term of 1851 to 1855. Jose Tadeo had already replaced the Liberals in government with men personally addicted to him. The presidency of Jose Gregorio was really a dictatorship of the powerful brother. Many liberals joined the opposition to the Monagas family rule.

Jose Gregorio Monagas is remembered in Venezuela as the President who abolished slavery on March 24, 1854.

> Yet, even this magnanimous gesture was tarnished. Abolition, delayed so many years by various legal strategems, finally came to Venezuela as an act of war. The Conservatives let it be known in the early 1850's that a victorious Paez would make abolition the first order of business, and as a consequence the level of slave unrest appeared to rise. The Monagas Abolition Decree of 1854 was designed to neutralize the effectiveness of this propaganda.[2]

In the elections of 1855, as was to be expected, Jose Tadeo Monagas won three hundred ninety-seven of the three hundred ninety-eight votes cast by the electors. A new Constitution was approved to extend the presidential term to six years. In March 1858, liberals and conservatives together revolted against Monagas. They were commanded by the Governor of Carabobo, Julian Castro. Monagas was exiled and, in a convention gathered in Valencia, Castro was provisionally designated President. A new Constitution was approved

by the end of the year. The conservatives got the best share of the government and some leaders of the Liberal party, among them Guzmán Blanco, Juan Crisóstomo Falcón, and Ezequiel Zamora, were exiled.

In St. Thomas, the exiled Venezuelans planned a revolution under the banner of Federation with Falcón as commander. The federal revolution resulted in a five-year-long civil war.

> From March 15, 1858, until July 24, 1863, several governments occurred in succession, in a anarchic wave which was to transform the country in its social and political structure in a radical way. While in Caracas they fight to control the power, the whole country lived in a revolution typified by confusion: war, desolation, social change.[3]

On July 17, 1863, the victorious federalists installed Juan Crisóstomo Falcón as President. In March 1863, the Federal Constitution was approved and the official name of the nation became the United States of Venezuela. Falcón could not pacify the country. Several revolts sprang up in different places and by 1868 civil war was rampant again. In 1868, Falcón resigned; Monagas headed a new revolt and in June was in control, with Guillermo Tell Villegas as President, until his death late that year. Jose Ruperto Monagas, son of Jose Tadeo, took charge of the executive branch until April, 1870, when a new revolution, this time with Antonio Guzmán Blanco as leader, turned over the government and the political anarchy.

The product of these two decades was a country paralyzed by the administrative catastrophe and military despotism in the states. The rise of militarism can be appreciated with one example: for the state of Carabobo, the census of 1873 listed four hundred forty-nine generals, six hundred twenty-seven colonels, nine hundred sixty-seven

commandants, eight hundred eighteen captains, and five hundred eighty-nine lieutenants; three thousand four hundred fifty ranked officers when the total male population over twenty-one in the state was twenty-two thousand nine hundred fifty-two.[4]

Education in Venezuela suffered the logical consequences of such a sad state of affairs. The executive branch interfered with all aspects of instruction, carried to the extreme by cancelling appointments of professors when they were "enemies of the government." This step was taken by Jose Tadeo Monagas after the Murder of the Congress in the Laws of March 30, April 18, April 21, and May 7, 1849, to reform, respectively Law XII, Transitory Dispositions, Law VI about university chairs, Law VIII about university degrees, and Law V about university professors of the Instruction Code of 1843.

The Law of March 30 introduced only one modification. The Law XII stipulated that the holders of the old Masters of Philosophy who wished a Doctor of Philosophy degree must take a special examination and to pay sixty pesos to the university treasury, four to the Rector, six to the Secretary, four to the Director, and two or four to the examiners of the Academy depending on whether the examiners were graduates. In the new disposition the Masters of Philosophy who had held a chair in philosophy for ten years, in universities or national colleges, could exchange their titles for the Doctor of Philosophical Sciences without any requirement of exams or payments. It is interesting to note that Jose Rafael Acevedo refused to exchange his degree for the doctorate. At that time, he was professor of Latin Syntax, a chair which he held from 1845 until 1854 when he went to the Rectorship of the National College of Carabobo. He had resigned his

position in the Academy of Mathematics to be the first Rector of the College of Cumaná, between 1841 and 1844.

In the modification of Law VI, about university chairs, the studies of political sciences were reduced from six to four years, but the two years of practice as assistant of a lawyer, required by the professional law, was necessary for the university degrees. The studies of municipal law were also included at the time. For medicine and mathematics the courses remained the same, but the order of presentation could be altered when a grave reason existed with the recommendation of the Junta de Gobierno and general direction. Furthermore, in similar conditions, any course at the university could be suspended, temporarily or permanently by the Executive. The Law regarding university degrees had slight modifications to adapt the new requirements in political sciences.

The last modification of the Code, on May 7, 1849, destroyed the stability of the professoriate. Paragraph two of article 3 said:

> . . . The Executive, in case of absence from classes of the professors, for hiding, emmigration, or any other cover for hate of government, acting in a summary and administrative way, can remove from their chairs all who incurred in them; in the case that the professor leaves the territory of the Republic for the said reasons, the chair will be vacant ipso facto. Also the Executive can, using its administrative faculties, dismiss from their chairs the professors opposed to the Government of the democratic spirit of the Republic's system.

With each political crisis and change of government, the expelling of professors from the university was common and frequent.

A bright spot in the Monagian period was the habilitation of certain National Colleges to teach the whole gamut of university courses: ecclesiastical sciences, law, medicine, mathematical

sciences and philology, and to grant the Bachelor's degree in theology, law, and medicine in addition to philosophy. The Colleges authorized to offer courses in the major faculties were Carabobo, Trujillo, Guanare, Barcelona, Barquisimeto, Guayana, and Maracaibo. The classes were to be opened when at least six students enrolled. This law was approved on March 27, 1852, and the colleges were not slack in applying it. The College of Carabobo initiated the courses in the major faculties on September 19 of the same year. This facet of the law was abused. On December 17, a decree of Monagas insisted on the minimum number of students in each class and their possession of the Bachelor's degree in philosophy. Also, the decree prohibited initiating curricula with only one class and required that all the classes must be offered by professors with at least a Licenciate degree in the respective faculty. On the second anniversary of the law a new decree was necessary: the classes must have at least six students and had to be suspended at the moment enrollment fell below that number. The control of the disposition was stringent: the governor of each province must visit the college at least every fifteen days and inform the ministry about "the existence, or nonexistence, of the six enrolled students."[5]

In 1856 the ecclesiastical courses were transferred to the seminary, to the satisfaction of both laymen and clergy. The former resented a union that reduced the scientific orientation of the university. The clergy felt that some teachings were destroying the spirit of the seminary.[6] The seminaries were to be extinguished by Guzmán Blanco in 1872. At that time the theological studies returned to the universities.

When Julián Castro ousted the Monagas' from government, new legal dispositions were established for education. The law against the stability of professors was abolished, even though the practice continued to flourish. The same Castro considered all the chairs as vacant and proceeded to name new professors. The universities were reorganized by the Decree of June 30, 1858, into six faculties: Ecclesiastical Sciences; Political Sciences (Law); Medical Sciences; Natural Sciences; Physical, Mathematical, and Philosophical Sciences; and Humanities.[7] The Military Academy of Mathematics was also reorganized by a Decree on April 26, 1858. Students and teachers were dismissed. The Academy was formed with a Director, one professor for each of the three biennium, two professors for topographical and linear drawing, one professor for military matters and half a company of students with two officers. A company of artillery and another of sappers were to be also instructed in the Academy.[8] The military academy was separated from the university on March 18, 1863, was reunited in 1865, and became independent after May 5, 1869.[9]

From 1859 to 1863 the civil war paralyzed education in the country. A large number of students were enrolled under one or another banner, and universities and colleges ceased to function for several periods. When the war was over, Falcón declared the nullity of all decrees, orders, and resolutions given between March 15, 1858 and June 15, 1863, and a general amnesty for the students. New authorities and teachers for the universities were designated by the President. Falcón did not care very much for education. The incomes of the universities were practically extinguished during the

war and in the five years of Falcón's Presidency. The government did not make payment to the University of Caracas and the building in San Jacinto was expropriated for a public market.[10]

In 1869, in a regulation of the Academy of Mathematics issued by Manuel Felipe Tovar as President of Venezuela on October 24, the civil and military engineers of the nation were integrated in a collegiate body called Colegio de Ingenieros de Venezuela. The purpose of the body was to foment natural and exact sciences in the country and to act as adviser of the government. In relation to the teaching of mathematics, the Colegio had the responsibility for sending visitors to the academy and for proposing the reforms estimated convenient by the body. It also had a consultive vote on the texts to be adopted in the Academy.[11] On October 28, 1861, the Colegio was established with twenty-two engineers attending its first meeting.

FOOTNOTES

[1]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), pp. 253-258.

[2]John V. Lombardi, The Decline and Abolition of Negro Slavery in Venezuela: 1820-1854 (Wesport, Connecticut, 1971), p. 26.

[3]MORON, p. 273.

[4]Ibid., p. 231.

[5]Venezuela, No. 805, March 27, 1854, Recopilación de Leyes y Decretos de Venezuela formada de orden del Ilustre Americano, General Guzmán Blanco (Caracas, 1874), p. 42.

[6]Delia Goetz, Education in Venezuela (Washington, 1948), p. 10.

[7]Venezuela, Recopilacion de Leyes y . . . , No. 1151, June 30, 1858, Art. 13, p. 534.

[8]Ibid., No. 1133, April 26, 1854, p. 513.

[9]Rafael PAREDES URDANETA, Bosquejo histórico de la Academia o Escuela Militar de Venezuela desde el 19 de Abril de 1810 (Caracas, 1940), p. 12.

[10]Ildefonso LEAL, Los Origenes de la Universidad de Caracas (Caracas, 1967), p. 58.

[11]Eduardo ARCILA FARIAS, Historia de la Ingeniería en Venezuela (Caracas, 1961), p. 337.

CHAPTER IX

1869 TO 1889: TWO DECADES OF DEVELOPMENT AND CENTRALIZATION

After the two decades of anarchy, the seventies marked for Venezuela a radical change and produced an expansion in education unequaled until the second half of the twentieth century. The responsibility for the progress was the autocratic government of Antonio Guzmán Blanco, a megalomaniac ruler who controlled the country until almost 1890.

Guzmán was the son of Antonio Leocadio Guzmán, one of the founders of the Liberal party. Guzmán Blanco was on the federal side during the civil war, and when Falcón won, he was commissioned in 1863 to negotiate a loan of one and a half million pounds in England. The terms of the loan offered by an English company were an effective sixty percent of the face value at a rate of six percent of the face value. The opposition which developed in the Congress was skillfully handled by Guzmán and the loan was accepted. At the end, the English company could not obtain the total amount and only one-third of it was received by Venezuela. But when Guzmán returned in November, 1863, he was the richest man in Venezuela. In 1869, Guzmán was the most important leader of the opposing Liberal party. After a riot, provoked by the Government at the doors of his house, he sought

asylum in the American Embassy and was exiled to Curacao. On February 14, 1870, he landed with a revolutionary army near Coro and in April occupied Caracas.[1] He was to be President during three separate periods in the next eighteen years, called the Septennium (1870-1877), the Quinquennium (1879-1884), and the Biennium (1886-1888).

When Guzman arrived in Caracas, a Congress was convoked to prepare the electionary process and designate the provisional President and two Vice-Presidents. In July, the Congress gathered in Valencia and obviously Guzmán was confirmed as acting President. In 1873, the elections resulted in the triumph of Guzmán Blanco, who started his constitutional four-year term, from 1873-1877. The Congress reduced, among other constitutional reforms, the Presidential term to two years in 1874 and eliminated the positions of Vice-President in the future.

The first Vice-President, Francisco Linares Alcántara, was elected President for the term of 1877-1879 and an anti-Guzman movement was fostered from the Presidency. Linares died on November 30, 1878. The Congress designated a half-brother of Alcántara, Jose Gregorio Valera, as acting President and Gregorio Cedeño, governor of the state of Carabobo, as first appointee to the Presidency. The movement against Guzmán grew bigger and in December a mob destroyed his statues which had been erected in Caracas during the Septennium. Cedeño reacted violently. He refused to accept the nomination of the Congress and in a fast action defeated the governmental troops. Guzmán came back from Europe and on February 25, 1879, was again in control as Supreme Director of the Republic. This

marked the beginning of the Quinquennium. He was elected for the term of 1880-1882 and re-elected for the term of 1882-1884. In 1886, he was elected again. In 1888 he withdrew from politics and established permanent residence in Paris. The period between the Quinquennium and the Biennium was served by a close friend of Guzmán, Joaquín Crespo, who was elected President for the term of 1884-1886.[2]

Guzmán Blanco was a "modern" dictator in the sense of giving an appearance of democracy and liberalism to his government and for the promotion of the structures of a modern state. He organized the economy, regularized the monetary system with the venezolano as a new monetary unit and, reorganized the legislation with Codes on civil, criminal, commercial, public funds, and military matters. Public works were executed all over the country. He really deserved the cognomen of Civilizing Autocrat given him in Venezuelan historiography.

Two details can help to fix the dark side of the picture of Guzman. His megalomania was patent in the statues of him raised during his government and in the decrees of the period. Usually, the decrees began with a traditional formula in which the name of the President is followed by the words "President of the Republic of Venezuela," and that custom was followed in his first years of government; but later, formulas like "Guzmán Blanco, Illustrious American, Pacifier, Regenerator and Constitutional President of Venezuela," were heading the decrees signed by Guzman.[3] His tricky manipulations to increase his wealth can be exemplified with the operation involving the property of Hacienda Chuao, which belonged to the

Central University. Guzmán wanted the rich plantation of cacao and proposed to exchange it for several houses he had in Caracas. The university refused, but on June 11, 1883, a decree ordered the universities to sell all their properties and to place the resultant funds in bonds of the Public Debt. The apparent rationale was to relieve the institutions of the administrative burden, but the reality was that Chuao, an estate estimated at two million bolivars in 1776, was auctioned to a man of straw of Guzmán for seven hundred fifty thousand bolivars.[4]

In education, three important events occur during the administrations of Guzmán: the decree of mandatory and free elementary instruction of June 27, 1870; the creation of the Ministry of Public Instruction, and the decrees of higher education of 1874 and 1883.

Elementary Instruction

The preoccupation existing over elementary education from the times of Vargas' Exposición had resulted in a Project of Public Instruction, with compulsory and free elementary instruction included, which was supposed to be discussed in the abortive Congress of 1869 during the brief conservative government. In 1870, the Minister of Development, Martin J. Sanavria, who was in charge of education, and Eduardo Castro, a high officer in the ministry, reacted the decree promulgated by Guzmán on June 27, 1870.[5]

The decree essentially modified Law I of the Code of 1843. The instruction was no more to be classified as general and scientific, but rather considered compulsory or necessary, and free or voluntary. The first, was required of all Venezuelans and the public officials had

the duty to offer it free, taking priority over any other; it corresponded to general principles of moral, reading, writing, practical arithmetic, metric system, and a compendium of the Constitution.[6] The central government assumed the responsibility of offering the compulsory instruction, but the local authorities were not relieved of their former duties. Moreover, they were to contribute in the development of elementary schools and to protect and help any person or institution working in this sense.

Parents were obligated to provide the prescribed instruction for their children at the age of seven, by themselves, by paying a private teacher, or by sending them to public school.

The intention of Guzmán was that

> where ten children can be brought together, there must be a teacher and a school. If there is no school, then classes should be held under a tree in order that there not be a single Venezuelan who cannot read the Constitution of the Republic.[7]

For this purpose, a National Direction of Elementary Instruction was created in Caracas, with corresponding Juntas in each state, department, and parish. A national tax was levied over any type of securities of one hundred bolivars or more. The tax was to be paid through special stamps, affixed on the documents to give them legal value.

The effect of the decree can be appreciated in Table II. By the end of the Septennium, the enrollment had increased four times and the number of schools eight times.

TABLE II

ELEMENTARY SCHOOLS 1871-1889

Year	Enrollment	Number of Schools
1871-72	15,226	210
1874-75	31,589	332
1875-76	48,140	1,124
1876-77	52,191	1,446
1877-78	60,911	1,664
1881	28,785	705
1886-87	99,446	1,957
1889	100,026	1,979

Source: Data from Mudarra, Miguel Angel Historia de la legislacion escolar contemporanea en Venezuela, Ministerio de Educacion, Caracas, 1962, p. 58, except the year 1889, which is from Sanchez, George I., The Development of Education in Venezuela, U.S. Office of Education, Bulletin 1863, No. 7, Washington, D.C., p. 20.

The increase of students and schools also increased the demand for teachers. Three Normal Schools, two in Caracas and another in Valencia, were established. In 1873, the Congress, considering that the success of elementary education depended on the preparation and capabilities of the teachers, authorized two scholarships to study pedagogy in

> Germany or the United States of the North, where the most extensive studies, successful progress in election of systems, elaboration of textbooks, and advancement of teachers in special institutes, has been realized.[8]

The beneficiaries of the scholarships accepted the obligation of establishing pedagogical institutions for the training of elementary teachers upon their return. By November 9, 1876, Mariano Blanco and Julio Castro had returned from the United States. With Virgilio Pérez, a Cuban architect, they were the first directors of the Normal Schools created on that day by Guzmán. The curriculum was comprised of four subjects offered in one semester:[9] writing and reading theory, administration of elementary schools, teaching methods, and the Constitution of Venezuela. Later, the tern was extended to a year and new schools for teachers were established in Cumaná, Barquisimeto, Ortiz, El Tinaco, Calabozo, and San Cristobal. After Guzmán, the Normal Schools practically disappeared for almost half a century.

During the Quinquennium, Guzmán formed the Ministry of Public Instruction, on May 24, 1881, composed of two divisions: the Direction of Popular Instruction, in charge of elementary education and the Direction of Higher Instruction, which regulated universities, colleges, libraries, academies, arts and crafts schools, and museums.

Colleges and Universities

In 1874, according to reports presented by the authorities of the institution, Guzmán reorganized the studies in the Central University in Caracas, into five faculties: Philosophical Sciences, Exact Sciences, Political Sciences, Medical Sciences, and Ecclesiastical Sciences. The last one had been returned by this time to the

university because all the seminaries were closed in 1872 since Guzmán was anticlerical and had several clashes with the church. Also, the Academy of Mathematics was closed in 1872 and the faculty of exact sciences assumed the instruction formerly offered there.

The faculty of Philosophy included three divisions: Languages, History, and Philosophy. Within the last, the subjects of the traditional curriculum for the Bachelor's degree were included, among them basic mathematics (See Table III). Two important additions were the requirements of languages and history for the degrees: Latin, Greek, and one year of world history, for the Bachelor's degree in Philosophy, and three more years of world history plus English, French, and German for the Licenciate in any career.

The programs in Exact Sciences were six years long, with the first biennium common with philosophy plus topographical drawing and water color drawing. Analytical and descriptive geometry, differential calculus and linear drawing were included in the third year. Integral calculus, theoretical mechanics, and linear drawing appeared in the fourth year. The last biennium included geodesy, astronomy, stereotomy, architecture, roads, bridges and channels, and applied mechanics. In Table IV, the recommended textbooks for the studies of mathematics are indicated.

At the end of the first biennium, after the individual examination of the students and presentation of two topographical plans, one in colors and another in Indian ink, of the actual measurements taken by the aspirant over a given terrain, the university, or college, granted a diploma which qualified the holder for the title of public land surveyor given by the government. In a similar way, at the end of the

TABLE III

APPROVED TEXTBOOKS FOR PHILOSOPHICAL SCIENCES, 1874

Division	Subject	Author
Philology	Latin	Ollendorff
	Greek	Ollendorff
	English	Ollendorff
	German	Ernst
	French	Ollendorff
Philosophy	Psychology	A. Jacques
	Logic	Julio Simon
	Moral Theodicy	E. Saisset
	Arithmetic and Algebra	Lacroix
	Geometry and Trigonometry	Legendre
	Land Surveying	Salneuve, and Menses
	Physics	Privat Des Chanel
	Cosmography	Andres Bello
	Chronology	Francoeur, and Acevedo
	Geography	Letronne, and Cortambert
History	Ancient History	(To be prepared by the professor)
	Middle Ages	
	Modern History	
	Comparative History	
	Philosophy of History	

Source: Decree of September 12, 1874. Leyes y Decretos Reglamentarios de las Estados Unidos de Venezuela, Ministerio de Realciones Interiores, Caracas, 1943.

TABLE IV

APPROVED TEXTBOOKS FOR MATHEMATICAL SCIENCES, 1874

Course	Subject	Author
First Year	Psychology	A. Jacques
	Logic	Julio Simon
	Moral Theodicy	E. Saisset
	Arithmetic and Algebra	Lacroix
Second Year	General Physics	Privat Des Channel
	Geometry and Trigonometry	Legendre
	Land Surveying	Salneuve, and Menses
	Topographical Drawing and Water Color Drawing	(To be prepared by the professor)
Third Year	Analytic and Descriptive Geometry	Zorraquin, and Lefebure de Fourcy
	Differential Calculus	Boucharlat
	Linear Drawing	(To be prepared by the professor)
Fourth Year	Integral Calculus	Boucharlat
	Theoretical Mechanics	Boucharlat, and Delaunay
	Linear Drawing	(To be prepared by the professor)
Fifth Year	Geodesy	Salneuve
	Astronomy	Francoeur
	Building	Claudel, and Laroque
	Stereotomy	(To be prepared by the professor)
Sixth Year	Architecture	Vignola, and Thumelop
	Roads, Bridges and Channels	Gayffer
	Applied Mechanics	Claudel
	Stereotomy	(To be prepared by the professor)

Source: Decree of September 12, 1874, Leyes y Decretos Reglamentarios de los Estados Unidos de Venezuela, Ministerio de Relaciones Interiores, Caracas, 1943.

six years a diploma from the university and a title of Civil Engineer from the Federal Government, were granted.[10]

The colleges underwent a complete re-organization in 1881. They were classified as Federal Colleges, of the first category, and Sectional Colleges, of the second category. At this moment, the second category colleges started to develop into the secondary schools, finally appearing as such in 1897, offering Latin and Greek, and three first years of philosophy, with the possibility of adding modern languages.

The Federal Colleges offered all the courses of the universities, except ecclesiastical sciences, and included pedagogy, which was added to the university curriculum in 1883. (Julio Castro, one of the students who was graduated in the United States, was the first teacher of pedagogy in the Central University.) The colleges of Carabobo, Guayana, Maracaibo, and Trujillo were the four of this category. All of them evolved into universities in the last decade of the century. The colleges granted the Bachelor's and Licenciate's degrees, but not the doctorate, which was exclusively obtained at the universities, even though it was a mere formality. The sectional colleges offered the degrees of Elementary Education Teacher, Public Land Surveyor, and Bachelor of Philosophical Sciences. The federal colleges offered, in addition, the Bachelor's in Political Sciences and Medicine and the Licenciate degree in Political Sciences, Medicine, and Philosophy, besides the Civil Engineering degree. At this time, the program of civil engineering was extended one year, requiring the complete philosophical triennium before the two biennia of specialization for a total

of seven years. The careers of medicine and law required six years after the philosophical triennium.

Each college had a laboratory school to teach writing and reading, decor, political constitution of Venezuela, practical arithmetic, geography of Venezuela, elements of world geography, and, in an extensive way, Spanish grammar. These courses, plus two years of Latin and Greek were required to enroll in philosophy.

During their studies, the civil engineers were required to take two years of natural history: botany and zoology in the first year, and mineralogy and geology in the second year. The Licenciate in any science required two modern languages chosen from English, French, or German, and two years of world history: up to the middle ages in the first year and modern history, comparative history, and philosophy of history in the second.

Law of Higher Education of 1883

In 1883, Guzmán Blanco published a degree to organize higher and scientific education in Venezuela. The former law of the Code of 1843 and the decree on national colleges mentioned above were revoked even though the later was incorporated with slight modifications in the new law.

One of the most important points of the law was the direct intervention of the government in the universities:

> The authorities of these institutions (universities and colleges) are the Federal, Executive, the Minister of Education, the Rector, the Vice-Rector, the Inspecting Junta, and, in universities and colleges of the first category, professors and faculty. The Rector and Vice-Rector will be freely appointed by the Federal Executive, who also will

> appoint professors from three names presented by the Rector.[11]

The direct interference of the government was the result of the unpopularity of Guzman among the students, who were the most enthusiastic statue-wreckers in the mobs of November, 1878.

A strong centralist tendency extended over the decree. The inspecting juntas, integrated by three academics for universities and the same as for elementary education in the case of colleges, had to visit, at least monthly, the institutions to prepare a report for the Ministry of Education with a "relation of the number of students attending classes, if there is progress in learning, and if they had found the functionaries discharging their duties."[12] Also, the inspecting juntas had to be present at all the examinations and send a separate report of their results. Of course, a sweeping attribution for the inspecting junta to watch the function of the institution by any possible way was also included.

The degrees of Licenciate were abolished and only the Central University in Caracas could issue the title of Doctor. The students who were graduated in the University of Merida or in the colleges of the first category received a diploma certifying the completion of the studies to be presented in Caracas for the doctorate. A similar diploma was issued for the studies of elementary education teacher, land surveyor, and civil engineer, which was to be presented to the Minister of Public Instruction who granted the titles.[13]

It is convenient to recall that, according to the Spanish tradition and law, preserved in Venezuelan legislation, the universities' degrees gave the legal right to practice a liberal profession and qualify

for certain public positions. In this sense, the university diploma was, and still is, a title of this right, and the corresponding Spanish words are used interchangeably. With this disposition, a distinction was introduced to centralize, in Caracas, the granting of titles.

The curriculum was equal to that approved for the federal colleges in 1881. Six years of study after the Bachelor's degree in Philosophy were required for medicine, law, and ecclesiastical sciences, and four for mathematics or engineering. The requirements of natural history, world history, drawing, and languages were the same as in 1881.

The courses of Greek, French, English, German, and pedagogy, each one year long, were offered every year. Latin, world history, and natural history, which took two years, and the philosophical, medical, political, and ecclesiastical sciences admitted new students every other year. Classes were five days a week, one hour each, except in the philosophical triennium, where classes met for an hour and a half each day, and in Latin and pedagogy, where classes met for two hours each day.

By the end of the era of Guzmán, Venezuela had two universities: Central University in Caracas and Universidad de Los Andes, in Merida, five federal colleges of the first category, practically equivalent to universities, and sixteen federal colleges of the second category for boys and fifteen for girls. There were also the nautical academy, the military academy, a school of fine arts, and two of music. For training in arts and crafts there were four schools called polytechnics and three normal schools for teachers.

In this period a clear differentiation emerged between higher and secondary education with the classification of colleges. In mathematics, the old common curriculum was separated into its military and civil branches. The studies of mathematics in the latter included more and more engineering until finally separating into an independent school in the next decade.

FOOTNOTES

[1]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 283.

[2]Ibid., pp. 289-298.

[3]See by example decree of July 24, 1880, No. 2223 of the Recopilación de Leyes y Decretos de Venezuela, formada de orden del Ilustre Americano, General Guzmán Blanco (Caracas, 1884), p. 478.

[4]Ildefonso LEAL, Los Origenes de la Universidad de Caracas (Caracas, 1967), p. 63.

[5]Miguel Angel MUDARRA, Historia de la legislacion escolar contemporanea en Venezuela (Caracas, 1962), pp. 51-52.

[6]Venezuela, Recopilacion de Leyes y . . . , Vol. V., No. 1723, June 27, 1870, pp. 58-65.

[7]Delia Goetz, Education in Venezuela, U. S. Office of Education, Bulletin 1948, No. 14 (Washington, 1948), p. 11.

[8]Venezuela, Recopilacion de Leyes y . . . , Vol. V, No. 1827, May 3, 1873, Art. 2, p. 822.

[9]Ibid., Vol. VII, No. 2008, November 9, 1876, Art. 2, p. 470.

[10]Ibid., Vol. V, No. 1776, November 19, 1872, pp. 154-155.

[11]Venezuela, Law of September 24, 1883, Arts. 108-109, Leyes y Decretos Reglamentarios de los Estados Unidos de Venezuela (Caracas, 1943), p. 811.

[12]Ibid., Art. 126, p. 814.

[13]Ibid., Art. 78 and 79, p. 809.

CHAPTER X

THE CODE OF PUBLIC INSTRUCTION OF 1897

The last decade of the nineteenth century was a stage of consolidation of the advancements attained in the Guzmán era. As an omen for a brilliant new century, new universities emerged from the national colleges and a Code of Instruction, the second of the republican period, unified the normative body of education. But at the turn of the century, Venezuela was under a new dictator, who, by 1904, had closed universities and colleges adducing excessively large numbers of lawyers, physicians, and engineers who ". . . may drive us, through the intellectual proletariate to a degeneration of the national spirit."[1]

In 1888, the influence of Guzmán determined the election of Dr. Juan Rojas Paul as President, the first civilian in the century after Dr. Vargas. Dr. Rojas was a democratic ruler and during his term, the autocratic power of Guzmán, who retired to Paris, vanished. Dr. Raimundo Andueza Palacio was elected for the term of 1890-1892 and once in power, he decided to modify the constitution to prolong the Presidential term. The political opinion was divided between the continuism of Andueza and the legalism of the opposition. In the first months of 1892, General Joaquín Crespo started a revolution under the legalistic banner and by October occupied Caracas. A constituent assembly extended the Presidential term to four years, but this time

in favor of Crespo, who made the arrangements to be elected for the term of 1894-1898.

In the next elections, as usual, the official candidate, General Ignacio Andrade, won for the term of 1898-1902. But on October 22, 1899, he was overthrown by Cipriano Castro. The end of the century marked the beginning of a long dictatorship which extended, first under Castro and later under Gomez, until 1935.[2]

In the nineties, two colleges of the first category were transformed into universities, the first two to be erected in the republic period. In the preceding chapter, it was indicated that no main differences existed between colleges of the first category and universities. Only the studies of ecclesiastical sciences in the university curricula, not offered at colleges, made a distinction.

In Maracaibo, an extension of the Academy of Mathematics was established on April 29, 1867, where the students could receive the degree of land surveyors and prepare themselves to take examinations for higher degrees in the Academy of Caracas.[3] It was called the School of Engineers of Maracaibo. On May 29, 1891, the college of the first category and the engineering school merged by a decree of Andueza Palacio to form the Universidad del Zulia. In Valencia, the federal college of the first category was transformed into a university with the name of Universidad de Carabobo by resolution of Joaquín Crespo on November 15, 1892. Both universities and the University of Bolivar, into which the College of Guayana was transformed by the end of the century, were closed in 1904. The University of Zulia was re-opened in 1946 and, in 1958, the University of Carabobo re-opened. In Ciudad Bolivar, one of the campuses of the Universidad de Oriente,

created on November 21, 1958, in the east part of Venezuela, is now operating.

Another remarkable event was the issuing, by the Congress, of the Public Instruction Code on June 3, 1897, under the Presidency of Joaquin Crespo. It was a comprehensive set of three hundred twenty-eight articles, which covered all the aspects of education in the country, and, as happened with its predecessor, the Code of 1843, was prepared with the help of the Central University. Great hopes were placed upon the organization provided by the Code, which, in the words of the Rector of the Central University at that time,

> . . . perhaps there may be some flaws, as in any human endeavor; in general, however, it is possible to assure that it is a piece as modern as its time and the corner-stone upon which the magnificent building of the future intellectual civilization of Venezuela will be raised.[4]

In this Code a clear differentiation was made for the first time among elementary, secondary, and higher education. In the second article, the classification of the educational establishments is as follows: Elementary schools for the teaching of the first letters, federal colleges and normal schools for secondary education, universities for higher and scientific instruction, special institutes (which included engineering schools), and academies. The degrees of bachiller (bachelor), agrimensor (land surveyor), and preceptor (elementary education teacher) were considered secondary education degrees and the first two were required for enrollment, respectively, at universities and engineering schools, even though the universities maintain the right to grant any secondary education degrees.

In mathematical education, the courses of the philosophical triennium were transferred to secondary education for the degrees of bachelor and land surveyor. In this way, algebra, theory of arithmetic, geometry, trigonometry, and elements of land surveying were required for the secondary education diploma of bachelor and land surveyor. The teachers training was extended to a three-year curriculum in which mathematics was included only as arithmetic and the study of the metric system.

At the level of higher education, important changes occurred: the studies of mathematics and engineering were differentiated and the latter was offered in an institution separate from the university. The engineering school was created on January 12, 1895, by Joaquín Crespo, as an institution of higher education, independent from the university. In 1904, it was included as a part of the faculty of exact sciences, really the only part it had, as one of the schools which was dependent on the university. In 1912, the name of exact sciences was substituted for faculty of physics and mathematics until 1953 when it was called faculty of engineering.[5] In 1912, the Central University was closed, and the school of engineering was one of the few which continued to function until 1922 when the university was opened again.

With this new organization, mathematical studies were offered at a higher level in the universities by the faculty of Exact Sciences and in the Engineering School. The faculty of exact sciences was made up of the professors of the former faculty of philosophical sciences and a new Faculty of Philosophy and Lettres was created. The structure of the universities by the end of the century included six faculties:

ecclesiastical sciences, political sciences, medical sciences, exact sciences, philosophy and letters, and pharmacy.

The faculty of exact sciences granted the doctorate upon the completion of a course of four years in higher algebra, analytic geometry, descriptive geometry, fundamental philosophy with history of philosophy, chemistry, differential and integral calculus, theoretical mechanics, geodesy, astronomy, physics, general biology, and sociology.

The courses in the engineering school offered an option of two different degrees: architect in two years, and engineer in four years. The degree of engineer required, also, a dissertation similar to the doctoral thesis.

In engineering, three curricula were offered in civil, military, and agronomic engineering. Civil engineering required the largest number of courses in mathematical sciences: higher algebra, analytic and descriptive geometry, calculus, theoretical mechanics, geodesy, astronomy, and industrial applications of mathematics. For military engineers, theoretical mechanics, geodesy, astronomy and the industrial applications were not required. In the case of agronomic engineers and architects, only analytic and descriptive geometry were offered.[6]

The increasing importance of engineering, and the professional emphasis of the universities of Spanish ancestry caused the faculties of engineering to absorb the studies of mathematics in higher education for the first part of the twentieth century. It was not until 1936, that mathematics was offered independently of engineering, in the

Pedagogico (Teachers College) for the training of secondary school teachers, and in 1958, at universities as a separate discipline.

FOOTNOTES

[1]Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad (Caracas, 1971), p. 303.

[2]Miguel Angel MUDARRA, Historia de la legislación escolar contemporánea en Venezuela (Caracas, 1962), p. 93, citing the Memoria del Ministerio de Instrucción Publica 1904-1905, pp. 37-38.

[3]Eduardo ARCILIA FARIAS, Historia de la Ingeniería en Venezuela (Caracas, 1961), p. 329.

[4]MUDARRA, p. 83.

[5]Ildefonso LEAL, Los Orígenes de la Universidad de Caracas (Caracas, 1967), p. 73.

[6]Venezuela, Code of Public Instruction of June 3, 1897, Leyes y Decretos Reglamentarios de los Estados Unidos de Venezuela (Caracas, 1943), pp. 759-785.

CHAPTER XI

SUMMARY AND CONCLUSIONS

The historical development of the teaching of mathematics in Venezuela presents a clear stream of continuity from the hispanic institutions to the republican organization of the country, in spite of the political convulsions and wars which had disrupted the life of the country on several occasions.

The formation of the Military Academy of Mathematics of Castro, in 1760, the establishment of higher education studies at Cumaná, in 1782, and the introduction by Marrero of mathematics in the philosophical triennium at the University of Caracas, in 1788, mark the beginning of the teaching of mathematics at a level different from the elementary basic rules of arithmetic.

The interest in applied sciences for the development of agriculture and arts induced Dr. de la Torre to advocate an Academy of Mathematics. The project was lost in the struggle for the control of the proposed academy between the university and the consulado.

The independence of Venezuela was proclaimed, and in the subsequent long war two attempts at establishing academies of mathematics failed. Only the studies at the University and the military academies preserved the teaching of mathematics during this period. In 1826, the Bolivarian reform established a chair of mathematics in the now Central University of Venezuela in Caracas, when Venezuela

was part of the Republic of Colombia. Maestro Rafael Acevedo was professor.

Shortly after Venezuela seceded from Colombia, the Academy of Mathematics, dreamed of by Marrero, was established in 1831 in Caracas. Vargas and Cajigal, two men with modern scientific educations obtained in Europe after the war drove them out of the country, played the major roles in the creation of the Academy. Cajigal, mathematician educated in Paris, and Acevedo, the teacher of mathematics at the University, were the two professors of the Academy. This institution served to both train civilian technicians and military officers and was attached to the University.

During the 1830's, several colleges, public and private, were established. They offered courses in mathematics as a part of the curriculum for the Bachelor degree in philosophy. The advancement of the studies in the country required legislative action to unify the patterns of development and a first Code of Public Instruction was approved by the Congress in 1843. The next two decades were years of political fights, wars, and stagnation and education in Venezuela suffered the logical consequences. Teachers were summarily dismissed from their positions and colleges and universities closed at different times. Early in this period, in 1852, the colleges were authorized to offer not only the philosophical triennium but also the higher courses in law, medicine, and mathematics. Conditions were not propitous for a strong development of these studies, but the disposition was an important event for what now are universities in several places of the country.

The confused situation of those twenty years produced a modern dictator in the country, Guzmán Blanco, who dominated the scene in the 1870's and 1880's and provoked fundamental developments in education. Early in the period, elementary education received a great boost when, against the tradition, it was included as a responsibility of the central government and made compulsory in Venezuela. Mathematics, at this level included the basic rules of arithmetic and the metric system, which was introduced at this time. Secondary education started to take shape as the collegiate part offered for the degree of Bachelor in Philosophy. Mathematics included the study of arithmetic, algebra, geometry, and trigonometry. Higher mathematics were offered at universities and federal colleges of the first category.

The last decade of the Nineteenth century brought to the country three new universities, created from the federal colleges of Maracaibo, Carabobo, and Ciudad Bolivar, a second Code of Public Instruction, in 1897, and, by the turn of the century, a new, but not modern, dictatorship which was going to bring education in the country to a standstill until the 1930's. For mathematics, the most important event was the creation of a separate engineering school and the creation of faculties of exact sciences at the universities. Later, the engineering school returned to the university and absorbed all the mathematical studies. The new universities were closed in 1904. The two oldest, Caracas and Merida, had a precarious existence and were closed for some periods during the dictatorship.

Conclusions

Characteristics of Venezuelan education and, particularly, of Venezuelan universities are better understood when their historical development is considered.

The development of secondary education from the common part of the university curricula produced a rather uniform and highly university-oriented secondary instruction. At the same time, the remotion of the common courses left the university with separated schools strongly dedicated to professional training. This produced a practically complete separation among disciplines, non-existence of university-wide departments, and early commitment of students to a specific career with scarce opportunity to change fields of study once enrolled at the university.

Another characteristic, present through all this historical development, is the qualification for professional practice consistently concomitant with university degrees, implied by the creation of higher education courses only by power of the highest authorities. The attempt, which was made in the 1860's to have the Colegio de Ingenieros control university instruction was ephemeral.

The self-government of the universities surprisingly survived most all the autocratic administrations of Venezuela and the tradition started in the medieval Studia Generale is still alive. It means that the administration is drawn from the faculty, and that rectors, vice-rectors, deans, and directors are elected for a fixed term with no re-election allowed.

After considering the historical development presented here, some points seem to suggest future opportunities for study. One of these is the introduction of calculus as a regular subject in the curricula in different places of the Americas, an event which occurred in a period of thirty years. The history of its expansion in the New World can be interesting in itself, or in comparison with similar cases, such as the theory of probability and the after Sputnik "modern" mathematics of this century.

The history of the development of the influences of pedagogical ideas in the United States upon Venezuelan education offers also an opportunity for study. Andujar and Julio Castro have been mentioned here as teachers who, separated in history by a hundred years, were informed about American education.

Comparative studies of the historical development of secondary education between the United States and Latin American countries or of the graduate professional schools in the United States and the professional faculties of Latin American universities might well yield interesting contrasts.

A SELECTED BIBLIOGRAPHY

"Academia de Matematicas," Gazeta de Venezuela, November 30, 1831.

"Academia de Matematicas," Gazeta de Venezuela, December 7, 1831.

ARCILA FARIAS, Eduardo. Historia de la ingeniería en Venezuela. Caracas: Colegio de Ingenieros de Venezuela, 1961.

BOLIVAR, Simón. Decretos del Libertador, 2 Vol. Publicaciones de la Sociedad Bolivariana. Caracas: Imprenta Nacional, 1961.

Cajori, Florian. The Early Mathematical Sciences in North and South America. Boston: Richard G. Badger, Publ., 1928.

CAPMANY, Geronimo de and Benito BAILS. Tratados de Matematica que para las escuelas establecidas en los Regimientos de Infanteria, . . . han escrito. . . . Madrid: Joachin Ibarra, 1772.

Catalogo General de libros y folletos de que consta la Biblioteca del Colegio Federal de la categoria del Estado Bolivar, incluido el aumento hasta el 15 de diciembre de 1896. Caracas: National Library, Manuscript, 1896.

Compayre, Gabriel. Abelard and the Origins and Early History of Universities. New York: AMS Press, rep. from 1893 New York edition, 1969.

COROMINAS, Joan. Breve diccionario estimologico de la lengua castellana. Madrid: Editorial Gredos, 1967.

Cuerpo de Leyes de la Republica de Colombia. Caracas: Universidad Central de Venezuela, 1961.

CUESTA DUTARI, Norberto. Filosofia Natural y Pugna de Facultades en la Universidad de Salamanca. Salamanca: Imprenta Comercial Salmantina, 1971.

DOMINGUEZ, Rafael. "Rectificaciones historicas. Clase y Academia de Matematicas. Las Matematicas del Padre Andujar." Anales de la Universidad Central de Venezuela. Caracas: The University, 1928, pp. 101-116.

Emerson, George S. Engineering Education: A Social History. Newton Abbot, Devon: David & Charles, 1973.

Enciclopeida Universal Ilustrada Europea Americana, 70 Vols. Madrid: Espasa Calpe, S.A., 1904-1930.

Goetz, Delia. Education in Venezuela. U.S. Office of Education, Bulletin 1948, No. 14. Washington: Government Printing Office, 1948.

Howe, Walter. The Mining Guild of New Spain and its Tribunal General. Cambridge: Harvard University Press, 1949.

Hussey, Roland Dennis. The Caracas Company 1728-1784: A Study in the History of Spanish Monopolistic Trade. Cambridge: Harvard University Press, 1934.

Lanning, John Tate. Academic Culture in the Spanish Colonies. London: Oxford University Press, 1940.

_____. The University of the Kingdom of Guatemala. New York: Cornell University Press, 1955.

_____. "Tradition and the Enlightenment in the Spanish Colonial Universities." Cahiers D'Histoire Mundiale, X (1967), 705-712.

LEAL, Ildefonso. Historia de la Universidad de Caracas 1721-1728. Caracas: Universidad Central de Venezuela, 1963.

_____. Los Origenes de la Universidad de Caracas. Caracas: n.p., 1967.

Lombardi, John V. The Decline and Abolition of Negro Slavery in Venezuela 1820-1854. Contributions in Afro-American and African Studies No. 7. Wesport, Conn.: Greenwood, 1971.

Moran, Catherine. Spain: Its Story Briefly Told. Boston: The Stratford Company, 1930.

MORON, Guillermo. Historia de Venezuela, 5 Vol. Caracas: Italgrafica, 1971.

OSSOT MACHADO, Willy. Los estudios de las matemáticas en Venezuela durante los siglos XVIII y XIX. Facultad de Humanidades y Educacion. Caracas: Universidad Central de Venezuela, (n.d.).

PALAU DULCET, Antonio. Manual del Librero Hispanoamericano, 24 Vols. Barcelona: Libreria Palau, 1948-1972.

PAREDES URDANETA, Rafael. Bosquejo histórico de la Academia o Escuela Militar de Venezuela desde el 19 de abril de 1810. Caracas: Editorial Cecilio Acosta, 1940.

PICON SALAS, Mariano. A Cultural History of Spanish America: From Conquest to Independence. Berkeley: University of California Press, 1962.

Rashdall, Hastings. The Universities of Europe in the Middle Ages, 3 Vols. Ed. by F. M. Powicke and A. B. Emden. London: Oxford University Press, 1936.

Sanchez, George Isidore. The Development of Education in Venezuela. U. S. Office of Education, Bulletin 1963, No. 7, Washington: Government Printing Office, 1963.

Simons, Lao Genevra. Bibliography of Early American Textbooks on Algebra. The Scripta Mathematica Studies, No. 1. New York: Yeshiva College, 1936.

"Senor Rafael Acevedo," El Cojo Ilustrado, No. 77, March 1, 1895, p. 130.

Smith, D. E. and J. Ginsburg. A History of Mathematics in America Before 1900. Carus Mathematical Monographs No. 5. New York: The Mathematical Association of America, 1934.

Universidad Central de Venezuela. Prospecto. Caracas: Editorial Elite, 1947.

Venezuela. Leyes y Decretos Reglamentarios de los Estados Unidos de Venezuela. Caracas: Ministerio de Relaciones Interiores, 1943.

Venezuela. Recopilación de Leyes y Decretos de Venezuela formada de orden del Ilustre Americano, General Guzmán Blanco. Caracas: Government of Venezuela, 1774-1884.

APPENDIX A

TITLE PAGE OF CAPMANY AND BAILS' BOOK

TRATADOS
DE MATHEMATICA,
QUE PARA LAS ESCUELAS

ESTABLECIDAS

EN LOS REGIMIENTOS DE INFANTERIA,

POR PARTICULAR ENCARGO

DE SU INSPECTOR GENERAL

EL EXC.mo S.or CONDE DE O-REILLY,
Teniente General de los Exércitos de S. M.
y Comendador de Befayan en la Orden
de Alcántara,

HAN ESCRITO

El Teniente Coronel graduado D. GERÓNYMO DE CAPMANY,
Sargento Mayor del Regimiento de la Corona,

Y

D. BENITO BAILS, *Director de Mathemáticas de la Real Academia de San Fernando, Individuo de las Reales Academias de la Lengua Española, de la Historia, y de las Ciencias Naturales y Artes de Barcelona.*

MADRID. MDCCLXXII.

Por D. JOACHIN IBARRA, Impresor de Cámara de S.M.

Con especial Privilegio de S. M.

APPENDIX B

TABLE OF CONTENTS OF CAPMANY AND BAILS' BOOK

TABLA
DE LOS ASUNTOS.

Elementos de Arismética.

Re-

TABLA.

Al-

TABLA.

Geometria Práctica.

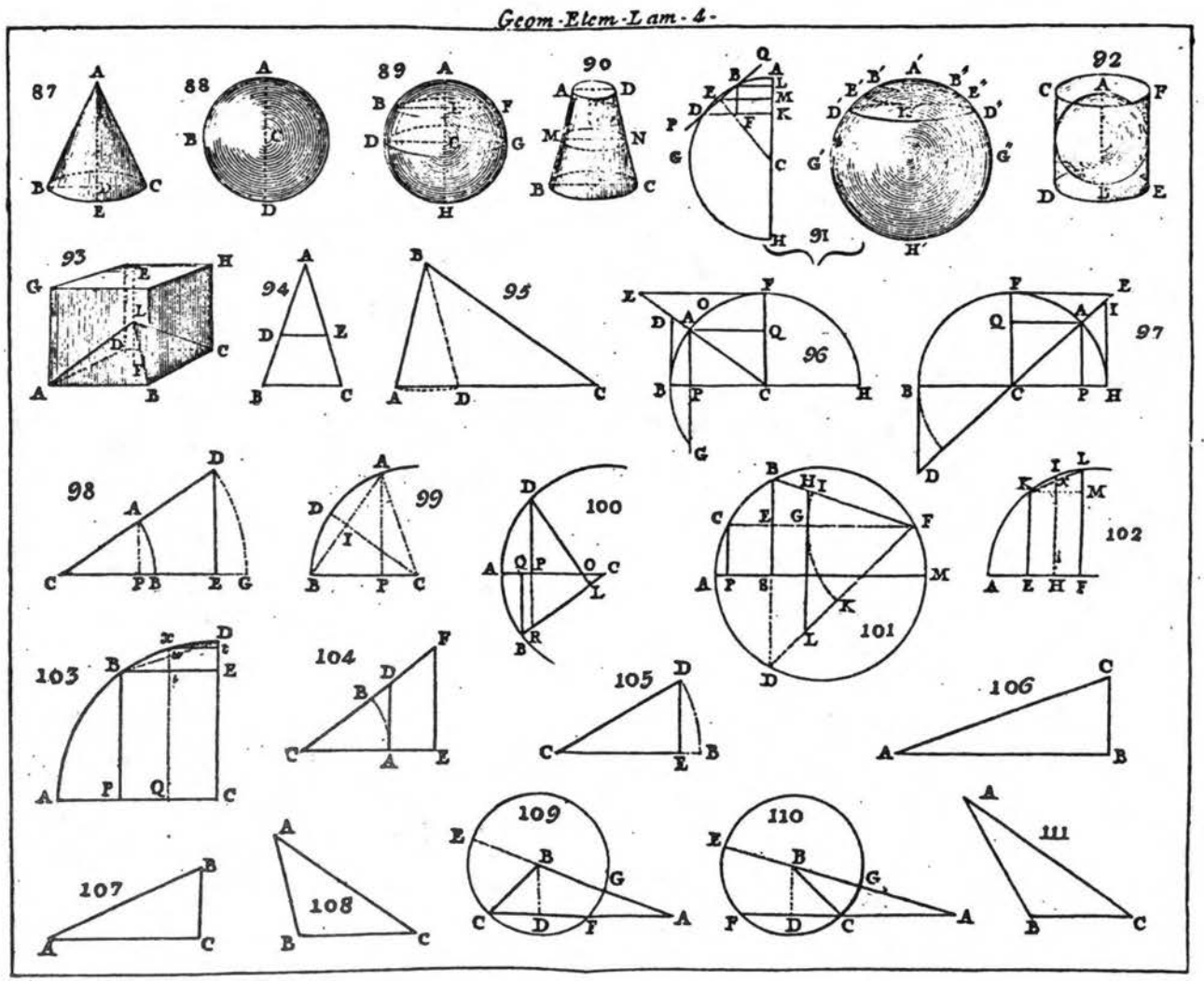
De

TABLA.

NOTA. *Un número dentro de un paréntesis significa que la proposicion donde está se funda en el artículo de la Obra que empieza por dicho número.*

APPENDIX C

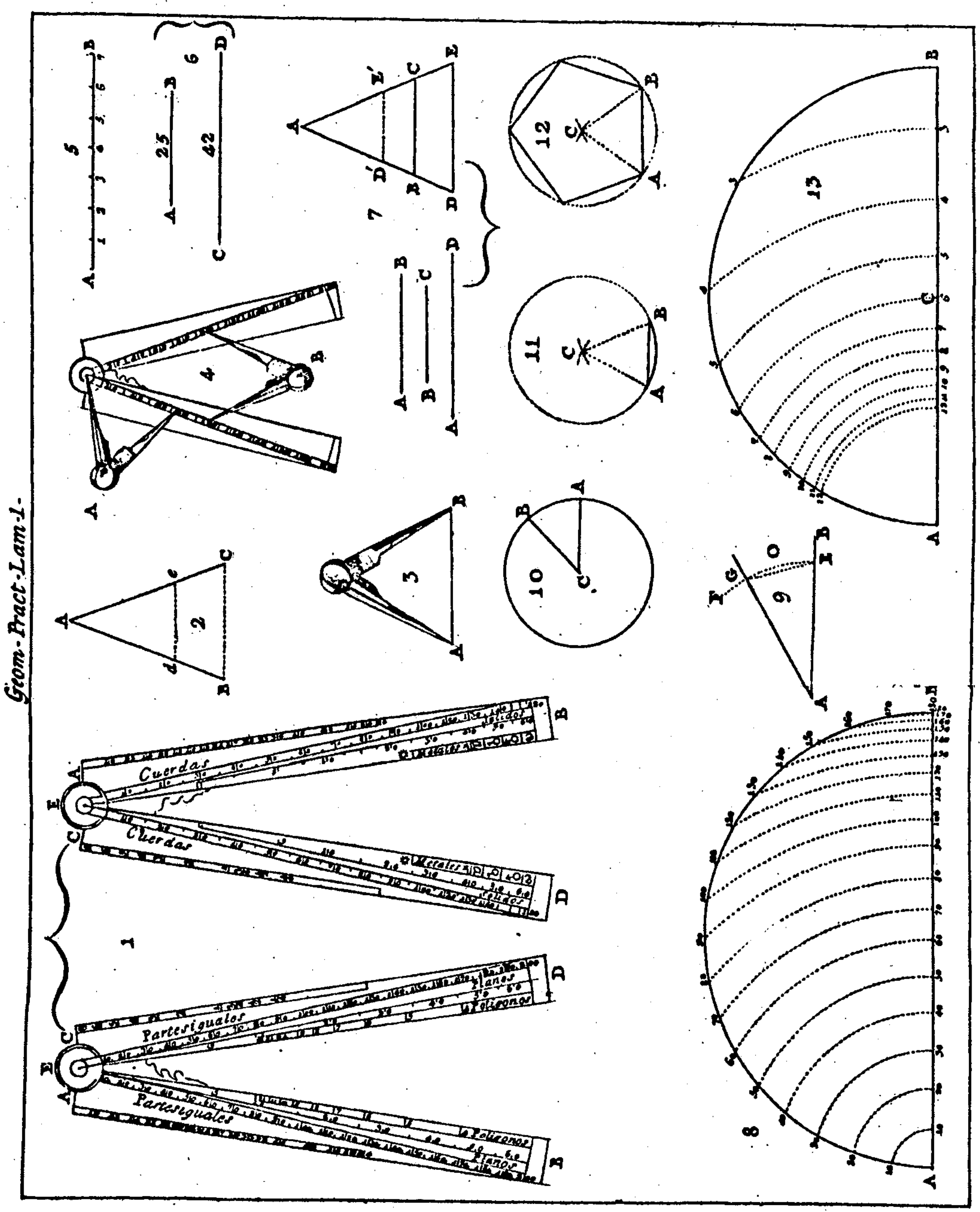
SAMPLE PLATE OF SOLID GEOMETRY


Geom-Elem-Lam-4-
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111

APPENDIX D

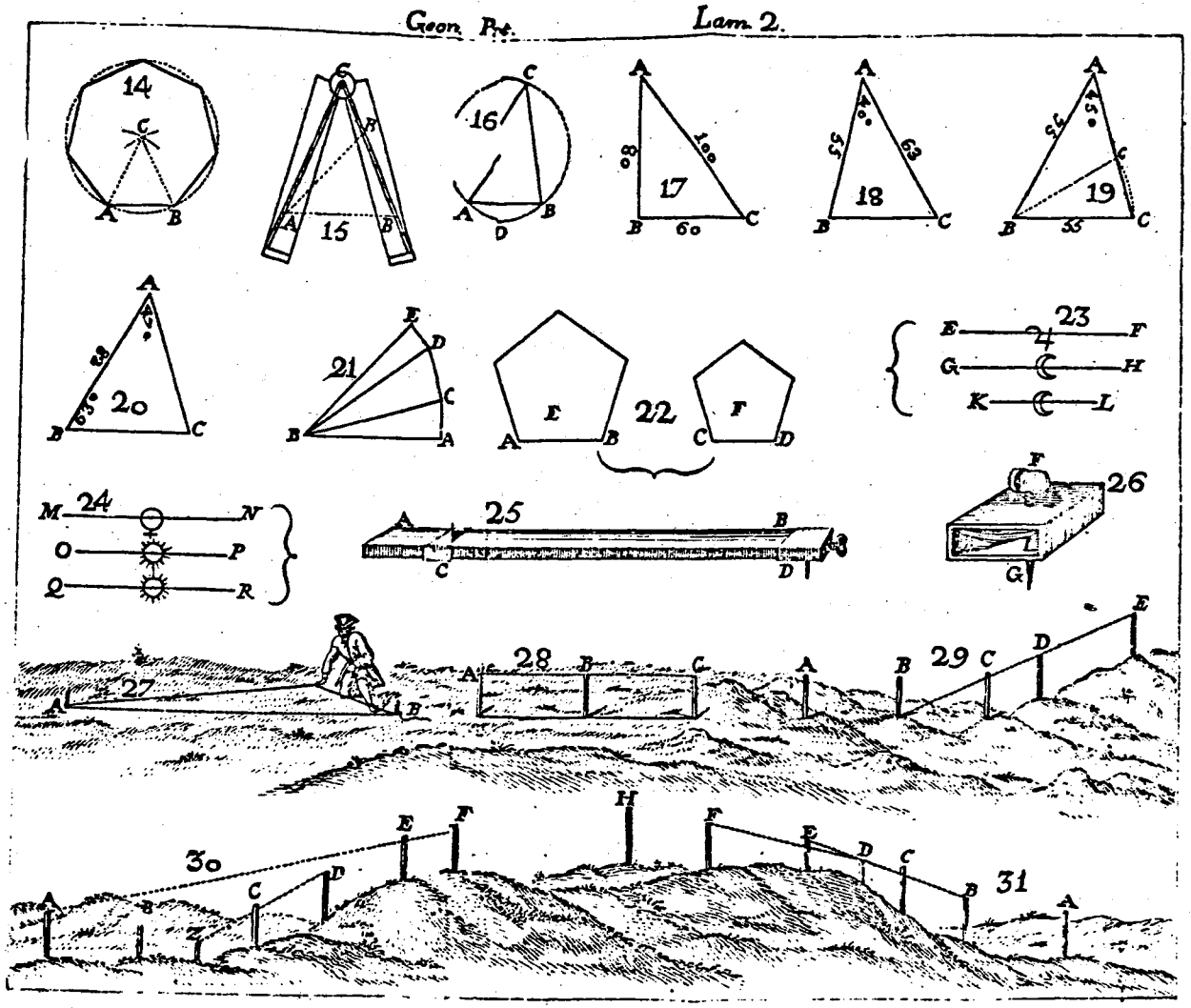
PLATE ON DIVIDERS

Geom-Pract-Lam-1-



APPENDIX E

PLATE ON MEASUREMENT


Geom. Pt.
Lam. 2.
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

APPENDIX F

ENROLLMENT AT THE CENTRAL UNIVERSITY OF VENEZUELA DURING THE NINETEENTH CENTURY

ENROLLMENT AT THE CENTRAL UNIVERSITY OF VENEZUELA DURING THE NINETEENTH CENTURY

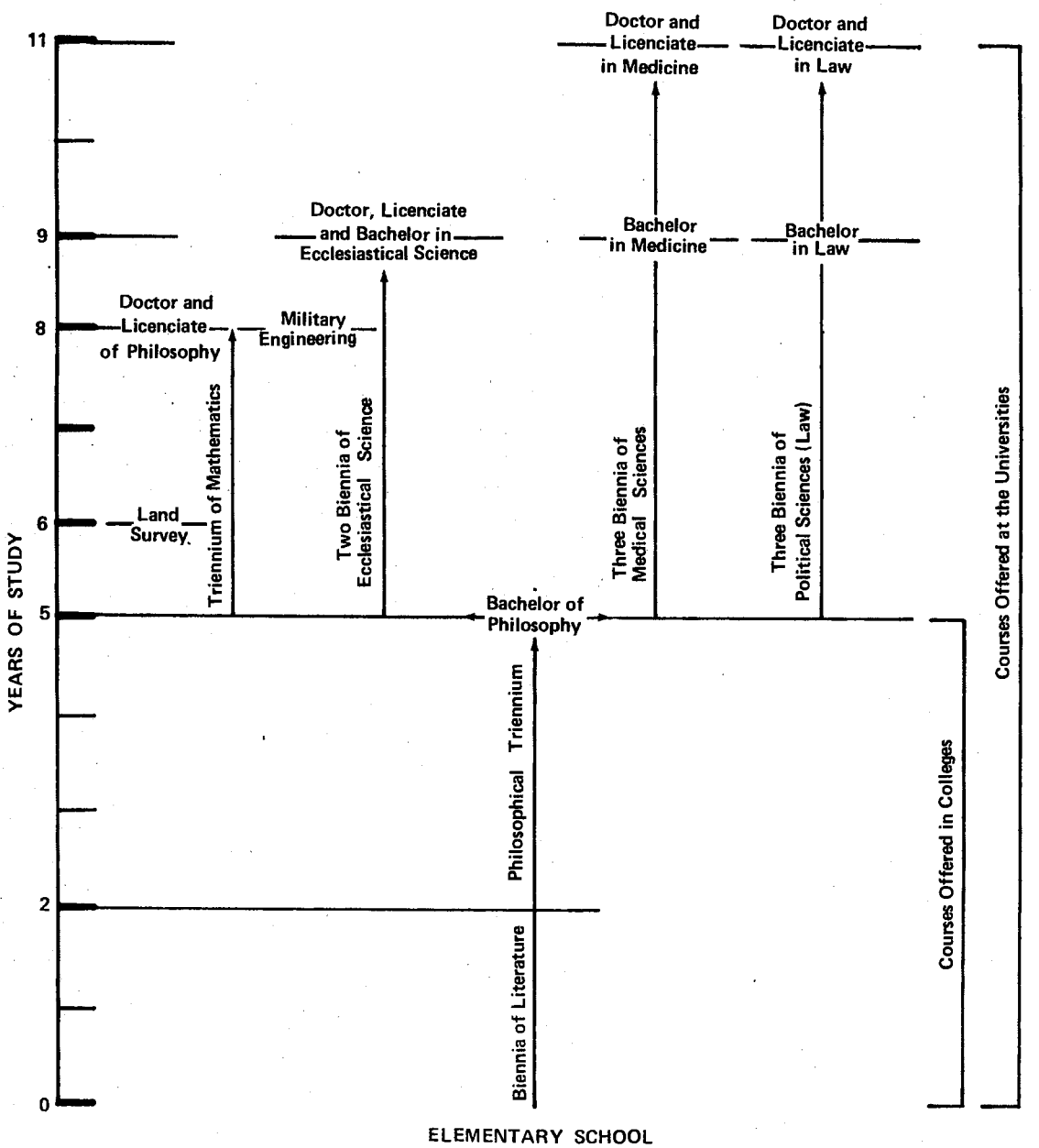
Year	No. of Students	Year	No. of Students
1810	129	1881	320
1815	40	1885	328
1827	348	1886	380
1841	425	1888	291
1844	548	1893	323
1856	569	1895	245
1860	326	1896	269
1873	267	1899	298

Source: Ildefonso LEAL, Los Origenes de la Universidad de Caracas, Caracas, 1967, p. 71.

APPENDIX G

SCHEMATIC PLAN OF UNIVERSITY DEGREES

SCHEMATIC PLAN OF UNIVERSITY DEGREES
CODE OF 1843



APPENDIX H

CURRICULA OF EARLY ENGINEERING SCHOOLS IN VENEZUELA AND THE UNITED STATES

Venezuela 1843	West Point 1817	Rensselaer 1849-50	M. I. T. 1865
		First Year	
Mathematics (arith., algebra, geom., plane & sph. trig., land surveying	Mathematics (algebra, geom., trig., mensuration)	Algebra, Geom., Trig.	Algebra, Solid Geom., Trigonometry
Philosophy (general grammar, metaph.)	French	General Physics	Elementary Mech.
		Geo. Drawing	Drawing
		English	English
		Foreign Language	Foreigh Language
		Surveying	Inorg. Chemistry
		Botany	
		Second Year	
Mathematics (cont.)	Mathematics (cont.)	Analytical Calculus	Analytical Calculus
Physics & Astronomy	Drawing	General Physics	Physics
	Analytical Geometry	Chemistry	Chemistry
	Fluxions (calculus)	Desc. Geometry, Mech. Drawing	Desc. Geometry, Mech. & Freehand Drawing
		Top. Hidr. Surv.	Survey, Plane
		English	English
		Foreign Language	Foreign Language
		Mineralogy	Astronomy, Nav.
		Zoology	
		Geology	
		Third Year	
Geography & Chron.	Topological Drawing	Calc., Anal. & Appl. Mech., Astronomy	Mech., Pract. Astron., Geodesy, Des. Geom., Top. Drawing
Physics & Astronomy (cont.)	Natural Phil. (Physics, Astronomy)	Surveying	Industrial Physics
	Chemistry	Desc. Geom., Mason. & Carpentry	English
		Physics; English; Drawing; Foreign Language	Practical Geometry
			Cont. Theory of Struc., Bridges, Hydraulic Railways
		Computation of Earth Work & Mason.	Mining
		Hydrograph. Survey	Metallurgy
			Philosophy of Mind
		Fourth Year	
Analytical & Desc. Geometry	Engineering (const.)		
Diff. & Int. Calculus	Mineralogy		
Drawing	Rethoric, Moral, & Political Science		
		Fifth Year	
Anal. & Desc. Geom. (cont.)			
Calculus (cont.)			
Civil Engineering			
		Sixth Year	
Civil Engineering			

Sources: Venezuela: Code of 1843;
West Point: Stephen E. Ambrose, Duty, Honor, Country: A History of West Point, John Hopkins, Baltimore, 1966, p. 90.;
Rensselaer and M. I. T.: George S. Emmerson, Engineering Education: A Social History, David & Charles, Newton Abbot, Devon, 1973, pp. 154-155.

APPENDIX I

POPULATION OF VENEZUELA

Year	Estimated By	Population
1787	Castro y Arroes	333,110
1800	A. Humboldt	780,000
1802	Depons	728,000
1807	Daussion de la Vaise	975,972
1810	Hall	825,000
1810	Jose M. Restrepo	800,000
1810	A. Humboldt	802,000
1814	Manuel Aurrecoecha	786,000
1816	Jose Domingo Diaz	758,259
1823	A. Humboldt	766,110
1825	Jose M. Restrepo	659,633
1825	Humboldt	785,000
1835	Agustin Codazzi	701,633
1838	Juan Manuel Cajigal	1,147,760
1838	Official Census	887,168
1839	Agustin Codazzi	945,348
1844	Official Census	1,218,716
1846	Official Census	1,273,155
1847	Official Census	1,267,692
1852	Wappans	1,564,431
1854	Official Census	1,564,433
1857	Official Census	1,888,149
1873	Official Census	1,784,194
1881	Official Census	2,075,245
1886	Official Census	2,198,320
1888	Official Census	2,238,922
1891	Official Census	2,323,527

Sources: "Venezuela," Enciclopedia Universal Ilustrada Europeo-Americana, Espasa-Calpe, Madrid, Vol. 67, except for the years 1886 and 1888, which are from Guillermo MORON, Historia de Venezuela, Vol. 5, La Nacionalidad, Italgrafica, Caracas, 1971, p. 300.

VITA

Freddy A. Mulino-Betancourt

Candidate for the Degree of

Doctor of Education

Thesis: HISTORICAL DEVELOPMENT OF MATHEMATICAL EDUCATION IN VENEZUELA DURING THE EIGHTEENTH AND NINETEENTH CENTURIES

Major Field: Secondary Education

Biographical:

Personal Data: Born in Valencia, State of Carabobo, Venezuela, March 13, 1934, the son of Policarpo Mulino and Carmen Z. Betancourt de Mulino.

Education: High school studies at Colegio Don Bosco and Liceo Pedro Gual, Valencia. Venezuelan degree of bachiller en Ciencias Fisicas y Matematicas, Ministerio de Education, Venezuela, July 1952. Received Ingeniero Civil professional degree at the Universidad del Zulia, Maracaibo, Venezuela, in July, 1957; Master en Ciencias degree in mathematics from the Universidad de Carabobo, Valencia, Venezuela, December, 1971, and completed requirements for the Doctor of Education degree at Oklahoma State University in July, 1974.

Professional Experience: Highway designer engineer for the department of Public Works at the State of Zulia, Venezuela, 1957-1960. Advisor engineer to the Catastro of the City Council of Maracaibo, State of Zulia, Venezuela, 1958. Assistant Professor of Geodesy and Highway Design at the University of Zulia, Maracaibo, Venezuela. Private practice as consulting engineer, 1960-1963. Agregate, associate and full professor of mathematics at the Universidad de Carabobo, Venezuela, 1963-1974. Director of the Institute of Applied Mathematics of the Faculty of Engineering, of the University of Carabobo, 1967-1968. Secretario of the University of Carabobo, elected for the period of 1968-1972, Valencia, Venezuela.