The Correspondence of Johann Georg Hagen, First Jesuit Director of the Vatican Observatory, with Directors of Jesuit Observatories

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Abstract

Johann Georg Hagen, the first Jesuit director of the Vatican Observatory, carried out an abundant correspondence with other directors of Jesuit observatories between 1906 and 1930. Letters of his correspondents preserved at the Vatican Observatory and a few of his letters at other observatories provide interesting information about the work and problems of Jesuit astronomical observatories at that time. Letters survive from observatories in Europe, North America, Asia, and Australia. A short presentation is given concerning the relationship between Hagen and the other directors and the contents of the correspondence.

Keywords

John G. Hagen – Jesuit observatories – Vatican Observatory – Stonyhurst – Valkenburg – Kalocsa – Ebro – Georgetown – Creighton – Manila – Zikawei – Riverview

Introduction

After the restoration of the Society of Jesus in 1814, Jesuits began to establish observatories in their universities, faculties of philosophy, and colleges.¹ This is

¹ Agustín Udías, *Searching the Heavens and the Earth: The History of Jesuit Observatories* (Dordrecht: Kluwer Academic Publishers, 2005) and Udías, *Jesuit Contribution to Science: A History* (Dordrecht: Springer, 2015), chap. 7.

an interesting phenomenon in the Jesuit contribution to science that has not received sufficient attention. In founding these observatories there was first and foremost the desire to continue the scientific tradition of the old Society, especially in astronomy, and the observatories were a way for Jesuits to be present in the field of natural sciences. The scientific work of Jesuits in their observatories was also presented as a practical refutation of the rationalistic currents, spread from the middle of the nineteenth century, which aggressively maintained an incompatibility between science and Christian faith.² The first observatory was established at the Roman College in Rome in 1824 and a total of seventy followed throughout the world. They flourished mostly in the late years of the nineteenth and first part of the twentieth century, but had largely decayed and closed or transferred to other institutions by the 1970s. The first observatories were astronomical but they also made geophysical observations. As larger telescopes became more and more expensive, Jesuit observatories move to other observations, especially those in meteorology, with a special dedication to the study of tropical hurricanes, in seismology and in geomagnetism. In spite of their large number, Jesuit observatories were not the result of an explicit, organized program by the order's central administration in Rome, but of individual local initiatives. Although they were independent from each other, there was a fluent communication among them. The most important ones became centers of training for Jesuits working in these fields. In 1890, Pope Leo XIII (r.1878–1903) founded the Vatican Observatory as a symbol of the Catholic Church's interest in the natural sciences. The foundation of the observatory was intended to be a refutation of the widespread accusations against the church as an enemy of scientific progress.³ In 1906, Pope Pius X (r.1903–1914) entrusted the Vatican Observatory to the Jesuits and thus it acquired a central role among Jesuit observatories.

The first Jesuit director of the Vatican Observatory was Johann Georg Hagen (1847–1930).⁴ In 1863, he had entered the Jesuit novitiate in Gorheim, Germany; from 1865 to 1867 he studied humanities in Friedrichsburg in Münster, and from 1867 to 1870 philosophy at Maria Laach in Eifel. During these studies he became interested in mathematics and physics. In 1870, he spent one year studying mathematics and astronomy at the University of

2 Udías, *Searching*, 10–11.

3 Sabino Maffeo, *La Specola Vaticana: Nove papi, una missione* (Vatican City: Pubblicazioni della Specola Vaticana, 2001), 38–39.

4 Johan Stein, "P. Giovanni Giorgio Hagen S. I.," *Atti della Pontificia Accademia delle Scienze Nuovi Lincei* 84 (1931): 66–84; H. Dopp, "Johann Georg Hagen S.J., 1847–1930," *Revue des questions scientifiques* 99 (1931): 5–37; Maffeo, *La Specola*, 69–98.

Münster and continued his studies at the University of Bonn for another year. He taught mathematics at the Jesuit college of Feldkirch, Austria for further three years. He studied theology in England at Ditton Hall in Liverpool. In 1880, after finishing his theological studies and receiving his priestly ordination, he travelled to the United States as a teacher of science at the Jesuit boarding school in Prairie du Chien, Wisconsin. There, in 1881, Hagen installed a small observatory, where he began to study variable stars, which became one of his lifelong subjects of research. In 1888, he was appointed director of the Georgetown Observatory, which had been founded in 1844 at Georgetown University (Washington, D.C.). There, he continued his observations of variable stars and, in 1905, he published the first three series of his monumental work on this subject, *Atlas stellarum variabilium*. He began also another lifelong interest in the observation of what he called the “cosmic or dark clouds.” We will see these two subjects appear in his correspondence.

From his position as director of the Vatican Observatory, Hagen soon became a reference for Jesuits working at observatories. His correspondence with other Jesuit directors gives an interesting view of the work and problems at these observatories from 1906 to 1930. Letters from Jesuit directors to Hagen have been preserved at the archive of the Vatican Observatory (Appendix 1). Unfortunately, only a few of Hagen's letters have been found at some of the observatories and in Jesuit archives. These letters were written in English, German, and French.

European Observatories

The Observatory of Stonyhurst College in England, established in 1838, was, together with the Observatory of the Roman College, one of the first Jesuit modern observatories.⁵ In the early days, Stephen Perry (1833–89), director in 1860–62 and 1868–89, exercised a certain leadership role among Jesuits working at observatories.⁶ Several Jesuits, appointed directors of observatories, spent some time at Stonyhurst training in astronomy and geophysics. Perry also helped them in the acquisition of the necessary equipment for the new observatories and their maintenance. Hagen's first correspondent from Stonyhurst was Walter Sidgreaves (1837–1919), director in 1863–68 and

⁵ Udías, *Searching*, 67–74 and 185–89.

⁶ George D. Bishop, “Stephen Perry (1833–1889); Forgotten Jesuit Scientist and Educator,” *Journal British Astronomical Association* 89 (1979): 473–84.

1889–1919.⁷ In 1908, he informs Hagen of the problems about getting copies of the *Monthly Notices* of the Royal Astronomical Society (RAS) that Hagen had asked for.⁸ Later he writes about the two prizes (*Grand Prix*) granted to Stonyhurst Observatory at the London 1908 Franco-British Exhibition, one for “scientific application of photography” and the other in the “educational section.” He asks Hagen to inform the superior general, Włodzimierz Ledóchowski (1866–1942) and Pope Pius x about them and to request the pope’s blessing for the observatory.⁹ In 1914, Sidgreaves writes to Hagen about the installation and cost of a Brown’s relay and promise to write to Brown to send information to Hagen.¹⁰

Aloysius Cortie (1859–1925), director of Stonyhurst Observatory in 1919–25,¹¹ wrote ten letters to Hagen (from 1908 to 1924) that have been preserved. In 1908, five letters concern Hagen’s election as an associate member of the RAS. Perry, Sidgreaves, and Cortie were members and held office on its council.¹² Cortie communicates to Hagen his election, in which he had received twelve of the fourteen possible votes.¹³ Sir William Huggins, late president of the Royal Society and foreign secretary of the RAS, a friend of Cortie and Sidgreaves, was influential in the election. In another letter, Cortie tells Hagen to write to the president of the RAS acknowledging his election and communicating the satisfaction of the Holy Father at the honor.¹⁴ Later he informs Hagen that a letter of Cardinal Rafael Merry del Val (1865–1930) expressing the satisfaction of Pope Pius x was read at the council of the RAS, which in turn communicated its appreciation, especially of its two Catholic members.¹⁵ In 1910, Cortie writes to Hagen that he has received a grant from the RAS to attend a meeting of the International Solar Union at Mount Hamilton, California, at which time he expects to be able to visit the observatories of Yerkes, Lick, and Mount Wilson,

7 Aloysius L. Cortie. “Father Walter Sidgreaves, S.J.,” *Monthly Notices Royal Astronomical Society* 80 (1920): 355–59.

8 Sidgreaves to Hagen, Stonyhurst, March 7, 1908 (all letters to Hagen are from the Vatican Observatory Archive).

9 Sidgreaves to Hagen, Stonyhurst, October 20, 1908.

10 Sidgreaves to Hagen, Stonyhurst, March 13, 1914.

11 H.E. Turner, “The Rev. Aloysius Laurence Cortie, S.J.,” *Monthly Notices Royal Astronomical Society* 83 (1926): 175–77.

12 Agustín Udías, “Serving God and Science,” *Astronomy and Geophysics* 42 (2001): 23–24.

13 Cortie to Hagen, Stonyhurst, March 15, 1908 and April 12, 1908.

14 Cortie to Hagen, Stonyhurst, June 22, 1908.

15 Cortie to Hagen, Stonyhurst, November 25, 1908.

and he asks him to send some articles to the *Monthly Notices* of the RAS.¹⁶ In a later letter, Cortie comments on Pope Pius XI allocutions at the 1922 meeting of the International Astronomical Union (IAU) in Rome, about which he had written an article in *The Month* (the English Jesuit journal), which he is sending to Hagen. He complains that in astronomical circles there is at present a proclivity for theorizing rather than observing.¹⁷ Later, Cortie comments about an article in *La Civiltà Cattolica* (an Italian Jesuit journal) about the relation between Galileo and Bellarmine and regrets that scientists keep repeating the old fables about this subject.¹⁸

Edward D. O'Connor (1874–1954), director of Stonyhurst Observatory in 1925–32,¹⁹ writes to Hagen that he has begun systematic observations of the Herschel Fields and nebulosities.²⁰ O'Connor relates his observations of *nebulae*, describing them as something with a “curdled milk” appearance. He has also observed “murky” places in Herschel Fields, like dirty grey patches of clouds, in places free of bright stars. In another letter O'Connor asks: “Is that my imagination? Have you ever noticed this?”²¹ From about 1920, as has already been mentioned, Hagen took as his particular subject of research the observation of what he called “cosmic clouds,” “dark clouds,” *nebulae*, “nebulosities” “Herschel Fields” and “Barnard’s dark objects.” He thought of them as clouds of cosmic matter in interstellar and intergalactic space, and as the material where stars are born. At that time this was a controversial subject and many astronomers did not believe that Hagen had really observed these clouds.²² This subject was especially prevalent in his correspondence with Georgetown Observatory.

In 1896, an astronomical observatory was established at Ignatiuskolleg, the faculties of philosophy and theology of the German Jesuits at Valkenburg, the Netherlands.²³ Michael Esch (1869–1938) was director from 1905 to 1938 and

16 Cortie to Hagen, Stonyhurst, April 3, 1910.

17 Cortie to Hagen, Stonyhurst, December 23, 1922.

18 Cortie to Hagen, Stonyhurst, February 13, 1924.

19 Patrick J. Treanor, “Edward O'Connor (Obituary Notice),” *Monthly Notices Royal Astronomical Society* 111 (1955): 129–30.

20 O'Connor to Hagen, Stonyhurst, November 19, 1929.

21 O'Connor to Hagen, Stonyhurst, May 22, 1930.

22 Arndt Latusseck, “Via Nubila am Grund des Himmels. Johann Georg Hagen und die kosmischen Wolken” (PhD diss., Hamburg University, 2009).

23 Udías, *Searching*, 94–96 and 207–8.

taught mathematics and physics at the Jesuit school in the nearby town of Sittard.²⁴ Four of his letters to Hagen from 1908 to 1921 have been preserved. In the first letters, Esch complains of the observatory's meager support for his work and how he had to divide his time with teaching in the school in Sittard. He thanks Hagen for receiving the 6 series of *Atlas stellarum variabilium*.²⁵ Later he writes that he manages to continue his astronomical observations and sends Hagen a photograph of the solar corona observed during an eclipse.²⁶ In 1919, Esch asks a series of questions about astronomical observations, including the observation of variable stars. He complains that he needs a better ocular for his telescope and about the difficulties in observations at certain angles due to the structure of the dome. He asks if he should include in his study all stars of the *Bonner Durchmusterung* (a comprehensive astrometric catalogue of the whole sky, compiled by the Bonn Observatory, Germany, from 1859 to 1903).²⁷ In 1920, Esch continues with this subject and informs Hagen that in the month of February he has made 379 observations of variable stars, the greatest number he ever made in a single month. He is thinking of estimating differences in luminosity, but he finds many difficulties in doing this. He also mentions Albert Einstein's difficulties in German scientific circles.²⁸

In 1878, Jesuits founded an observatory at the college (the Stephaneum Gymnasium) in Kalocsa, Hungary. It was called Haynald Observatory because of the support from Cardinal Lajos Haynald, archbishop of Kalocsa.²⁹ Gyula Fényi (1845–1927), the key figure in the history of the observatory at Kalocsa, was its director from 1885 to 1927.³⁰ He devoted himself to solar physics, especially to the observation and study of solar protuberances. Only one letter from Fényi to Hagen has been preserved, together with his answer to a request for copies of the Kalocsa meteorological bulletins. In this letter Fényi complains about the Swiss Jesuit Theodor Angehrn (1872–1952), who after five years studying astronomy had been appointed college administrator.³¹ Angehrn was Fényi's assistant from 1906 to 1909, and became director of the

24 Johan Stein, "P. Michael August Esch, S.J., 1869–1938," *Astronomische Nachrichten* 266 (1938): 47.

25 Esch to Hagen, Valkenburg, April 4, 1910.

26 Esch to Hagen, Valkenburg, December 21, 1910.

27 Esch to Hagen, Valkenburg, September 22, 1919.

28 Esch to Hagen, Valkenburg, March 18, 1920.

29 Udías, *Searching*, 74–77 and 191–93.

30 Theodor Angehrn, "Todesanzeige von P. Julius Fényi, S.J.," *Astronomische Nachrichten* 232 (1928): 127–28.

31 Fényi to Hagen, Kalocsa, February 17, 1912.

observatory from 1913 to 1948. Eight of his letters to Hagen from 1908 to 1927 have been preserved. In his first letters, Angehrn informs Hagen of his scientific studies, concentrating on astronomy, since 1904 at the universities of Vienna and Budapest under the supervision of Professor Rado von Kövesligethy (director of the Cosmographic Institute, Budapest). Angehrn informs Hagen that Kövesligethy has invited him to lecture on variable stars at the Mathematic and Physical Union, and adds that his professor of mathematics regrets that Hagen did not continue his textbook of mathematics (*Synopsis der höreeren Mathematik*), which he regards highly. Angehrn also informs Hagen that this year there were no lectures on astronomy, but that he took courses on mathematics, meteorology, and seismology, and devoted most of the time to private study. He complains that he does not have access to recent works and that he is tired of studying for examinations. He considers writing his dissertation on solar protuberances, but with so many works already about the subject, "how could he write something original?"³² In a later letter, Angehrn tells Hagen that Kövesligethy is getting more and more interested in seismology, and that he himself thinks that seismology is becoming an important science, to which he too must dedicate himself. However, Fényi has recommended that he work on solar protuberances and offered him unpublished material for the dissertation. Angehrn asks Hagen for suggestions. At present he is preparing for his final examination. He complains that his superiors are concerned with the length his studies and expect him to finish soon.³³ In 1909, Angehrn informs Hagen that he has finally obtained his doctorate. He plans to go the Stonyhurst to study spectrography with Sidgreaves and observe the spectrum of Halley's Comet.³⁴

In 1913, Angehrn was appointed director of the observatory because Fényi was suffering from an illness that affected seriously his eyes. The same year he informs Hagen of his work on spectroscopy of solar protuberances. He would also like to conduct stellar spectroscopy, but he would need a better telescope and a larger dome, and there is no money for either. He asks Hagen about the problem of the size of the dome. He informs him that a seismograph has been installed at the observatory and that the Jesuit provincial wants him to take time to visit the observatories in Germany.³⁵ Two months later he complains that he has not been able to find a Maecenas for the observatory. A new

32 Angehrn to Hagen, Kalocsa, October 30, 1908.

33 Angehrn to Hagen, Kalocsa, November 27, 1908.

34 Angehrn to Hagen, Kalocsa, November 25, 1909.

35 Angehrn to Hagen, Kalocsa, September 21, 1913.

archbishop has not yet been nominated and Angehrn does not know what his attitude toward the observatory will be. He tells Hagen that Fényi continues his observations of solar protuberances in collaboration with the Italian astrophysicist Annibale Riccò. Angehrn also asks Hagen's opinion on the spectroscopic studies of long period variable stars that are being made in Potsdam (Germany) and Pulkovo (Russia).³⁶ Ten years later, Angehrn writes about the difficult situation of the observatory and how during the war all scientific activity had ceased. Now he has no assistants and has to do everything, including meteorological observations, by himself. He has also been asked to take the task of teaching French classes and the administration of the school and complains that he has no money for books and journals. A friend from the Smithsonian Institution has promised him a grant of \$700 for the publication of Fényi's observations, but the future of the observatory seems very bleak, adding, "The Lord will provide." He ends the letter by telling Hagen that he is the person he most trusts. This letter opens with a passage in which Angehrn tells Hagen about the religious positions of the Hungarian astronomers Kövesligethy, Anton Tass and Lajos Terkán.³⁷ The last letter, from 1927, shows Angehrn in a more optimistic mood. Thanks to Tass and his influence with the *Kultusminister*, a yearly financial subsidy for the observatory has been approved and the seven-inch telescope had been sent to the state observatory at Schwabenberg to be updated at the government's expense. A new dome will be also needed but that will cost a lot of money. It seems to him that there is a new spring for astronomy in Hungary with the collaboration between state and private observatories. Angehrn relates that the new situation allows him to look with optimism to the celebration of the one-hundredth anniversary of the observatory in 1978.³⁸ He was unaware that the observatory, together with the college, would be confiscated by the communist government in 1950.

In 1904, the Ebro Observatory was established in Roquetas, Tarragona (Spain). It was dedicated to the study of the solar-terrestrial relationship and had magnetic, meteorological, and seismological sections.³⁹ Its first director was Ricardo Cirera (1864–1932), who from 1890 to 1894 had been in charge of the magnetic section of the Manila Observatory in the Philippines.⁴⁰ In 1907, he wrote to Hagen expressing the desire for the Vatican Observatory to become

36 Angehrn to Hagen, Kalocsa, November 24, 1913.

37 Angehrn to Hagen, Kalocsa, April 22, 1923.

38 Angehrn to Hagen, Kalocsa, December 10, 1927.

39 Udías, *Searching*, 88–93 and 213–18.

40 Luis Rodés, "Reverend Ricardo Cirera, S.J.," *Terrestrial Magnetism and Atmospheric Electricity* 37 (1932): 481–82.

“the center of union” of all Jesuit observatories.⁴¹ Luis Rodés (1881–1939) succeeded Cirera and was director from 1919 to 1939.⁴² In 1922, he thanked Hagen for his interest in his article on the influence of the earth on the formation of sunspots and tells him about the general book on astronomy he is writing. He informs Hagen that Professor George Hale of the Mount Wilson Observatory has asked him that Ebro Observatory join the International Astronomical Union (IAU) and collaborate in solar atmosphere, but the problem is that Spain is not yet a member of the IAU. Rodés hopes to go to the IAU meeting in Rome and visit the Vatican Observatory.⁴³ In 1928, seven Jesuits attended the third meeting of the IAU in Leiden, among them Rodés, O'Connor, Phillips, and Angehrn. Two letters of Hagen to Rodés have been found. In the first, he informs Rodés of the advantages of becoming a member of the *Astronomische Gesellschaft* (AG, the German astronomical society). After the First World War, Germany was isolated and Hagen considers that scientific collaboration with Germany would be an example of Christian unity among scientists. He tells Rodés that before writing a book on astronomy he should think of translating into Spanish the book by Newcomb, *Populäre Astronomie*, that he considers the best of its kind. The book has a note on Galileo by Hagen himself.⁴⁴ However, Rodés went ahead with his book, *El firmamento*, published in 1927 with a second edition in 1939, which became very popular in Spain.

Observatories of North America

The first and most important Jesuit observatory in North America was that established in 1844 at Georgetown University. It was the fourth observatory established in the United States, only six years after the first one in Williamstown, Massachusetts.⁴⁵ Hagen, who had been director from 1888 to 1906 before being appointed director at the Vatican Observatory, maintained a close relationship with Georgetown. John Hedrick (1853–1923), Hagen's successor, was director from 1906 to 1916. Only three of his letters to Hagen have been preserved. In the

41 Cirera to Hagen, Ebro, July 27, 1907.

42 James B. Macelwane, “Padre Luis Rodés, S.J., 1881–1939,” *Terrestrial Magnetism and Atmospheric Electricity* 45 (1940): 87–91; Manuel García Doncel and Antonio Roca, *Observatorio del Ebro: Un siglo de historia (1904–2004)* (Roquetas: Observatori de l'Ebre, 2007), 89–120.

43 Rodés to Hagen, Ebro, January 27, 1922.

44 Hagen to Rodés, Ebro, March 26, 1923 and May 24, 1923 (Archivo S.J. Barcelona).

45 Udías, *Searching*, 103–08 and 221–24.

first one, Hedrick informs his predecessor of the continuation with the observations of variable stars. A list of variable stars had been published in the *Astronomische Nachrichten* (AN, a German astronomical journal), vol. 179 (1908) and Hedrick includes the discrepancies with Hagen's list. He asks if it is appropriate to send the same journal a list he has of variable stars "announced or suspected." He comments on the need for a revision of the classification of the colors of stars made by Sestini and suggests observations to be made by women, who are better at differentiating colors. Benedetto Sestini (1816–90), who was at the observatory of the Roman College from 1840 to 1848 and at Georgetown from 1848 to 1869, had studied this subject in 1850. Hedrick informs Hagen of William Rigge's (see below) appointment as "astronomical editor" at the new Jesuit weekly magazine *America*, and of the visit of George Zwack, a Jesuit from Manila Observatory.⁴⁶ In 1911, Hedrick excuses himself for not writing more often due to health problems. He continues with the observation of variable stars, but doubts whether he could publish a new set of twenty-two in AN. Hedrick writes that Professor Ernst Hartwig of the Bamberg Observatory was displeased with his previous article. In turn he intends to criticize Hartwig's identification of RR Monoceroties, but "mildly." Now he is correcting the periods of variable stars using a photometer and will send them to Hagen. Hedrick wonders why Fr. Johann Stein (1871–1951), who had been Hagen's assistant between 1906 and 1910 and would succeed him as director after his death, has left the Vatican Observatory and returned to the Netherlands. He also asks about the troubles that Fr. Esch had in Kalocsa knowing that "he is rather an impossible kind of man." Hedrick had refused to bring Esch to Georgetown because of his personality. He is glad that Hagen is receiving *America*, which is doing well. Among the visitors to Georgetown have been Cortie (Stonyhurst) and Cirera (Ebro).⁴⁷ In 1913, Hedrick writes to acknowledge receipt of series 4 to 6 of Hagen's *Atlas stellarum variabilium*. He informs Hagen that Dr. Woodward of the Carnegie Institution gave a lecture at the Philosophical Society on the deviation of the fall of bodies and referred to Hagen's book *La rotation de la terre*, and that the U.S. government has put radio stations at Fort Myer and Arlington for time-signals, which Hedrick is receiving. He also informs Hagen that he has given a lecture on Fr. Fargis's method for photographic transits.⁴⁸ George A. Fargis (1854–1916) was at Georgetown Observatory from 1890 to 1910.

46 Hedrick to Hagen, Georgetown, September 3, 1909.

47 Hedrick to Hagen, Georgetown, March 6, 1911.

48 Hedrick to Hagen, Georgetown, July 18, 1913.

Edward C. Phillips (1877–1952) was director of the Georgetown observatory for only two years from 1926 to 1928 and we have only two of his letters to Hagen. However, in the archive of Georgetown University there are fourteen letters and four postcards from Hagen to Phillips during those two years. This is the largest number of Hagen's letters to one person that has been found. The main subject of these letters is the observation of "cosmic clouds" and they shed light on this controversial problem. In an early letter in 1908, Phillips thanks Hagen for a list of Catholic mathematicians he has received for use in the *Catholic Encyclopedia* and he promises to do some of the biographical sketches. He tells Hagen he has just obtained his Ph.D. from John Hopkins University.⁴⁹ The second, in 1925, is to inform Hagen of his appointment as director of the observatory. He is trying to become acquainted with the equipment and the work done at the observatory. He asks Hagen, knowing his great interest in the observatory, what he should do with the large amount of unpublished work (some by Hagen himself) housed there: thousands of observations, photographic plates, charts, and so on especially the observations made by the photographic nine-inch Transit and Zenith telescopes.⁵⁰ Other of Phillips's letters that Hagen acknowledges having received have not been found.

In his first letter, Hagen congratulates Phillips for being put in charge of the observatory. He tells Phillips what to do with the unpublished material: some are useless; the chronograph plates could serve for a nice publication; photographic plates by the Zenith telescope made by Hedrick and measured by Fargis could be used to compute variations of latitude and be published; observations of variable stars continued by Hedrick have been reworked at the Vatican and they are no longer useful. Hagen suggests enlarging and organizing the library, and completing the collection of journals and binding them, setting aside about \$300 a year for this purpose.⁵¹ In a later letter, Hagen tells Phillips that he is in a better financial situation than he was during his time at Georgetown. He suggests that Fr. John Gipprich (1880–1950) should become a member of AG, as Cortie and Berlotti are already. Gipprich was director of the Georgetown Observatory in 1925 and Bonaventure Berlotti (1856–1934) director of the Ksara Observatory in Lebanon from 1906 to 1925. He tells Phillips not to follow Hedrick's perfectionism, and that "he [Hedrick] never published anything on his own."⁵² Hagen is satisfied that Phillips has become member of the AG and that he is getting into contact with American and

49 Phillips to Hagen, Georgetown, June 14, 1908.

50 Phillips to Hagen, Georgetown, July 14, 1925.

51 Hagen to Phillips, Georgetown, July 27, 1925 (Georgetown University Archives, hereafter GUA).

52 Hagen to Phillips, Georgetown, September 17, 1925 (GUA).

European astronomers. The AG meeting in Copenhagen will help in this. He also tells him how to solve some instrumental problems.⁵³ In a subsequent letter, Hagen explains that there is a problem with the recovery of Hedrick's papers and observations. Observations of variable stars made at Georgetown have been used by Hagen and been already published in his *Atlas*. He tells Phillips that when he arrived at Georgetown it took him five years before he began to publish. Now it will take ten years before the observatory is in full working condition according to modern requirements. This is to be done first and publications will come later. It is also important that Phillips trains Jesuit scholastics in astronomy as his assistants.⁵⁴ In another letter, there is a harsh criticism of Hedrick's work: "He seemed satisfied to spend his days doing something, with no definite aim."⁵⁵ In another letter he complains that of all his assistants at Georgetown only Esch has remained in astronomy.⁵⁶ Hagen mentions to Phillips the letter he has received from Charles Deppermann at Manila Observatory (see below), and how happy he is that the provincial takes the work of the two observatories, Georgetown and Manila, seriously. (At that time, Jesuits in Philippines belonged to the province of Maryland.)⁵⁷

An interesting subject in Hagen's letters to Phillips concerns the observations of cosmic clouds.⁵⁸ Hagen gives Phillip the advice, "I prefer to do something which no other does," and suggests that he observe cosmic clouds.⁵⁹ He instructs Phillips to observe cosmic clouds, starting with the more conspicuous objects such as Barnard's Ring.⁶⁰ Hagen was pleased that Phillips was starting to observe regions where cosmic clouds were present and adds: "you surely have seen what I see. There is evidently a knack in recognizing these nebulosities" and he adds "you need not be 'discouraged' that you did not get the knack at once. I have been observing the heavens for nearly forty years." Hagen tells Phillips of two of his principles: "1) I always did what nobody else did. 2) I always showed that much can be done with little." He applied the first principle to his observations of cosmic clouds.⁶¹ He comments on Phillips's difficulties in observing the cosmic clouds: "I suspect that your

53 Hagen to Phillips, Georgetown, October 31, 1925 and November 20, 1925 (GUA).

54 Hagen to Phillips, Georgetown, November 30, 1925 (GUA).

55 Hagen to Phillips, Georgetown, June 30, 1926 (GUA).

56 Hagen to Phillips, Georgetown, November 22, 1926 (GUA).

57 Hagen to Phillips, Georgetown, August 2, 1927 (GUA).

58 About Hagen's observations of cosmic clouds see Latusseck, "Via nubila".

59 Hagen to Phillips, Georgetown, September 17, 1925 (GUA).

60 Hagen to Phillips, Georgetown, October 31, 1925 (GUA).

61 Hagen to Phillips, Georgetown, June 30, 1926 (GUA).

eye is not equally sensitive to all colors. If that were the case it would throw light on the mystery that these clouds have so far not been photographed." He recognizes that his observations have not been widely accepted: "the great struggle that I have with the skepticism of the English-speaking astronomers."⁶² This is the last letter; on September 12, Phillips was appointed provincial and wrote, "This change of duties definitively and probably permanently excludes the opportunity of following Fr. Hagen's suggestions and requests."

Paul A. McNally (1890–1955) was Phillip's successor as director of Georgetown Observatory from 1928 to 1948. Only one of his letters, from 1930, to Hagen has been preserved. McNally apologizes for the long delay in answering Hagen's letters and informs him of his stay at Lick Observatory from June to December of the previous year. He tells Hagen that he is very busy because Frederick Sohn (1894–1972) has been put in charge of seismology after Francis Tondorf's (1870–1929) death and no longer working in astronomy. He also comments on a recent proposal for a new calendar, endorsed by the American Association for the Advancement of Science.⁶³ However, we have six letters from Hagen to McNally written in 1928 and 1929, and three postcards (two in 1929 and one in 1930). The six letters deal with the problems of the observations of cosmic clouds or nebulosities. During the time McNally was at Lick Observatory Hagen urges him to train in photography, "although cosmic nebulae cannot be seen in photographs," and he adds that "everything that can be seen can be photographed is *falsch*"; "terrestrial clouds can only be photographed when illuminated."⁶⁴ In another letter Hagen advises McNally to observe "genuine Herschel nebulosities"; adding "if you stay one more year at Licks you could verify my observations." Hagen insists, "don't photograph, this is the mystery that puzzles all astronomers. They don't show!!" He finishes by saying "I have said all on cosmic clouds [...] you will follow my work."⁶⁵ Later Hagen tells McNally to observe "Barnard's Dark Objects" but once again states that "photographs are not useful." Against these objections, Hagen says that Herschel, Secchi, and Barnard saw "real nebular matter" in the sky. According to Hagen, Secchi was the first after Herschel to recognize cosmic nebulosities.⁶⁶ Angelo Secchi (1818–78), director of the observatory of the Collegio Romano from 1849 to 1878, is recognized as a pioneer

62 Hagen to Phillips, Georgetown, August 25, 1928 (GUA).

63 McNally to Hagen, Georgetown, February 18, 1930.

64 Hagen to McNally, Georgetown, September 25, 1928 (GUA).

65 Hagen to McNally, Georgetown, January 15, 1929 (GUA).

66 Hagen to McNally, Georgetown, February 10, 1929 (GUA).

of astrophysics.⁶⁷ In a later letter, Hagen continues with the subject and comments on a report published in the *Washington Star*, which states, regarding the many astronomers who have questioned his observations, that he has fallen in “increasing bitterness” and that he “considers his lifework a failure,” but he declares, “not true!!” He asks McNally that “whenever you have an opportunity to speak to or before astronomers, you might, for the glory of God, counteract these impressions.”⁶⁸ This is Hagen’s only mention of his personal reaction to other astronomers’ general unbelief about his observations of cosmic clouds. In a later postcard, he asks McNally, if he does publish his observations, “not to mention my name, but those of Herschel and Barnard exclusively.”⁶⁹

In 1885, a small astronomical observatory was established at Creighton College in Omaha, Nebraska by Joseph F. Rigge (1842–1913).⁷⁰ In 1896, he was succeeded by his brother William F. Rigge (1857–1927), who had spent some time in 1890 at Georgetown Observatory with Hagen. Seven of his letters to Hagen between 1909 and 1917 have been preserved. In 1909, Rigge writes to Hagen about the need to rebuild the observatory because of changes made in a nearby street.⁷¹ In another letter he tells Hagen that he has been appointed to the Jesuit journal *America* to write about astronomy, but complains that “*America* does not care for my articles” (a complaint repeated in other letters). He has seen Tondorf’s review of Hagen’s book on the rotation of the earth and tells Hagen about his graphic method for predicting occultations. He informs Hagen that Edward S. King at Harvard uses his method and finds it very satisfactory.⁷² In the last letter (1917), Rigge tells Hagen about the book he is preparing on graphic construction of eclipses and occultations, enclosing a list of the chapters (the book was published in 1924).⁷³

Observatories in Asia and Australia

In 1865, Spanish Jesuits established Manila Observatory in the Philippines, the first Jesuit observatory in Asia.⁷⁴ The main work of the observatory was

67 Aldo Altamore and Sabino Maffeo, eds., *Angelo Secchi: L'avventura scientifica del Collegio Romano* (Foligno: Quarter, 2012).

68 Hagen to McNally, Georgetown, May 5, 1929 (GUA).

69 Hagen to McNally, Georgetown, November 18, 1929 (GUA).

70 Udías, *Searching*, 108 and 227.

71 Rigge to Hagen, Georgetown, February 7, 1909.

72 Rigge to Hagen, Georgetown, September 24, 1911.

73 Rigge to Hagen, Georgetown, April 14, 1917.

74 Udías, *Searching*, 147–158 and 269–274.

meteorology, with the study and forecasting of typhoons (tropical hurricanes), but in 1893 and 1897 two telescopes were installed and astronomical observations began. José Algué (1856–1930), director from 1897 to 1926, had spent one year in 1893 with Hagen at Georgetown Observatory.⁷⁵ Two of Algué's letters to Hagen have been preserved. In the first (1908), Algué congratulates Hagen on his work at the Vatican Observatory and tells him he is starting his own work on typhoons and earthquakes.⁷⁶ In the second, he comments on the problems created by the official status of the observatory which had been put in charge of the Weather Bureau of the Philippines by the United States administration. He finally tells Hagen that now he is working full time in meteorology.⁷⁷ In 1906, Juan Comellas (1863–1942), who had also spent some time with Hagen at the Georgetown Observatory, took charge of the astronomical section. In 1908, he complains to Hagen that he does not know what he is really doing and that he feels isolated in his work in astronomy, since everybody else is working at the Weather Bureau. He congratulates Hagen for the publication of his work on variable stars, asks for guidance about what to do in astronomy, and thanks Hagen for his advice to study variable stars by means of spectroscopy.⁷⁸

After 1920, American Jesuits began to replace Spaniards at the Manila Observatory. The most outstanding among them was Charles Deppermann (1889–1957), who arrived to Manila in 1926 and was director between 1948 and 1957.⁷⁹ Although trained in astronomy, Deppermann switched to meteorology and made his most important scientific contributions on the nature of typhoons in the Philippines. Hagen comments in a letter to Phillips regarding Deppermann, “I see that the observatory [of Manila] is now in able and energetic hands, as that of Georgetown.”⁸⁰ Deppermann had replaced Comellas at the astronomy section of the observatory. Three of his letters to Hagen between 1928 and 1930 are preserved. He complains that weather conditions are creating difficulties for astronomical observations, but tells Hagen that astronomers will be finally convinced of the reality of nebulosities and “you will be vindicated.”⁸¹ In 1929, he tells Hagen that he has been put in charge of the “time service”: “This is one of my chief duties as a government employee [...] and

75 Ángel Hidalgo, *El P. José Algué, S.J.: Científico, inventor y pacifista*. (Manila: Manila Observatory, 1974).

76 Algué to Hagen, Manila, October 12, 1908.

77 Algué to Hagen, Manila, August 29, 1918.

78 Comellas to Hagen, Manila, December 18, 1908.

79 James J. Hennessey, “Charles E. Deppermann S.J.: Philippine Scientist.” *Philippine Studies* 5 (1957): 311–35.

80 Hagen to Phillips, Georgetown, September 20, 1927 (GUA).

81 Deppermann to Hagen, Manila, November 20, 1928.

I cannot give it up or will be sent to teach in some college." He accepts that this means less time for astronomy. However, he expects to be able to do some work on variable stars.⁸² In his last letter, he comments on the observation of nebulosities: "You ask if I ever saw a dark nebulae. That is what I would like to know it [*sic*] myself!" He is afraid that in the end he will have to take up meteorology. He says it depends on the decision of his father provincial.⁸³ This is exactly what happened and Deppermann made greater contributions to meteorology, applying the ideas of frontology to typhoons for the first time.

In 1872, French Jesuits founded the observatory of Zikawei, in Shanghai, China, devoted primarily to meteorology.⁸⁴ In 1904, Stanislas Chevalier (1852–1930), director of Zikawei from 1888 to 1897, established the nearby astronomical observatory of Zose (See Shan Hill).⁸⁵ Two of Chevalier's letters to Hagen are preserved. In the first (1911), Chevalier explains to Hagen the problem with Karl F. Küstner's answer to some of Chevalier's observations of stars in the BD Catalog, which he had sent to Hermann Kobold, editor of *Astronomischen Nachrichten*, and which Kobold had published. Chevalier also complains that he has been left alone since the Japanese Jesuit astronomer and mathematician Paul Tsuchihashi (1866–1965), who had been working in Zose from 1906 returned to Japan.⁸⁶ Tsuchihashi taught at the Jesuit Sophia University (Tokyo) and became rector in 1940. In the second letter, Chevalier insists that Jesuit observatories must reestablish relations with German observatories and be above national quarrels (referring to the isolation of Germany after the First World War). He tells Hagen that he is sending publications from Zose to Berlin.⁸⁷

Riverview Observatory in New South Wales, Australia, was founded in 1907. It began with meteorological and seismological observations and in 1922 installed an equatorial telescope.⁸⁸ Edward F. Pigot (1858–1929), an Irish Jesuit who had previously worked at Zikawei Observatory (1899–1907), was its founder and first director.⁸⁹ In 1915, Hagen wrote to Pigot proposing to carry out an experiment with the Foucault pendulum. The experiment had not been conducted in the Southern

82 Deppermann to Hagen, Manila, September 15, 1929.

83 Deppermann to Hagen, Manila, August 16, 1930.

84 Udías, *Searching*, 158–67 and 276–81.

85 Edmund de la Villemarqué, "Le Père Stanislas Chevalier (1852–1930): Un demi siècle de vie scientifique, 1880–1930," *Bulletin de l'Université l'Aurora* 26 (1933): 39–53.

86 Chevalier to Hagen, Zikawei, November 22, 1911.

87 Chevalier to Hagen, Zikawei, May 4, 1921.

88 Udías, *Searching*, 179–81 and 290–91.

89 David Branagan, "Earth, Sky and Prayer in Harmony: Aspects of the Interesting Life of Father Edward Pigot, S.J., B.A., M.B., B.C.H. (1858–1929). A Jesuit Seismologist. Part 1," *Earth Science History* 29 (2010): 69–99.

Hemisphere except for once in 1851 in Rio de Janeiro—and, according to Hagen, in an unsatisfactory manner. Foucault had performed his experiment for the first time in Paris in 1851 and the same year the experiment was repeated by Secchi in the St. Ignatius Church in Rome. Hagen gives Pigot some details of how to perform the experiment, and tells him that he is sending him his book on the subject, *La rotation de la terre*.⁹⁰ After receiving Pigot's consent, Hagen explains that he had first thought of Chile for the experiment, but had received no answer from Jesuits there. The visit of the Jesuit provincial of Australia to the Vatican Observatory made him change his mind. The provincial had told him that Pigot was the man to write to. Hagen adds some more details about the experiment and he ends by saying, "Pleasure to do quiet scientific work in these troubled times."⁹¹ Only one of Pigot's letters to Hagen has been preserved. He tells Hagen of the first trials of the experiment. Pigot had succeeded in installing the pendulum in the Queen Victoria Market in Sydney, a building with a high dome that the City Council had put entirely at his disposal. The pendulum had a length of eighty-five feet and the ball weighed sixty pounds. To the ball he added a lamp with a lens to record the motion of the pendulum on photographic paper, and called the device a "photo-geogyrograph." He finishes by saying, "suspend your judgment until you see the detailed results."⁹² Hagen answered Pigot after seeing the results from the first experiments. He shows interest in the recording device and notes some problems to be addressed. He explains that the pendulum describes an elliptical motion, a problem that had puzzled Secchi.⁹³ The experiment was repeated several times with positive results.⁹⁴ Some years later Hagen published an article on the subject.⁹⁵

Conclusion

The preserved correspondence of Johann Hagen, between his appointment as the first Jesuit director of the Vatican Observatory in 1906 and his death in 1930, with directors of other Jesuit observatories in Europe, North America, Asia, and Australia reveals a personal dimension of this little studied Jesuit contribution to modern science. The letters show that Jesuits carried out true scientific work

90 Hagen to Pigot, Riverview, March 20, 1915 (Jesuit Australian Archive, hereafter JAA).

91 Hagen to Pigot, Riverview, July 21, 1915 (JAA).

92 Pigot to Hagen, Riverview, May 1, 1916.

93 Hagen to Pigot, Riverview, August 15, 1916 (JAA).

94 Edward F. Pigot, "A Photographic Foucault Pendulum," *Journal and Proceedings of the Royal Society of New South Wales* 50 (1916): 262–71.

95 Johann G. Hagen, "The Free-Pendulum Experiment Photographed," *Popular Astronomy* 38 (1930): 381–85.

in their observatories and were in contact with other observatories and astronomers. They also show the problems they encountered. Observatories were local initiatives and depended on the support of local Jesuit superiors, which was not always forthcoming. Financial problems were frequent as maintenance and modern instruments became more expensive. Keeping observatories outfitted with up-to-date equipment was a common problem. Scientific subjects in the letters are reduced to those of Hagen's main interests, namely, observations of variable stars, the problem of cosmic clouds, and the rotation of the earth. Relations with the contemporary astronomical community can be appreciated by the references made in the letters to various scientific colleagues (Appendix 2). Through the letters we can see the importance Hagen gave to Jesuits belonging to scientific societies, especially the *Astronomische Gesellschaft* and the Royal Astronomical Society, the attending scientific meetings and publishing their observations in scientific journals. This correspondence constitutes an important source for future work on modern Jesuit observatories.

Appendix 1: Hagen's Correspondence

Stonyhurst Observatory (Lancashire, England)

Walter Sidgreaves (1837–1919), Director 1863–68, 1889–1919: March 7, 1908; October 20, 1908; November 20, 1908; March 13, 1914.

Letter from Hagen to Fr. Assistant, October 23, 1908 to be sent to Sidgreaves Aloysius Cortie (1859–1925), director 1919–1925: March 15, 1908; April 12, 1908; May 17, 1908; June 22, 1908; November 25 1908; April 3, 1910; December 23, 1922; February 13, 1924; December 9, 1924.

Henry H. Macklin, Collaborator 1930–39: March 9, 1923.

Edward D. O'Connor (1874–1954), Director 1925–32: November 19, 1929; May 22, 1930.

Observatory at Ignatiuskolleg (Valkenburg, The Netherlands)

Michael Esch (1869–1938), director 1905–38: April 4, 1910; December 21, 1910; September 22, 1919; March 18, 1920.

Haynald Observatory (Kalocsa, Hungary)

Gyula Fenyi (1845–1927), director 1885–1913: February 17, 1912; December 28, 1909; December 19, 1910.

Theodor Anghern (1872–1952), director 1913–47: October 30, 1908; November 27, 1908; November 25, 1909; September 21, 1913; November 24 1913; December 26, 1913; April 22, 1923; December 10, 1927.

Ebro Observatory (Roquetas, Spain)

Ricardo Cirera (1864–1932), director 1904–20: July 27, 1907; March 20, 1914.

Luis Rodés (1881–1939), director 1920–39: January 27, 1922; March 22, 1923.

Hagen to Rodés: March 26, 1923; May 24, 1923 (Archivo S.J. Barcelona).

Georgetown Observatory (Washington, D.C.)

John T. Hedrick (1853–1923), director 1906–16: September 3, 1909; March 6, 1911; July 18, 1913.

Edward C. Phillips (1877–1952), director 1926–28: June 14, 1908; July 14, 1925.

Hagen to Phillips: July 27, 1925; September 17, 1925; October 31, 1925; November 20, 1925; November 30, 1925; December 4, 1925 (postcard, P); February 8, 1926; May 15, 1926; June 30, 1926; September 15, 1926; November 22, 1926; March 25, 1927 (P); May 31, 1927 (P); August 2, 1927; September 20, 1927; April 1, 1928; August 25, 1928; February 5, 1929 (P) (Georgetown University Archives).

Paul A. McNally (1890–1955), director 1928–48: October 19, 1926; February 18, 1930.

Hagen to McNally: September 25, 1928; October 23, 1928; January 15, 1929; February 10, 1929; March 25, 1929; May 5, 1929; June 16, 1929 (P); November 18, 1929 (P); March 13, 1930 (P) (Georgetown University Archives).

Francis A. Tondorf (1870–1929) *Seismology* 1910–30: June 11, 1920.

Observatory of Creighton University (Omaha, Nebraska)

William F. Rigge (1857–1927), director 1896–1932: February 7, 1909; March 21, 1910; September 24, 1911; January 18, 1912; January 14, 1913; February 27, 1913; April 14, 1917.

Manila Observatory (Manila, Philippines)

José Algué (1856–1930) director, 1897–1926: October 12, 1908; August 29, 1918.

Juan Comellas (1863–1942): December 18, 1908.

Charles Deppermann (1889–1957), director 1948–57: November 20, 1928; September 15, 1929; August 16, 1930.

Zikawei and Soze Observatory (Shanghai, China)

Stanislas Chevalier (1852–1930), director Zikawei 1888–97; 1927–29; Soze 1902–27: November 22, 1911; May 4, 1921.

Riverview Observatory (New South Wales, Australia)

Edward Pigot (1858–1929), director 1907–29: May 1, 1916.

Hagen to Pigot: March 20, 1915; July 21, 1915; August 15, 1916 (Jesuit Australian Archive).

Appendix 2: Contemporary Astronomers Mentioned in Hagen's Correspondence

Aitken, Robert Grant (1864–1951), Lick.
 Barnard, Edward Emerson (1857–1923), Lick, Yerkes.
 Baume-Pluvinel, Aymar Eugène de la (1860–1938), Paris.
 Bauschinger, Julius (1860–1934), Strasbourg, Berlin.
 Bigelow, Frank Hagar (1851–1924), US Weather Bureau.
 Bigourdan, Guillaume (1851–1932), Paris.
 Dean, Benjamin McLaughlin (1901–65), Michigan.
 Doberck, August William (1852–1941), Hong Kong.
 Dugan, Raymond Smith (1879–1940), Princeton.
 Dyson, Frank Watson (1868–1939), Greenwich.
 Fowler, Ralf Howart (1889–1944), Cambridge.
 Franks, William Saddler (1851–1935), Brockhurst.
 Graff, Kasimir Romuald (1878–1950), Hamburg, Vienna.
 Harkness, William (1837–1903), US Naval Observatory.
 Hartwig, Ernst (1851–1923), Bamberg, Vienna.
 Huggins, William (1824–1910), Tulse Hill (London).
 King, Edward Skinner (1861–1931), Harvard.
 Kobold, Hermann (1858–1942), Strasbourg, Kiel.
 Konkoly-Thege, Miklós (1842–1916), Ugyalla.
 Koveligethy, Rado (1862–1934), Budapest.
 Küstner, Karl Friedrich (1856–1936), Berlin.
 Lundmark, Knut Emil (1889–1958), Lick, Mount Wilson and Lund.
 Newcomb, Simon (1835–1909), US Naval Observatory.
 Nijland, Albertus Antonie (1868–1936), Utrecht.
 Pickering, Edward Charles (1846–1919), Harvard.
 Pogson, Normand Robert (1829–91), Madras (Chennai).
 Ricco, Annibale (1844–1919), Mount Etna and Catania.
 Russell, Henry Norris (1877–1957), Princeton.
 Schlesinger (1871–1943), Yerkes, Yale.
 Schwarzschild, Karl (1873–1916), Göttingen and Potsdam.
 Shapley, Harlow (1885–1972), Mount Wilson, Harvard.
 Stewart, John Quincy (1894–1972), Princeton.
 Trumpler, Robert Julius (1886–1956) Lick.
 Woodward, Robert Simpson (1849–1924), US Geological Survey, Carnegie Institute.