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Artículos científicos

La educación de la Ingeniería Topográfica en la Universidad de Guanajuato: 152 años de tradición histórica

The education of Surveying Engineering at the University of Guanajuato: 152 years of historical tradition

Formação em Engenharia Topográfica na Universidade de Guanajuato: 152 anos de tradição histórica

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Resumen

El principal objetivo de esta reseña histórica fue dibujar la memoria y la identidad del egresado de Ingeniería Geomática para que se conozcan sus orígenes y su importancia como profesional de las ciencias de la tierra, así como de la sociedad regional, estatal y nacional. Para ello, se realizó una investigación documental a través del método de identificación, selección e inclusión de documentos históricos provenientes de archivos oficiales gubernamentales e institucionales. El tipo de material utilizado fueron fotografías, así como consulta en tesis de ingeniería topográfica, actas de consejos universitarios, libros históricos de la ciudad y del estado de Guanajuato, entre otros. En síntesis, se puede concluir que describir la evolución histórica de una de las carreras más antiguas que se imparten en la Universidad de Guanajuato permite conocer la evolución de la

sociedad guanajuatense, así como de la sociedad mexicana en general, ya que el pasado sirve para que las nuevas generaciones entiendan su presente y su futuro.

Palabras clave: educación superior, ingeniería, topografía.

Abstract

The main objective of the current historical review, is to draw the identity and memory of the Geomatics Engineering graduated student, for his/her beginnings and importance as a professional of the earth sciences and regional and national society, to be known. For this, documentary research was performed, trough the identification, selection and inclusion method, reviewing historical documents from official government and institutional archives. Pictures, topographical engineering thesis, college council proceedings and Guanajuato city and state historical books, were reviewed. In conclusion to discover the historic evolution of one of the oldest careers of the Guanajuato University, allow us to understand the Guanajuato´s and in general Mexico´s society evolution, as the past helps the new generations to understand their present and future.

Keywords: higher education, engineering, topography.

Resumo

O objetivo principal desta revisão histórica foi traçar a memória e a identidade do graduado em Engenharia Geomática para que sejam conhecidas suas origens e sua importância como profissional das ciências da terra, bem como na sociedade regional, estadual e nacional. Para isso, foi realizada uma pesquisa documental por meio do método de identificação, seleção e inclusão de documentos históricos de arquivos oficiais governamentais e institucionais. O tipo de material utilizado foram fotografias, além de consultas em teses de engenharia topográfica, atas de conselhos universitários, livros históricos da cidade e do estado de Guanajuato, entre outros. Em resumo, pode-se concluir que descrever a evolução histórica de uma das carreiras mais antigas ensinadas na Universidade de Guanajuato permite conhecer a evolução da sociedade de Guanajuato, bem como da sociedade mexicana em geral, já que o passado serve para que as novas gerações compreender seu presente e seu futuro.

Palavras-chave: ensino superior, engenharia, topografia.

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Introduction

Engineering in New Spain began when the first towns were settled in colonial times due to the need to defend the new territories and use their resources, for which professionals were required mainly in three areas: in the military field with the use of cartographic maps of the territory; in the botanical, with the use of medicinal plants from the region, and in the mining, mainly in the development of mineral processing (Sandoval, September 16, 2016). However, given the small number of professionals, attention to the territory was minimal.

For this reason, on January 1, 1792, the Royal Mining Seminar was created, which included the Mining College, at the request of the Creole miners Juan Lucas de Lassaga and Joaquín Velázquez Cárdenas y León to King Carlos III, with the purpose of telling with specialists to increase, with scientific bases, the production of precious metals in the face of the common problems of flooding and loss of veins (Sandoval, September 16, 2016), seed for the National School of Engineering of the National University founded in 1910 by Justo Sierra Méndez, now called the Faculty of Engineering of the National Autonomous University of Mexico.

Method

A documentary investigation was carried out through the method of identification, selection and inclusion of historical documents from official governmental and institutional archives to carry out a historical review and thus be able to substantiate the identity of the Geomantic Engineering graduate.

Material

The type of material used in the historical research project were historical documents, photographs, as well as consultation in topographic engineering theses, minutes of university councils, historical books of the city and the state of Guanajuato, among others, which are found at protection of the Ponciano Aguilar historical archive of the University of Guanajuato, the general archive of the University of Guanajuato, the historical archives of the Department of Geomatics and Hydraulic Engineering of the Engineering Division of the Guanajuato Campus of the University of Guanajuato, the Armando Olivares Library of the University of Guanajuato and in the General Archive of the Executive Power of Guanajuato.

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Topographical Engineering at the College of the State of Guanajuato

In 1827, the Colegio de la Purísima Concepción (today the University of Guanajuato) was reopened by the State Constituent Congress, and in 1828 the career of Mining Engineer was established (University of Guanajuato, 2022).

In 1867, the Mining Engineering career included in the first two years the chairs of Mechanics, Topography and Geodesy, as well as two years of internships, which constituted the beginning of the Topographical and Hydromensor Engineer career (Ramírez, 1981).

On January 5, 1870, the General Law of Public Instruction was enacted by the Constitutional Congress of the State of Guanajuato, where the career of Topographer and Hydrometer Engineer was recognized, with the rector Lic. Nicanor Herrera (Ramírez, 1981; University of Guanajuato , 2022).

The bachelor's degree initially derived from an essential need of the Mining Engineer career. Upon passing the first two years of this, it was possible to access the title of Hydromensor Topographer Engineer if one also completed a semester of professional practices and presented a general knowledge exam and a receptional exam.

The subjects of the Hydromeasure Topographer Engineer career were, among others, Topographic Drawing, Topography and Geodesy (figure 1), Hydromeasurement, Hydrology, Meteorology, as well as Theoretical-Practical Astronomy. On the other hand, in the Mining Engineer career, the most outstanding subjects were Linear and Machine Drawing, Physics, Analytical and Applied Mechanics, Geology, Mineralogy, Mineral Chemistry and Organic Elements, Chemical Analysis and Teaching (figure 2) (Ramírez, 1981).

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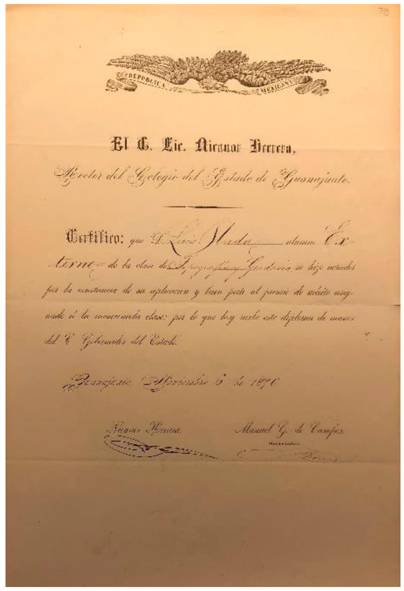
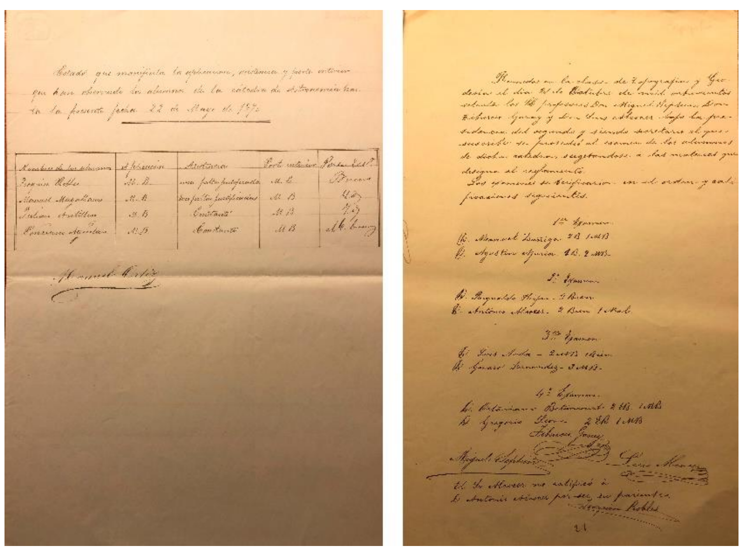
Figure 1. Certificate issued on November 6, 1870 referring to the chair of Topography and Geodesy


El C. Lic. Nicanor Herrera,
Rector del Colegio del Estado de Guanajuato.
Certifico:

Source: General Archive of the University of Guanajuato (s. f.)

Figure 2. Report of qualifications of students of the career of Engineer Topographer Hidromensor (1870)



Source: General Archive of the University of Guanajuato (s. f.)

On December 20, 1870, the practice regulations for the careers of Mining Engineer, Hydrometer Surveyor Engineer, Beneficiaries and Assayers were issued by the government of the State of Guanajuato (Armando Olivares Library, s.f.) (Figure 3).

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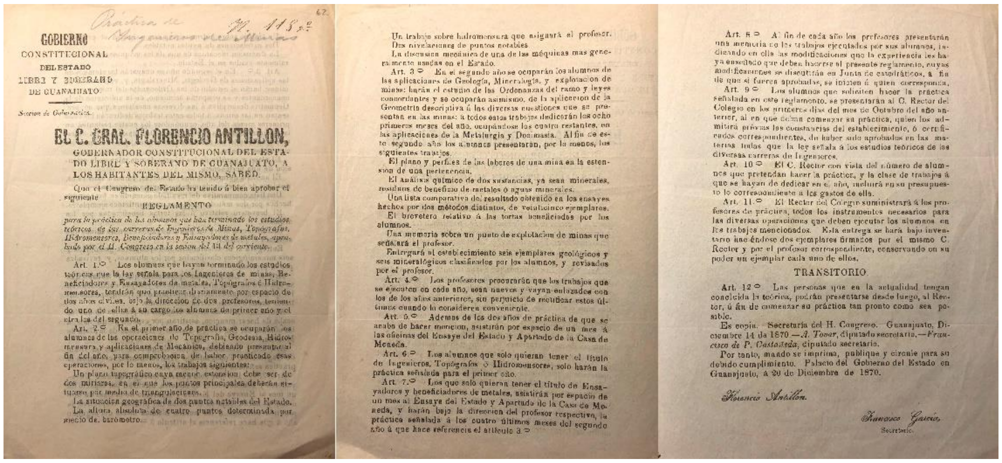
Figure 3. Regulation of practices for the careers of Mining Engineer, Hydrometer Topographer Engineer, Beneficiaries and Assayers, issued on December 20, 1870 by the Government of the State of Guanajuato


GOBIERNO CONSTITUCIONAL DEL ESTADO LIBRE Y SOBERANO DE GUANAJUATO

Seccion de Gobernacion.

EL C. GRAL. FLORENCIO ANTILLON,

GOBERNADOR CONSTITUCIONAL DEL ESTADO LIBRE Y SOBERANO DE GUANAJUATO, A LOS HABITANTES DEL MISMO, SABED.

Que el Congreso del Estado ha tenido á bien aprobar el siguiente

REGLAMENTO

para la práctica de los alumnos que han terminado los estudios teóricos de las carreras de Ingenieros de Minas, Topógrafos, Hidromensores, Beneficiadores y Ensayadores de metales, aprobado por el H. Congreso en la sesion del 14 del corriente.

Art. 1.º Los alumnos que hayan terminado los estudios teóricos que la ley señala para los Ingenieros de minas, Beneficiadores y Ensayadores de metales, Topógrafos é Hidromensores, tendrán que practicar durante por espacio de dos años civiles, bajo la direccion de dos profesores, teniendo uno de ellos á su cargo los alumnos de primer año y el otro los del segundo.

Source: General Archive of the University of Guanajuato (s.f.)

In the period from 1912 to 1920, two receptional exams were required to obtain the title of Topographer and Hydrometer Engineer (Ramírez, 1981). The first was purely theoretical, where a jury of five engineers questioned the subjects studied in the career and where the minimum time was 30 minutes per engineer. At the end of the interrogation by the synod, they deliberated and later called the sustainer, who provided data to solve problems related to their career and had a month to present their second receptional exam, which consisted of carrying out internships. , presentation of topographic plans, as well as hydrometric or hydrological plans to which the notebooks used and the spreadsheets of these works had to be attached. The time for the second exam was also two and a half hours in which the teachers examined the data and checked the results. Both exams were conducted in private. The public and relatives of the supporters waited outside the enclosure to then carry out the traditional burning of rockets, while the bell announced that the College had given the society a new topographical engineering professional.

By then, a significant difference was already beginning to be noticed between the careers of Surveying Engineer and Mining Engineer, since their subjects were specializing in these two areas with greater emphasis. (Ramírez, 1981).

Around 1943, the students and teachers of the Hydromensor Topographer Engineer career carried out an internship trip to the recently created Paricutín volcano (in the state of Michoacán) in order to observe the events of this event and make observations of territorial changes generated by this natural event. The excursion was led by the engineer and professor Manuel G. Aranda (Library Armando Olivares, s. f.).

The Surveyor and Mining Engineer Ponciano Aguilar Frías. One of the most prominent graduates of the careers of Hydromeasure Surveying Engineer and Mining Engineer at the State College was the illustrious Ponciano Aguilar Frías (Periodico Correo, 2017). Born into a middle-class family in 1853, he graduated as a Topographer Hydrometer and Mining Engineer in 1876 as one of his most outstanding students (Jáuregui, Ponciano Aguilar and his circumstance, 1996), during the time when the School de Minas was the only study center for engineers. His first job was at Minera la Luz y Anexas where he began collecting rock specimens, which was of great value during his lifetime. In 1879 he married Miss Micaela Zavaleta Pérez-Gálvez (Jáuregui, Ponciano Aguilar and his circumstance, 1996). This marriage allowed the engineer Ponciano Aguilar to have better working relationships, as well as being able to teach at the State College (Figure 4).

Figure 4. In the center, Mr. Ponciano Aguilar

Source: General Archive of the University of Guanajuato (s. f.)

Once graduated, the engineer Ponciano Aguilar was a professor at the Colegio del Estado from 1876, where he taught Geology, Paleontology and Petrography. This will lead him to form a large collection of minerals with more than 7,000 pieces (Jáuregui, Ponciano Aguilar and his circumstance, 1996).

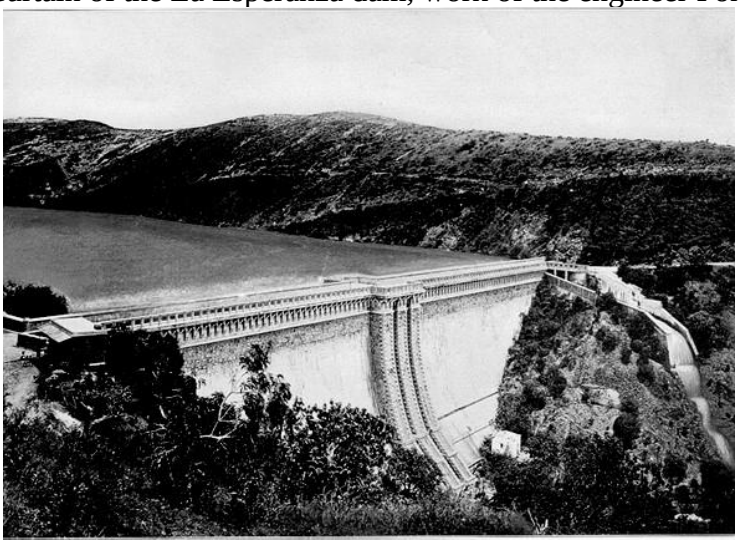
Don Ponciano Aguilar is credited with the application of the voltaic arc in the characterization of minerals, which is the basis of spectrometry, the main tool for the identification of minerals. This technique consisted of subjecting the minerals to the action of the voltaic arc, with which the elements that make up the minerals were dissociated and volatilized and the sublimates that were produced were captured. Then, by the colorations of each element, the

minerals were characterized. Direct observation of the spectrum was carried out with an inverted object microchemical microscope. The arc operated on the stage and the ordinary eyepiece was replaced by a spectro-ocular. Later, with a cinematographic camera, the successive spectra were captured (Rionda Arreguín, Santa Fe and Real de Minas Guanajuato, 2010).

Don Ponciano Aguilar, in addition to being a prominent mining engineer and surveying engineer, was a renowned civil engineer (Periodico Correo, 2017); he proposed and built various works to attend to urgent needs and great repercussions for the municipality and the state of Guanajuato.

La Esperanza dam. Together with engineer G. Rocha, they began preliminary studies in 1887 for the project carried out by engineer Francisco Gleniee (Blanco et al., 2000; González, 2017; Rionda Arreguín, Testimonios sobre Guanajuato, 1989). The construction of the La Esperanza dam, in the ravine of the same name, by the engineer Ponciano Aguilar, began on May 5, 1887 and was inaugurated on September 16, 1894 (figure 5). The work cost 355,797 pesos, with a curtain of 30.40 (initially raised at 20 meters) and 140 m long. With six iron gates, it allowed water to be stored in dry weather and to provide the population with the precious liquid through piping material from Belgium and the placement of 125 hydrants distributed throughout the city (González, 2017; Rionda Arreguín, Testimonios sobre Guanajuato, 1989).

Figure 5. Curtain of the La Esperanza dam, work of the engineer Ponciano Aguilar

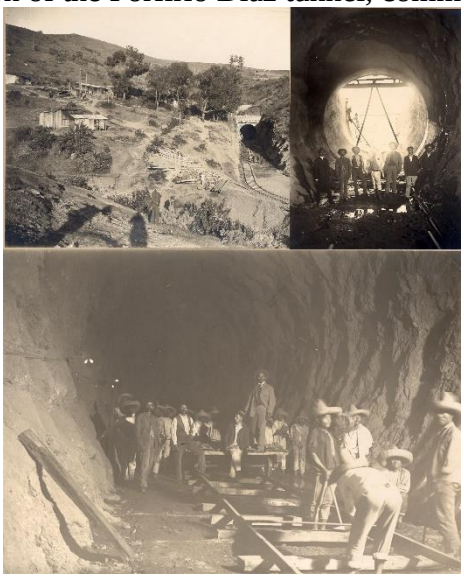


Source: General Archive of the Executive Power of Guanajuato (s. f.)

The Porfirio Diaz tunnel. After the terrible flood that the city of Guanajuato suffered in 1905, the State Government, seeking to avoid new tragedies, summoned in that same year those interested in the construction of the tunnel known as El Coajín, whose official name was Porfirio Díaz tunnel,

based on the study carried out by the engineer Ponciano Aguilar, called Sanitation Works for the City of Guanajuato (Rionda Arreguín, Testimonios sobre Guanajuato, 1989). Given the urgency required, the work was assigned directly to the engineer Aguilar in the same year of 1905, and was inaugurated on January 23, 1908 (figure 6).

Figure 6. Construction of the Porfirio Díaz tunnel, commonly known as El Coajín



Source: General Archive of the University of Guanajuato (s. f.)

This work is 1,162 meters long and has a diameter of 7 meters (figure 7). Its purpose was to relieve the runoff of rainwater that reached the Del Monte River and the Olla dam to protect the city from large avenues. (Rionda Arreguín, Santa Fe y Real de Minas Guanajuato, 2010).

Figure 7. Inauguration of the Porfirio Díaz tunnel, commonly known as El Coajín

Source: General Archive of the University of Guanajuato (s. f.)

A special mention deserves the award obtained by the dam project for the Lerma river in its arrival at the Yuriria lagoon, as a regulating vessel, including an irrigation channel for the use of water, which would earn it the diploma and the silver medal during the 1900 Universal Exhibition in Paris[1] (Archivo histórico Ponciano Aguilar de la Universidad de Guanajuato, s. f.).

Guanajuato-Dolores Hidalgo highway. The engineer Ponciano Aguilar proposed to the State Government the construction of the Guanajuato-Dolores Hidalgo highway, a project he devised after the opening of the highway from Guanajuato to the Santa Rosa mineral, whose inauguration date was September 16, 1887, and the Glennie tunnel, designed by engineer Enrique Glennie (figure 8). In said project, the engineer Ponciano Aguilar specified that his proposal was important in achieving that, through the developed line, the travel time between both cities was reduced to three hours. (Blanco *et al*., 2000; Rionda Arreguín, Santa Fe y Real de Minas Guanajuato, 2010).

Figure 8. The engineer Ponciano Aguilar Frías during the drawing of the Guanajuato-Dolores Hidalgo highway

Source: Ponciano Aguilar Historical Archive of the University of Guanajuato (s. f.)

Other infrastructure projects in which he participated were in the layout of the railways of the Guanajuato bajío, as well as in the studies for the trams of the cities of León, Irapuato and

[1] Unfortunately we do not know the reasons put forward by the organizers of the Universal Exposition for awarding said prize to Ponciano Aguilar's project; however, the validity of the project and its futuristic vision is expressed by Gabriel Francia (2001) when pointing out that said project supported by the Government of the State of Guanajuato, started in 1894 under the direction of the engineer Ponciano Aguilar, in addition to seeking the use of surface waters through an irrigation channel, sought to generate a navigable communication route of approximately 120 km between the benefited populations that could include those of Yuriria, Jaral, Salamanca and Irapuato, through the union of the Yuriria lagoon with the Turbio river, connecting the agricultural areas with the railways that would allow the extraction of the crops from the Guanajuato shoal, given the lack of rural roads in the Porfirian era. However, the author concludes, the project will not be approved, or it will be at the time of the Revolution, which led to its abandonment (see Francia, G. (2001). Navegando de Yuriria a Irapuato. An irrigation project of 1894. Newsletter of the Historical Archive of Water. *6*(18), 29-36.

Guanajuato (Blanco et al., 2000). Engineer Ponciano Aguilar participated in many projects, as well as positions he held in public administration.

Ponciano Aguilar's daughter, María Aguilar Zavaleta, after the engineer's death —which occurred on April 10, 1935— donated her father's belongings to the University of Guanajuato, including his house, his personal archives, as well as as well as his extensive collection of books, which are currently exhibited in the Museum of Mineralogy, located in the Department of Mines, Metallurgy and Geology of the Engineering Division of the Guanajuato Campus. (Universidad de Guanajuato, 2022).

Topographic Engineering at the University of Guanajuato

The State College was named the University of Guanajuato on March 25, 1945. In this way, it began a process to improve the quality of teaching, as well as to offer new careers for the benefit of society (not forgetting those that existed up to that time).) such as Law Degree, Mining Engineer, Hydromensor Topographer Engineer, Civil Engineer, among others (Universidad de Guanajuato, 2022).

Directors of the School of Surveying and Hydraulic Engineers from 1962 to 2022

The direction of Engineer Miguel Izaguirre Mendoza (1962-1977). The School of Surveying and Hydrometering Engineers was founded in January 1962, and its first director was engineer Miguel Izaguirre Mendoza (Armando Olivares Library, s.f.) (figure 9).

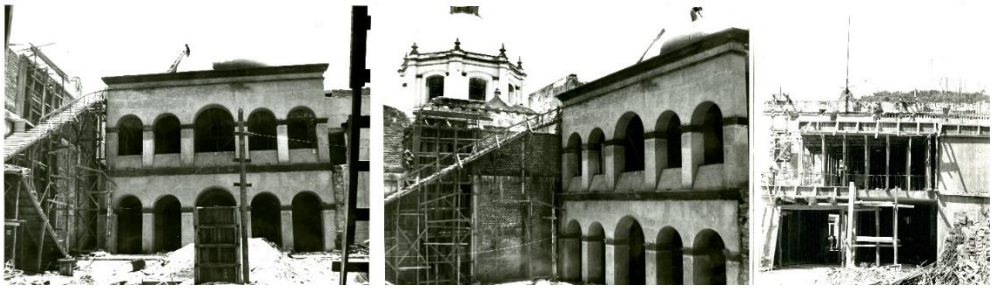
Figure 9. Engineer Miguel Izaguirre Mendoza, director from 1962 to 1977

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

Towards 1963 the subject of General Practices of Underground Topography is updated to give the student a better opportunity to improve their practical skills. Due to the scientific and technological advances of that time, it was proposed that the Hydromensor Topographer Engineer career be updated, which was accepted on July 2, 1965 by the Honorable University Council. This is how the School of Topographical and Hydraulic Engineers arose, with two careers: Topographical and Hydrometer Engineer (lasting two years) and Topographical and Hydraulic Engineer (lasting three years). In these the subjects of Sanitary Engineering and Notions of Urbanism, General Notions of Construction, Hydraulic Installations and Pumping Systems, as well as Human Relations at Work (Historical Archives of the Department of Geomatics and Hydraulic Engineering of the Engineering Division of the Campus) were taught. Guanajuato of the University of Guanajuato, s. f.).

Around 1967, due to insufficient space, the schools of Topographic and Hydraulic Engineers, Civil Engineering and Mining and Metallurgical Engineering —which until then were located on the fourth floor of the central building of the University of Guanajuato (located in Lascuráin de Retana Street # 5)—were changed to the building located next to the Temple of the Immaculate Heart of Mary (Bethlehem)—known as the former Belén convent (current Belén headquarters)—, which was conditioned to house the Schools of Engineering, as well as the School of Architecture (Armando Olivares Library, s. f.) (figure 10).

Figure 10. Refurbishment works in the ex-convent of Belén (current headquarters of Belén)

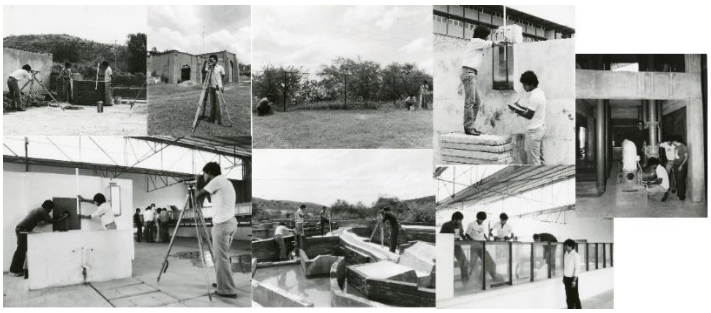


Source: General Archive of the University of Guanajuato (s. f.)

Between 1970 and 1971 the subjects of Notions of Strength of Materials and Construction were taught, as well as the humanistic subjects of Industrial Relations and Ethics, as well as the subjects of Hydraulic Machines and their Installations, Land Routes, and Irrigation Systems. One of the achievements of the administration of the engineer Izaguirre was the creation of the Hydraulics and Photogrammetry laboratories (1970), whose support was essential for the

development of student practices and the generation of an adequate place for research (Armando Olivares Library , n.d.) (figure 11).

Figure 11. Practices carried out by Topographic Engineering students in the Hydraulics laboratory located in Noria Alta



Source: General Archive of the University of Guanajuato (s. f.)

Between 1972 and 1973, the annual period was changed to a six-month period and the name of the career was changed from Hydromeasure Topographer Engineer to Topographer and Hydrologist Engineer. In the fourth semester, the subjects of Cartography, Elements of Geohydrology, Agrarian Procedures, and Hydraulic Works Projects are added (Library Armando Olivares, s. f.).

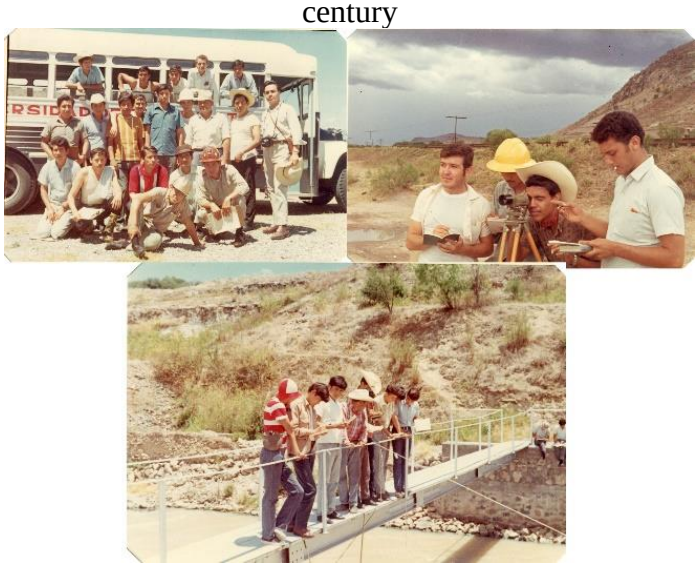
The direction of Engineer Víctor Manuel Manrique Leal (1977-1985). During the direction of the engineer Víctor Manuel Manrique Leal (figure 12), a new reform is carried out both in hours and in subjects to the Study Plan (in the year 1978). The introduction of the subjects Legal Topography, Potential Flows, Viscous Flows and Hydraulics of Open Channels, Rapidly Varied Flow in Hydraulic Structures, and Costs and Administration stands out. (Biblioteca Armando Olivares, s. f.).

Figure 12. Engineer Víctor Manuel Manrique Leal, director from 1977 to 1985

Source: Archive of the Department of Geomatics and Hydraulic Engineering, (s.f.)

During this period, field practices are established, as well as practical outings so that students acquire the necessary skills for their professional work (figure 13).

Figure 13. Internship activities for Topographical Engineering students in the 70s of the 20th century



Source: General Archive of the University of Guanajuato, (s.f.)

A new modification to the Study Plan will be made in 1982 to meet the social, scientific and technological needs of the time. Although the plan only consisted of a list of subjects, these responded to the requirements established by the graduates of the career to adjust to the scientific and technological advances of that period, as well as to merge the two existing careers in the School, which would give origin to the career of Topographical and Hydraulic Engineer, with a duration of 4 years of studies (Library Armando Olivares, s. f.).

The direction of Engineer Rodrigo Ogaz Muñoz (1985-1990). During the direction of the engineer Ogaz Muñoz (figure 14), work continued with the Study Plan carried out in 1982, as well as with the title of Degree in Topographical and Hydraulic Engineer. (Biblioteca Armando Olivares, s. f.).

Figure 14. Engineer Rodrigo Ogaz Muñoz, director from 1985 to 1991

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

During the period of engineer Ogaz Muñoz, the celebrations of the 25th anniversary of the founding of the School of Topographical and Hydraulic Engineers were held (figure 15). The festivities were presided over by the rector of the University, Dr. Santiago Hernández Ornelas (Archivo General de la Universidad de Guanajuato, s. f.).

Figure 15. Celebration ceremony of the 25th anniversary of the foundation of the School of Topographical and Hydraulic Engineers

Source: General Archive of the University of Guanajuato (s. f.)

The direction of Engineer Luis Barrón Reyes (1990-1994). During the period as director of engineer Barrón Reyes (figure 16), the academic staff was consolidated with the hiring of new full-

time professors who complemented the areas of topography and hydraulics. (Archivo General de la Universidad de Guanajuato, s. f.).

Figure 16. Engineer Luis Barrón Reyes, director from 1990 to 1994

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

As an initiative of engineer Barrón Reyes, several professors from the teaching staff began their postgraduate studies with the aim of strengthening research, since, being the School recognized as a provider of extension services, it was also desired that it be linked to the field. Of the investigation. In 1991, at the initiative of the University of Guanajuato, several academic units entered into a program of curricular evaluation. Among these academic units was the School of Topographical and Hydraulic Engineers, since after many years without changing its curriculum, it was considered pertinent to update it based on the social, technological and economic advances that were priorities at that time. for society.

The direction of Master Martín Fernández Montes (1994-1998). The curricular reform initiated in 1991 will see its approval culminated in the ordinary session of the Academic Council of Exact, Natural and Engineering Sciences Areas, on November 19, 1995 (Academic Council of Exact, Natural and Engineering Sciences Areas, 1995), being and director the Mtro. Martín Fernández Montes (figure 17). This curriculum, during its validity, promoted the training of surveying and hydraulic engineers with the knowledge, abilities, attitudes and skills to participate in the range of engineering studies and projects where it is required to use the field of surveying and with the ability to carry out studies and projects related to hydraulic resources, as well as

comprehensive training to develop the graduate's skills, abilities and promote support with a vocation for service in meeting the topographical and hydraulic needs of society.

Figure 17. Maestro Martín Fernández Montes, director from 1994 to 1998

Source: Archive of the Department of Geomatics and Hydraulic Engineering, (s.f.)

The study plan contemplated reinforcing their area of study with two subjects (a requirement that had to be covered to contribute to the student's comprehensive training): Translation of Technical English, and Technical Writing, which had an accredited or non-accredited assessment. The student had the option of submitting and accrediting them without taking the course; otherwise, they should take and accredit them within the first five semesters. The main reason for considering it this way was because in the subjects of the last semesters comprehensive projects had to be presented supported by up-to-date information, which required skill and knowledge to translate from English and comply with certain writing and structuring standards (Engineering Department Geomatics and Hydraulics, s. f.).

The Mtro. Fernández Montes, in his management, promoted the creation of the Specialty in Real Estate Valuation, in an interdisciplinary way with the Faculty of Architecture and the Faculty of Civil Engineering, whose approval by the Academic Council of Exact, Natural and Engineering Sciences Areas was carried out in the month of September 1997 (Academic Council of Exact, Natural Sciences and Engineering Areas, 1997). These studies respond to the need for specialists in the valuation of real estate required in the state of Guanajuato in order to support decision-making in the cadastral offices of the municipalities.

The direction of Master Juan Manuel Tovar Alcantar (1998-2006). The Mtro. Tovar Alcantar assumes the direction of the School of Topographical and Hydraulic Engineers in 1998 and during

his management, important and high-impact changes are developed for the then School of Topographical and Hydraulic Engineers (figure 18).

Figure 18. Maestro Juan Manuel Tovar Alcantar, director from 1998 to 2006

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

In the month of September 1998, with the implementation of the common core of Engineering of the University of Guanajuato (Academic Council of Areas of Exact, Natural and Engineering Sciences, 1998), the need to carry out a new curricular reform was seen, which It was based on the compilation of both internal and external information, where results were obtained, which at the time, were analyzed by the groups of academics in charge of carrying out the curricular research. From these, interpretations and proposals for solutions to the problems detected emerged to later be submitted to discussion and analysis by the teaching staff of the School of Topographical and Hydraulic Engineers. Thus, the conclusion was reached of the separation of the existing career of Topographer and Hydraulic Engineer in the careers of Geomatics Engineer and Hydraulic Engineer. The curricular proposal was approved by the Academic Council of Exact, Natural Sciences and Engineering Areas on August 27, 1999 (School of Topographical and Hydraulic Engineers, 1999). This curricular reform responded to the needs of the beginning of the 21st century, that is, to have an engineering professional with the knowledge and skills in the use and management of sophisticated tools (such as global coverage satellite positioning systems) and the management and rapid and timely distribution of data related to geographic information systems, among others. In this way, the participation of the engineer in Geomatics would be very important and varied in many fields of human activity.

It should be noted that in those years it was considered that the country had initiated projects (both at the national, state or regional level) linked to the use of natural resources, land regularization, among others, which caused a great demand for this type of professional The activities of the engineer in Geomatics were aimed at developing cartographic works, topographic surveys, geodesics and planning of geographic information systems that serve as support for infrastructure works during the construction process and, later, to observe their behavior during their operation, as well as support and control in engineering projects in general.

Another of the important achievements in the administration of Mtro. Tovar Alcantar was that the creation of the Master's Degree in Water Sciences was promoted, whose approval by the Academic Council of Exact, Natural and Engineering Sciences Areas was on May 19, 2000 (Academic Council of Exact, Natural and Engineering Sciences Areas). Engineering, 2000). This master's degree responded to the need for the training of postgraduate human resources with a high academic level, capable of planning, directing and carrying out projects arising from pure and applied research, with in-depth knowledge of water sciences to solve problems related to with the quality, exploitation of aquifers, preservation, sanitation and management of water; as well as with the attitudes and values necessary for the teaching and promotion of culture that guarantee the sustainability of this resource. (Escuela de Ingenieros Topógrafos e Hidráulicos, 2000).

In 2001, the University Council was asked to change the name of the School of Hydraulic Surveying Engineers to the Faculty of Geomatics and Hydraulics Engineering, since by then postgraduate studies were offered, as well as the careers of Surveying and Hydraulic Engineering (whose last generation graduated in 2003), Geomatic Engineer and Hydraulic Engineer, which was approved on February 23, 2001 (University of Guanajuato, 2001).

The direction of Dr. Francisco Martínez González (2006-2008). Under the direction of Dr. Francisco Martínez González (figure 19), work continued under the scheme of the Faculty of Geomatics and Hydraulic Engineering until 2008, when the University will establish a new model of academic-administrative organization based on divisions and departments, so the faculty will change its name to the Department of Geomatics and Hydraulic Engineering (Universidad de Guanajato, 2008).

Figure 19. Doctor Francisco Martínez González, director from 2006 to 2008

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

During the management of Dr. Martínez González, the teaching staff of the faculty was consolidated, as well as the Hydraulics laboratory, which by then had already changed its location when it passed from the Noria Alta facilities (the buildings began to have structural failures because they were located on land that had previously been used to deposit tailings from the mines) to the current site of La Perlita. Dr. Martínez González took steps to provide the new Hydraulics laboratory with the necessary equipment for its operation both in student practices and for research carried out by professors, as well as for support in extension projects. The most recent organic structure of the University of Guanajuato was constituted in 2008, an academic-administrative reorganization began by adopting the modality of campuses, divisions and departments.

In this way, three academic units emerged that originated the formation of the Engineering Division of the Guanajuato Campus: the Faculty of Civil Engineering, the Faculty of Geomatics and Hydraulic Engineering, and the Faculty of Mining, Metallurgy and Geology Engineering (these faculties became in departments). Once this structural change was made at the University of Guanajuato, Dr. Martínez González left the direction of the Faculty of Topographical and Hydraulic Engineers to take office as the first director of the Engineering Division of the Guanajuato Campus during the period 2008-2012 (University of Guanajuato, 2008).

The direction of doctor Gilberto Carreño Aguilera (2008-2012). First period 2008-2012. When the academic-administrative restructuring of the University of Guanajuato was carried out, the Faculty of Geomatics and Hydraulic Engineering became the Department of Geomatics and Hydraulic Engineering, and its first director was Dr. Gilberto Carreño Aguilera (figure 20).

Figure 20. Doctor Gilberto Carreño Aguilera, first director of the Department of Geomatics and Hydraulic Engineering of the Engineering Division of the Guanajuato Campus, periods 2008-2012 and 2015-2019

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

During his first term as director, the enrollment income for the educational programs of Geomatics Engineering and Hydraulic Engineering increased; likewise, the Master's in Water Sciences and the Doctorate in Water Sciences and Technology (Department of Geomatics and Hydraulic Engineering, s.f.) were maintained as quality postgraduate courses, within the National Register of Quality Postgraduate Courses (PNPC). In the case of the Property Valuation Specialty, it continued as a self-sustaining and pertinent specialty. In terms of infrastructure, within its management, the Photogrammetry laboratory was divided into two: Geomatics laboratory and Geographic Information Systems laboratory. Likewise, works were carried out to give better functionality to the Hydraulics laboratory and the generation of new cubicles for the professors assigned to the Department of Geomatics and Hydraulics Engineering.

The direction of Master Josefina Ortiz Medel (2012-2015). Once Dr. Carreño Aguilera's term ended, Mtra. Josefina Ortiz Medel (figure 21), the first woman to hold this position since the founding of the previous School of Hydromeasuring Topographical Engineers.

Figure 21. Prof. Josefina Ortiz Medel, first director of the Department of Geomatics and Hydraulic Engineering of the Engineering Division of the Guanajuato Campus, periods 2012-2015

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

During his administration, new professors were hired to strengthen the areas of Geomatics and Hydraulics; Likewise, he promoted the Academic Body (AC) of Water Science and Technology by making it go from being formed to being consolidated, which allowed the teachers of said AC to be recognized as quality teachers. Another very important point to highlight in the period of the Mtra. Ortiz Medel is the impulse and support for the degrees of Geomatics Engineering and Hydraulic Engineering to carry out a curricular reform in order to adjust it to the Educational Model of the University of Guanajuato (MEUG) (University of Guanajuato, 2011). Thus, in 2015, these curricular projects were approved by both the Divisional Engineering Council and the University Council of Campus Guanajuato (University Council of Campus Guanajuato, 2015). The Mtra. Ortiz Medel was unable to complete her assigned period (university regulations provide that Department directors last 4 years) because she was summoned to participate in the central administration as Director of Planning at the University of Guanajuato by the recently appointed rector general, Dr. Luis Felipe Guerrero Agripino.

The direction of doctor Gilberto Carreño Aguilera, (2015-2019). Second period 2015-2019. After the Mtra. Josefina Ortiz Medel will leave the Directorate of the Department of Geomatics and Hydraulic Engineering due to her appointment as Director of Planning at the University of Guanajuato, she is summoned to appoint the new director of the Department, a position that Dr. Gilberto Carreño Aguilera occupies again during the period 2015-2019. In this second management of Dr. Carreño Aguilera, the necessary activities were carried out to ensure that the educational programs (PE) of Geomatics Engineering and Hydraulic Engineering achieved national accreditation under the 2014 reference framework of the Engineering Teaching Accreditation Council, A. C. (CACEI) in 2016 with a validity of 5 years (figures 22 and 23).

Figure 22. Recognition of national accreditation granted by the CACEI to PE Geomatics Engineering

CACEI

RECONOCIDO POR EL CONSEJO PARA LA ACREDITACIÓN DE LA EDUCACIÓN SUPERIOR, A.C.

EL CONSEJO DE ACREDITACIÓN DE LA ENSEÑANZA DE LA INGENIERÍA A.C.

ACREDITA

al programa de

Ingeniería Geomática

de la División de Ingenierías Campus Guanajuato

de la Universidad de Guanajuato

del día 13 de abril del 2016 hasta el 12 de abril del 2021, por cumplir con los estándares de calidad educativa establecidos por el CACEI.

Ciudad de México, 13 de abril de 2016.

Ing. María Elena Barrera Bustillos
Directora General del CACEI

Source: Archives of the Engineering Division of the Guanajuato Campus

Figure 23. Recognition of national accreditation granted by the CACEI to PE Hydraulic Engineering

CACEI

RECONOCIDO POR EL CONSEJO PARA LA ACREDITACIÓN DE LA EDUCACIÓN SUPERIOR, A.C.

EL CONSEJO DE ACREDITACIÓN DE LA ENSEÑANZA DE LA INGENIERÍA A.C.

ACREDITA

al programa de

Ingeniería Hidráulica

de la División de Ingenierías Campus Guanajuato

de la Universidad de Guanajuato

del día 7 de julio del 2016 hasta el 6 de julio del 2021, por cumplir con los estándares de calidad educativa establecidos por el CACEI.

Ciudad de México, 7 de julio del 2016

Ing. María Elena Barrera Bustillos
Directora General del CACEI

Source: Archives of the Engineering Division of the Guanajuato Campus

That same year (2016), together with the group of professors of the Postgraduate Committee, the Master's Degree in Water Sciences achieved permanence in the PNPC, which was also achieved the following year (2017) with the Doctorate in Science and Technology. of the water. At that time, the Division of Social Sciences and Humanities in coordination with the Division of Engineering, both from the Guanajuato Campus, carried out the curricular project for the PE degree in Geography, which was approved by the two Divisional Councils, as well as by the Council University of the Guanajuato Campus. The responsibility of said EP falls on the Engineering Division, with the support of the professors attached to the Department of Geomatics and Hydraulic Engineering. The first generation of this new degree enters in 2018 (H. Consejo Universitario del Campus Guanajuato, 2017).

Likewise, Dr. Carreño Aguilera takes the necessary steps to support the department's full-time professors to enter the National System of Researchers (SNI), achieving 46% of professors who attend the Hydraulic Engineering degree and 57% of the who work mainly in the degree of Geomatics Engineering. Before the end of his second period, he gave the impetus for a group of professors to carry out the project to update the PE Geomatics Engineering curriculum. The opinions of the various interventions were considered, which were later submitted to discussion and analysis by the teaching staff of the Department of Geomatics and Hydraulic Engineering (Engineering Division, 2019).

The direction of the master Víctor Manuel Ortega Chávez (2020-2024). In January 2020, Víctor Manuel Ortega Chávez took office as director of the Department of Geomatics and Hydraulic Engineering (figure 24).

Figure 24. Master Víctor Manuel Ortega Chávez, director of the Department of Geomatics and Hydraulic Engineering of the Engineering Division of the Guanajuato Campus, periods 2020-2024

Source: Archive of the Department of Geomatics and Hydraulic Engineering (s. f.)

During his management, the academic staff has been strengthened by ensuring that professors are accredited with the desirable profile of the Program for Professional Teacher Development (PRODEP), as well as that 50% of them are in the National System of Researchers (SNI) (Division Engineering, 2021). In relation to the student population, in recent semesters the issuance of admission cards has been increasing. The absorption has been carried out favoring the largest possible number of applicants as long as they have shown a good result in the admission exam and in accordance with the physical spaces available.

Likewise, during his management, the re-accreditation of the Educational Programs of Geomatics Engineering and Hydraulic Engineering has been achieved by the Accreditation Council for the Teaching of Engineering, A. C. (CACEI) [figure 25].

Figure 25. Recognition of national accreditation granted by the CACEI to PE Geomatics and Hydraulic Engineering

Source: Archives of the Engineering Division of the Guanajuato Campus

Discussion

From all of the above, we can conclude that describing the historical evolution of one of the oldest careers taught at the University of Guanajuato allows us to know the evolution of Guanajuato society, as well as Mexican society in general, since the past serves so that the new generations understand their present and their future. It is important to emphasize that the human being is a social being and that his actions materialize collectively; therefore, knowing its history allows forging a future with very firm foundations and interpreting the social, cultural and economic contexts in the best way.

On the other hand, in our regional, state and national environment, similar studies were found carried out by the public universities of our country where the history of the origin of their careers in the area of engineering is narrated, as well as their founding reasons to respond to the social needs of your region; therefore, the social, cultural and historical aspects of each region allow us to highlight the importance and the need for the creation of the various careers in topographic engineering, which, although similar in their function, have their particularities that define them as part essential for the development of the region where they were established.

Therefore, it can be affirmed that the main objective of this historical review was to draw the memory and identity of the Geomatics Engineering graduate so that his origins and his importance

as a professional of the earth sciences, as well as of the regional society, are known. , state and national.

Conclusions

The introduction of topographic engineering studies at the regional level dignified and meant a gradual process of specialization, from its initial insertion in mining engineering to assuming its own position as a particular support element for the development of infrastructure solutions, hydraulic works, roads and railways, among other activities. The revision of the study plans led to specifying said specialization, with subjects more particular to the new engineering that separate it from mining, as well as longer periods of study to achieve greater precision in its field of development for the contribution of a solution to the problems of Guanajuato society and the country; likewise, with specializations for its graduates, which entails the transition from a bachelor's degree to a specialty, a master's degree and a doctorate in elements that are particularly sensitive to Guanajuato residents, as is the case of water.

In short, the University of Guanajuato seeks to adapt to these needs in relation to its graduates, with updated study plans that respond to social, cultural, economic, technological and sustainable development demands. In a few words, the graduates of the Geomatics Engineering degree seek to attend to the urgent social and infrastructure needs, as did the engineer Ponciano Aguilar Frías, who obtained worldwide recognition for his innovative and advanced hydraulic projects at his time.

Future lines of research

In future research, the historicity of university careers can be deepened, since this will help the academic community and its social environment to know their origins, as well as the reasons that led to the creation of their professions. In this way, an awareness of the relationship between the past, the present and the future will be generated, and events can be located in a precise time and space.

Finally, given the great historical importance of the Topographical Engineering career, which later became Geomatics Engineering, it is recommended that studies focused on the development of Topographical Engineering and Geomatics Engineering in Mexico and how these careers impact prosperity be considered. social and economic of the country.

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