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German Mineral Specialists in Elizabethan England and Early English America

Mineral experts from Germany played an important role in helping to establish or modernize the English mineral and metal industry under Queen Elizabeth I. German mineral specialists accompanied Martin Frobisher, the seeker after the Northwest Passage, in 1577 and 1578. At least one accompanied Sir Humphrey Gilbert when he tried to establish the first English colony in the New World in 1583. Joachim Gans, a German Jew from Prague, took part in the first English settlement in what is today the United States. It was established in 1585 under Sir Walter Raleigh in an area the settlers called Virginia and we know today as the Outer Banks of North Carolina. David B. Quinn, the world authority on this colony, believes that it included also a group of German miners. Samuel Eliot Morison states that German miners in addition to Gans were present in this settlement.

German Mineral Experts in England

The first English explorers and colonizers eagerly sought metals such as gold, silver and copper. Within Elizabeth's domain, immigrants from Germany were among those deemed most versed in locating and working minerals. According to *A History of Technology*, by "the middle of the sixteenth century Germany led Europe in the practice of mining and metallurgy."¹ "Germany was the great school of metallurgy for the rest of Europe," declares the *Journal of Chemical Education*, "and it was due to the wise foresight of Queen Elizabeth that German workers were invited to England to instruct her subjects in this art."² According to British historian William Rees:

The pre-eminence attained by the Germans in certain aspects of metal working by the first half of the sixteenth century . . . is abundantly evidenced by the large number of experienced technicians recruited from Germany to direct the growing native industry in Britain. . . .³

German experts were called to England in the early years of Elizabeth's reign to extract the silver from the base coins and to re-mint the coinage.⁴ In 1564, Elizabeth gave exclusive rights to the Augsburgers Daniel Höchstetter and the Englishman Thomas Thurland to mine and smelt ores of gold, silver, copper and mercury in eight counties and in Wales. In 1565, Höchstetter and Thurland along with other shareholders formed the Society of the Mines Royal. Höchstetter represented Augsburg capitalists, who were the major underwriters of the enterprise. In the same year, William Humfrey, master of the mint, Christopher Schütz from Annaberg, Saxony, and three English partners received from Elizabeth the sole right to undertake prospecting and smelting in the areas not included in the grant made to the Mines Royal. Their organization, the Society of the Mineral and Battery Works, also received the exclusive right to produce brass and to make iron and copper wire. (Battery refers to the process of hammering or battering metal into useful shapes.)⁵ For the Mineral and Battery Works, "German experts provided the necessary guidance as key-men in the early states . . ." and for the Mines Royal, German skill and capital "provided the mainspring of development," declares Rees.⁶ Although the shareholders of the Mineral and Battery Works were critical of the fact that the corporation did not turn a quick profit, Humfrey believed that without the German specialists "the recent progress would not have been possible. . . . With them the realm had attained within a relatively few years to a standard of development which had taken Germany many hundreds of years."⁷

In 1567, Höchstetter, the managing director of the Society of the Mines Royal, headquartered in Keswick, Cumberland, was able to send Elizabeth samples of the first copper smelted in England. The society, which employed a total of 150 German-speaking workers using the German copper-smelting process, produced about 350 tons between 1568 and 1576.⁸

In summary, Germans made extensive contributions to the English mineral and metal industry in the period before 1585. They discovered new deposits of metallic ores, and they taught English and Welsh miners to mine at greater depths. They introduced iron-clad stampers (*Stampfer*) driven by waterwheels to break up ores. They introduced the jiggging sieve for separating ore from dirt. They were the first in England to discover deposits of calamine ore, a necessary ingredient in the manufacture of brass, and likewise the first to produce brass and copper. They introduced the process of separating silver from copper and lead. They replaced the manual method of drawing wire with one using waterwheels. In short, German miners and metallurgists played a key role in hastening England's industrial development by introducing certain technological innovations.

German Mineral Specialists Participated in English Explorations

The first two English explorers of North America—Frobisher and Gilbert—took along German mineral specialists. Martin Frobisher brought

along Jonas Schütz, a metallurgist from Annaberg in the Erzgebirge, the range between Bohemia and Saxony that was the most important copper mining area of Bohemia in the sixteenth century, to supervise the mining of stones from Frobisher Bay off Baffin Island in 1577. Another German mineral expert by the name of Gregory Bona (Gut?) accompanied Frobisher both in 1577 and 1578.⁹

When Sir Humphrey Gilbert set out in 1583 to "inhabit and possess Western lands," as called for in his patent from Queen Elizabeth, one of his major ambitions was to discover precious metals. We know the name of at least one German mineral expert who took part in this the first English attempt to establish a settlement in America. It was Master Daniel, a mineral specialist and refiner from Saxony. But there were also other "mineral men and refiners" aboard; these were apparently under his charge, since he is the only one singled out by name and entitled master.¹⁰ They may also have been German. Unfortunately, Daniel, along with most of the prospective settlers, drowned in a storm off Sable Island after prospecting for silver in Newfoundland.

The First English Colony in the Present United States

The first English settlement in what is today the United States was established in 1585 under the leadership of Gilbert's half brother Sir Walter Raleigh. It was carried out under a patent from the queen similar to Gilbert's. On 26 June 1585, Raleigh's ships under the command of Sir Richard Grenville arrived at the barrier islands known today as the Outer Banks of North Carolina (near Cape Hatteras). On 29 June, the pilot of the flagship known as *Tyger* tried to get her to a safe harbor in the sound beyond the outward islands, but the inlet was too shallow and the 160-ton ship ran aground. To get her free, the crew had to jettison valuable provisions. They spent most of July exploring the coastal islands and adjacent mainland in smaller vessels. Finally, on 27 July, they found a passable inlet for the *Tyger*. Shortly thereafter they began to build a fort and settlement on Roanoke Island situated in the middle of the sound. (This settlement site is preserved today by the National Park Service as Fort Raleigh National Historic Site, Manteo, North Carolina. It is identical with the site of the better-known but later "Lost Colony.")

One of the primary objectives of the colony of 1585 was to win valuable metals for Raleigh and his queen. Since metals were so important to Sir Walter, we can assume that he would have wanted to utilize the most up-to-date methods of finding them. The most effective way to accomplish this would have been to employ German mineral men. Ivor Noël Hume, America's leading historical archaeologist, believes that the men running metallurgical assays and scientific tests on Roanoke Island were "a blue-ribbon team, and like most scientific research efforts today, quality of mind brushed aside barriers of race, religion, or national origin. . . ."¹¹ Quinn, chief historian of early English settlements, described the mineral experts as follows:

One group of specialists was of considerable importance, namely the "mineral men"—metallurgists and miners. The leading metallurgist in the list [of settlers] was Dougham Gannes, otherwise Joachim Ganz, a Jewish expert from Prague, who had been involved in the locating and working of copper mines in England. He would be considered to be "Dutch" or German in the nomenclature of the time.¹²

In Search of Metals

During the exploration of the mainland in the spring of 1586, some of the colonists traveled up the Roanoke River in search of what one native chief described as rich mineral deposits at the falls. A "marvelous and most strange mineral" was to be found there, their commander Ralph Lane reported later.¹³ However, he was forced to turn back because of Indian attacks and lack of food. In reporting to Raleigh about the search for copper, Governor Lane passed along the following opinion of his chief metallurgist: "And touching the mineral, thus does M[aster] Yougham affirm, that though it be but copper, seeing the savages are able to melt it, it is one of the richest minerals in the world."¹⁴ What Joachim Gans apparently meant was, even if this mineral is only copper, it must be copper in its purest form, seeing that the natives are able to smelt it with their simple equipment. His opinion, if it was indeed accurately reported, contradicts the assumption of modern historians who hold that the indigenous people of what is today the United States could do no more than cold-work the native copper; only the inhabitants of Mexico and the Andean region are believed to have been capable of smelting the metal.

According to Quinn, Joachim Gans, as the chief metallurgist of the colony, "tested metal objects found in Indian hands . . . to find out whether the copper was of good quality and also whether these objects contained any gold or silver."¹⁵ The English naturalist Thomas Hariot [also Harriot] reported later that some Indian copper was "found by trial to hold silver." (Hariot's account, *A briefe and true report of the new found land of Virginia*, was published in 1590 in Frankfurt.)¹⁶ Two chunks of surface-pitted but pure copper, 12 and 21½ ounces, were discovered by archeologist Jean Carl Harrington on the island.¹⁷ According to Quinn, "there seems little doubt that they were smelted on Roanoke Island and that Ganz had a furnace capable of reaching the almost 2,000 degrees Fahrenheit necessary to melt copper. . . ."¹⁸

Locally made bricks from an assay furnace probably built under the direction of Gans have been found on Roanoke. "Many of the bats were heavily burned at one end, and several had been ground down so that one side was deeply concave," declares Noël Hume.¹⁹ These concave bricks formed the arches of the two openings of the assay furnace. This raises the question, why did Gans not have a portable assay furnace of European manufacture on Roanoke Island, as did Jonas Schütz in Frobisher Bay and Master Daniel in Newfoundland? Why did he have to build a makeshift one from locally made



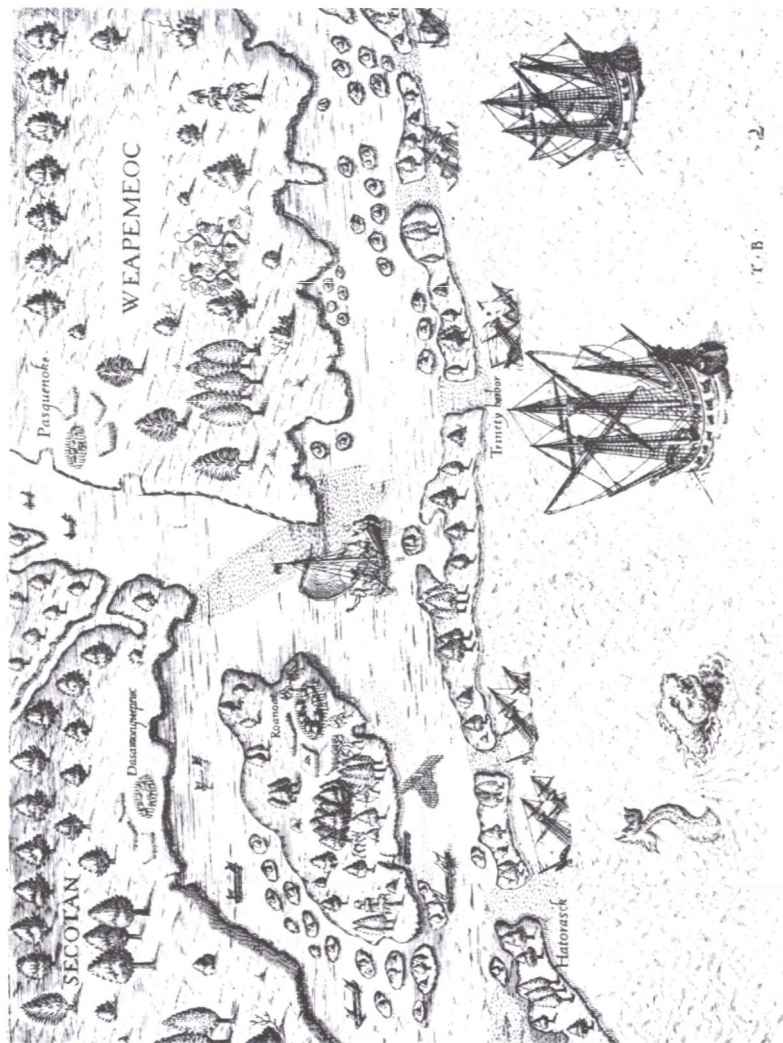
Engraved title page of the English edition of Thomas Hariot's report of the discoveries made by the English in their settlement of Virginia in 1585-86. Hariot's book was published in Frankfurt-am-Main in 1590.



Map of "Virginia" engraved by Theodor de Bry, a citizen of Frankfurt, and published in 1590 in Hariot's report. It depicts the area explored by the first English settlers and German mineral specialists in 1585-86. It includes what are today called the Outer Banks of North Carolina (bottom)



and Chesapeake Bay (right). Roanoke Island, their place of settlement, is at the bottom, center, just inside the barrier islands.



Detailed map of Roanoke Island, Virginia (today, North Carolina), the settlement site of the first English colony in America. German mineral specialists participated in this settlement of 1585-86 at what has been called "America's first science center." The map was published by de Bry in Frankfurt in 1590 as part of Harriot's report.



Title page of the German edition of Harriot's report of Virginia. The German, English, Latin and French editions were published by Theodor (Dietrich) de Bry in 1590 in Frankfurt and printed by Johannes Wechel.

bricks? Assayers normally carried their portable furnaces with them. Gans's may have been thrown overboard by the sailors trying to lighten the *Tyger* when it ran aground at the barrier islands. Luckily, Gans knew how to make one from scratch.

In 1849, a visitor had reported finding "glass globes containing quicksilver, and hermetically sealed." Noël Hume believes that they were from Gans's metallurgical laboratory.²⁰ In addition to assaying copper, Gans or an assistant also produced iron, because we read in Hariot's report:

In two places of the country specially, one about fourscore and the other six score miles from the Fort or place where we dwelt, we found near the water side the ground to be rocky, which by the trial of a mineral man, was found to hold iron richly. . . .²¹

Noël Hume indicates that evidence of scientific and technological activity on Roanoke Island is spread over about fifty square meters at Fort Raleigh National Historic Site. He reports many fragments of crucibles such as would have been used in metallurgical work, flat tiles of European manufacture that were used on Roanoke in an assay or smelting furnace, antimony used to separate metals, slag from metallurgical activity, a lump of copper ore plus two pieces of smelted copper (referred to earlier), as well as fragments of assayers' flasks. He calls the locus of the assaying and distilling work "America's first science center."²²

The Identity of the Mineral Specialists at the First Colony

As we have seen, Joachim Gans was the leading mineral expert of the first English settlement in North America.²³ He was originally from Prague. In 1581, the German-speaking George Needham, clerk of the Society of the Mines Royal, had brought the mining engineer Joachim Gans "up to Keswick to explain and develop the brilliant new ideas he had about mineral dressing and smelting," relates Maxwell Bruce Donald, the chief historian of the Society.²⁴

We know from official depositions that Gans was born in Prague, Bohemia,²⁵ probably around the middle of the sixteenth century. He is believed to have been a member of the prominent Gans family of that city.²⁶ The best-known member of the family was the Renaissance astronomer, mathematician, geographer and chronicler David Gans (1541-1613), who was born in Lippstadt, Westphalia.²⁷ Joachim Gans may have acquired his knowledge of the smelting and refining of copper, lead and silver in the Erzgebirge. Georgius Agricola (Georg Bauer), the father of mineralogy, described the highly developed mining and smelting techniques employed in the Erzgebirge in his book *De Re Metallica* published in 1556.

An important Elizabethan personality who may have been instrumental in inducing Gans to go to America in 1585 was Sir Francis Walsingham, Elizabeth's

principal secretary of state and the governor of the Society of the Mines Royal since 1580. Sir Francis was acquainted with Gans's abilities as a mineral expert, because Gans had proposed to the Secretary in 1582 methods for improving the smelting operations of the Mines Royal. We are told by Quinn that Sir Francis was "a subscriber to the 1585 venture, in which a number of members of his household took part."²⁸ Did Walsingham induce German miners from the Mines Royal to accompany Gans? This question invites further research.

"There are certainly names of Germanic character in the list [of settlers]. . . ." declares Quinn.²⁹ And he suggests Erasmus Clefs, Edward Ketchemen, Thomas Skevelabs, Smolkin, Haunce Walters and Daniel as possible German miners among the 108 settlers.³⁰ Morison states that two German miners were present, in addition to Gans, but he does not give us their names.³¹

One of the men mentioned by Quinn as a possible German mineral man appears as Haunce Walters in the list of colonists. Hans is, of course, a contraction of the German or Dutch given name Johannes. A Hans Wautter was the butler of the Society of the Mines Royal at Keswick; Wautter appears Anglicized as Walters in the local parish register.³²

Only the first name is given for two of the settlers—Daniel and Robert. The compiler of the list may not have bothered to write down their last names, because they were either boys or foreigners. In the sixteenth century, the English frequently referred to German mineral experts solely by their first names, perhaps because they had difficulty with German last names. (As we have seen, Lane called Joachim Gans "Master Yougham.") Quinn believes that Daniel was Daniel Höchstetter, Jr., the son of Daniel Höchstetter, Sr., who was the first managing director of the Society of the Mines Royal.³³

Daniel, Jr., was born in 1562 in Augsburg, his mother being Radagunda Stamler of a South German merchant-banker family. Next to the Fuggers and Welsers, the Höchstetters were the most important South German merchant family in the first decades of the sixteenth century. They had established a branch in Antwerp (where Höchstetter Street was named after them) from whence they engaged in extensive financial dealings with English sovereigns. King Henry VIII gave Joachim Höchstetter, the father of Daniel, Sr., monopoly over the mining of gold and silver in England. For a while, the Höchstetters played a leading role in the extraction of silver and copper from mines in the Tyrol. The family enterprise collapsed, however, in 1529 due to a disastrous speculation in mercury. It was under Henry's daughter Elizabeth and Joachim's son Daniel, Sr., that the proposed German-English mining enterprise was realized in the form of the Society of the Mines Royal.³⁴

In 1585, Daniel Höchstetter, Jr., would have been twenty-three, a good age for an adventure in America. His father had died in 1581; therefore, he was free of fatherly restraints, and he had as yet no wife. (He would marry Jane Nicholson in 1590 and become managing director of the Society around 1597, but in 1585 he had no such responsibilities, the company being managed by his brother-in-law and by his older brother.) Since the Society of the Mines Royal

held the official monopoly over mining and smelting in much of England, it would have been the logical organization to be involved in mining and smelting in the English part of the New World. Daniel would have been the appropriate person for the Society to send overseas to investigate potential new sources of metals. Being the brother of the managing director, he was in a good position to represent the interests of the company; being the younger brother, he could be spared at home. If the Haunce Walters of the colony was indeed identical with the Hans Wautter who was the butler or provisioner of the Society, this old family retainer would have been sent along to look after the young Höchstetter. Daniel's interest in the New World may be gauged by the fact that an inventory he made shortly before his death in 1633 listed a folio edition of Thomas Hariot's *A briefe and true report of the new found land of Virginia* as well as the *Natural and Moral History of the East & West Indias*.³⁵

Conclusion

On 17 June 1586, the leadership of the colony abandoned the Virginia settlement, because of lack of supplies from England and trouble with the native Americans, which they themselves had provoked. They returned to England with Sir Francis Drake after having spent a year in the New World.

Despite this setback, Gans and his mineral men offer an inspiring picture. We saw them land in the American wilderness and forthwith set up their assaying equipment to investigate their new environment and study its natural resources. The ground-breaking scientific and technological work of Joachim Gans and his miners should be measured not by its immediate results but by the groundwork it laid for future success. The plan by the English to start a mineral industry through the talents of Continental experts at the very first tiny settlement in the wilderness was too grandiose to succeed (even if there had been exploitable minerals in Tidewater North Carolina). But history shows that few human enterprises of any importance, particularly one of such magnitude, succeed without initial failures.

Although the Spaniards and the French early established their presence and influence in North America, the United States developed primarily out of English America. The participation of Jonas Schütz, Gregory Bona and Master Daniel in the first English explorations, the presence of Joachim Gans and his assistants at the first English settlement, as well as the subsequent appearance of German glassmakers, house builders, mineral specialists and sawmillwrights at Jamestown, Virginia, the first permanent English colony, demonstrate that Germans were present at the very creation of this country.

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Notes

¹ Charles Singer, et al., eds., *A History of Technology* (Oxford: Clarendon Press, 1957), 3:678.

² Eva V. Armstrong and Hiram S. Lukens, "Lazarus Ercker and His 'Proberbuch' Sir John Pettus and His 'Fleta Minor,'" *Journal of Chemical Education* (Division of Chemical Education of the American Chemical Society) 16,12 (December 1939): 559.

³ William Rees, *Industry Before the Industrial Revolution* (Cardiff: University of Wales Press, 1968), 25. Herbert Clark Hoover, the future president of the United States, and Lou Henry Hoover stated, "There can be no doubt . . . that in copper mining in Cornwall and elsewhere in England, the 'Dutch Mynerall men' did play a large part in the latter part of the 16th Century" (*Georgius Agricola De Re Metallica* [London: Salisbury House, 1912], 282-83).

⁴ Maxwell Bruce Donald, *Elizabethan Monopolies: The History of the Company of Mineral and Battery Works from 1565 to 1604* (London: Oliver and Boyd, 1961), 26-27.

⁵ Rees, *Industry Before the Industrial Revolution*, 386-87.

⁶ *Ibid.*, 397.

⁷ *Ibid.*, 394.

⁸ George Hammersley, "Technique or Economy?: The Rise and Decline of the Early English Copper Industry, ca. 1550-1660," *Schwerpunkte der Kupferproduktion und des Kupferhandels in Europa: 1500-1650*, ed. Hermann Kellenbenz (Cologne: Böhlau Verlag, 1977), 4-5.

⁹ William W. Fitzhugh, ed., *Archeology of the Frobisher Voyages* (Washington, DC: Smithsonian Institution, 1993), 138. Fitzhugh states that during Frobisher's second expedition (1577) "there were three assayers ('goldfiners') with Jonas Shutz [Schütz], an experienced German metallurgist, in charge. With him were Gregory Bona, another German metallurgist, and Robert Denham, a London goldsmith." Fitzhugh relates that during the third voyage in 1578 Frobisher was accompanied by several assayers including Gregory Bona. "Bona may have been prospector as well as assayer because, distinct from the others, he is listed as goldfinder in the second and third voyages . . ." Fitzhugh indicates that he had found evidence of mining and metallurgical work performed by the Frobisher expeditions. Mining was done on islands and peninsulas in Countess of Warwick Sound, off Baffin Island in Frobisher Bay. Headquarters were on Countess of Warwick Island (Kodlunarn I.) Fitzhugh continues on page 143: "The technology of fire assaying was well advanced by the time of the voyages. Available publications included Georgius Agricola, Lazarus Ercker and Vannoccio Biringuccio. Jonas Shutz, chief metallurgist in the second voyage, was from an active mining region in present-day East Germany [Erzgebirge] and must have been acquainted with this technology." The English were not the first explorers or settlers to employ German mineral experts in America. Almost fifty years earlier, German specialists had been brought to the Spanish possessions: "*Im Jahre 1528 schloß Hieronymus Sailer im Auftrage Heinrich Ehingers für die Gesellschaft der Welsler mit der Krone einen Vertrag über die Anwerbung und Überführung von fünfzig deutschen Bergleuten nach Santo Domingo ab. Die Bergleute sollten von der Welsergesellschaft in Deutschland angeworben werden und in den verschiedenen Kolonialprovinzen als Lehrmeister und Vorarbeiter für die Kolonisten und für die eingeborenen Hilfskräfte dienen. Dem Bergbau wurde in den neuentdeckten Ländern von Anfang an ein lebhaftes Interesse entgegengebracht, und anscheinend ging den deutschen Bergleuten schon damals der Ruf voraus, Meister in ihrer Arbeit zu sein, so daß es für zweckmäßig befunden wurde, 'minereros alemanes' nach Amerika zu holen, 'para que con su industria y saber se hallan las minas de oro y plata y otros metales en las tierras e islas.' . . . In dem Vertrag über die Bergleute wird ausdrücklich betont, daß diese in Amerika die gleichen Vorteile genießen würden wie alle in den Minenbetrieben von Galicia (Spanien) bereits tätigen deutschen Bergknappen. Ferner wird ausdrücklich hervorgehoben, daß es Aufgabe der deutschen Bergwerksmeister (maestros mineros) sein*

solle, auf allen Inseln und in allen kolonialen Provinzen nach Erzlagerstätten zu forschen und zu deren Erschließung beizutragen. . . . Der größte Teil der Bergleute wurde in *S. Joachimstal bzw. im sächsischen Erzgebirge* angeworben. . . . Zunächst wurde in Sachsen ein Transport von vierundzwanzig Bergleuten abgefertigt, der im Herbst 1528 in Antwerpen eintraf [und dann] nach Sevilla geführt [wurde]. . . . Im Laufe des Jahres 1529 sind noch weitere fünfundzwanzig Leute von S. Joachimstal und eine kleine Anzahl, die man in Schwaz angeworben hatte, von Leipzig nach Sevilla abgefertigt worden. Ein Teil der Bergleute ist wahrscheinlich mit der ersten für Venezuela bestimmten Flotte der Welser unter dem Befehl *Garcia de Lermas* nach Santo Domingo gefahren, der größere Teil aber erst mit der Expedition, die unter dem Befehl von *Nikolaus Federmann* im Oktober 1529 von Sevilla auslief. . . . Höchstwahrscheinlich sind die Bergleute an den verschiedensten Stellen tätig gewesen. . . . Anscheinend haben aber nur wenige Bergleute einen dauernden Gewinn von ihrer Tätigkeit in Amerika erlangt. . . . Vollkommen erfolglos ist die Überführung der deutschen Bergleute nach Santo Domingo nicht gewesen. Die Welsergesellschaft dürfte kaum einen Gewinn erzielt haben, wohl aber auf die Dauer die spanische Krone. Der Kupferbergbau der *Cotoy-Minen auf der Insel Española* [Haiti and the Dominican Republic] und die Silberminen in der Nähe von *Zultepeque in Mexiko*, welche bald eine große Bedeutung erlangten, sind zweifellos mit Hilfe der deutschen Bergleute ausgebaut worden. . . . Unwahrscheinlich ist es nicht, daß sich die Welser an der Goldgewinnung auf *Española* beteiligt und hierfür ebenfalls deutsche Kräfte verwandt haben." In addition, a German mining engineer and copper smelter, Hans Tetzl, was active in Cuba around 1546 to 1550 (Karl H. Panhorst, *Deutschland und Amerika: Ein Rückblick auf das Zeitalter der Entdeckung und die ersten deutsch-amerikanischen Verbindungen unter besonderer Beachtung der Unternehmungen der Fugger und Welser* [Munich: Verlag Ernst Reinhardt, 1928], 112-21).

¹⁰ Richard Hakluyt, "A report of the voyage and successe thereof, attempted in the yeer of our Lord 1583 by sir Humfrey Gilbert knight, with other gentlemen assisting him in that action, intended to discover and to plant Christian inhabitants in place convenient, upon those large and ample countreys extended Northward from the cape of Florida . . . written by M. Edward Haes gentleman, and principall actour in the same voyage, who alone continued unto the end . . .," reproduced in *Early English and French Voyages, Chiefly from Hakluyt, 1534-1608*, ed. Henry S. Burrage (New York: Charles Scribner's Sons, 1906). Gilbert "was most curious [inquisitive] in the search of metals, commanding the mineral man and refiner especially to be diligent. The same was a Saxon born, honest and religious, named Daniel. . . ." After prospecting near St. John's harbor in Newfoundland, Daniel "brought at first some sort of ore" which seemed to be iron. The next time the Saxon found ore, he brought it to Gilbert "with no small show of contentment." He said that if silver were the thing which might satisfy the general and his followers, there it was; they needed to seek no further. On this he swore to stake his life, which was "as dear unto him as the Crown of England unto her Majesty," to "use his own words." Gilbert would have liked to have stayed in Newfoundland, he maintained, to find more of the silver, but he felt compelled to continue his journey in order to bring more lands under his sway before his patent from Queen Elizabeth expired. He sent the ore on board ship to have it tested at sea by Daniel. On 20 August 1583, the fleet departed St. John's and sailed south for more prospecting on the American mainland and to establish a settlement. In the morning of 29 August, "the wind rose, and blew vehemently" toward the mainland, bringing with it rain and thick mist, "so that we could not see a cable length before us." Somewhere near Sable Island, Daniel's ship struck bottom and was broken up by the waves. "Here also perished our Saxon Refiner and discoverer of inestimable riches, as it was left among some of us in undoubted hope" (205-12).

¹¹ Ivor Noël Hume, "Roanoke Island: America's First Science Center," *Colonial Williamsburg* 16,3 (Spring 1994): 20.

¹² David B. Quinn, *Set Fair for Roanoke: Voyages and Colonies, 1584-1606* (Chapel Hill, NC: University of North Carolina Press, 1985), 92. Israel Abrahams in *The Jewish Encyclopedia* describes "GAUNSE (Gauz, Ganse, Gans) JOACHIM (Jeochim, Jochim)" as a "German mining expert who . . . was born at Prague, and was therefore in all probability a connection of David Gans, who settled there in 1564; he certainly shared his scientific interests" (Isidor Singer, ed. [New York: Funk & Wagnalls, 1925], 5:576). Gans is also identified as "German" by the U.S. Government at its National Park Service Visitors Center at Fort Raleigh National Historic Site, Manteo, NC. Gans is so characterized in connection with a display of a copper nugget found on Roanoke Island and attributed to him. Herbert Hoover and his wife describe Gans as "an imported German" in footnote 1 of Book 8 of *Georgius Agricola De Re Metallica*. A word of explanation is in order for the variations

in the spelling of the surname of the German-Jewish metallurgist from Prague. There was, of course, no fixed spelling of last names in England in the sixteenth century. The name is spelled "Gannes" in the list of Virginia settlers. He himself spelled it "Gaunz" in a document he wrote around 1589; this was apparently his attempt to Anglicize his name. Quinn, professor emeritus at Liverpool University, uses the spelling "Ganz." I am using "Gans," because that is the way the name is spelled by the Prague family from which Joachim is probably descended.

¹³ Report by Governor Ralph Lane in *The principall navigations, voyages and discoveries of the English nation*, edited by Richard Hakluyt, the younger (London: G. Bishop and R. Newberie, 1589).

¹⁴ *Ibid.* Passages in Elizabethan English have been rendered in modern spelling throughout this article.

¹⁵ Quinn, *Set Fair for Roanoke*, 92.

¹⁶ Thomas Hariot, *A briefe and true report of the new found land of Virginia . . .* (Frankfurt am Main: Theodor de Bry, 1590), 10. This book, one of the first about the East Coast of North America, was published by Theodor (Dieterich) de Bry, a citizen of Frankfurt, and printed in English, German, French and Latin by Johann Wechel and sold in the Frankfurt bookstore of Sigismund Feyerabend. The complete title of the English edition of 1 April 1590 is *A briefe and true report of the new found land of Virginia, of the commodities and of the nature and manners of the naturall inhabitants. Discovered by the English Colony there seated by Sir Richard Greinuile Knight In the yeere 1585, Which remained vnder the gouernement of twelue monethes, At the speciall charge and direction of the Honourable SIR WALTER RALEIGH Knight lord warden of the stanneries who therein hath been faouered and authorised by her MAIESTIE and her letters patents: This fore booke Is made in English By Thomas Hariot seruant to the aboue named Sir WALTER, a member of the Colony, and there employed in discovering CVM GRATIA ET PRIVILEGIO CAES. MAT^{IS} SPECIA^L*. The title of the German edition of 3 April 1590 reads: *Wunderbarliche/doch Warhafftige Erklärung/Von der Gelegenheit vnd Sitten der Wilden in Virginia/welche newlich von den Engelländern so im Jar 1585 vom Herrn Reichard Greinuile/einem von der Ritterschafft/in gemeldte Landschafft die zu bewohnen geführt waren/ist erfunden worden/In verlegung H. Walter Raleigh/Ritter vnd Obersten deß Zinbergwerches auß vergünstigung der Durchleuchtigsten vnd Vnüberwindlichsten/Elisabeth/Königin in Engelland/etc. Erstlich in Engelländischer Sprach beschrieben durch Thomam Hariot/vnd newlich durch Christ. P. in Teutsch gebracht. Mit Römischer Keys. Maiest. Freyheit auff vier Jar nicht nachzudrucken.*

¹⁷ Jean Carl Harrington, *Search for the Cittie of Raleigh: Archeological Excavations at Fort Raleigh National Historic Site* (Washington, DC: National Park Service, U.S. Department of the Interior, 1962), 21-22.

¹⁸ Quinn, *Set Fair for Roanoke*, 405.

¹⁹ Noël Hume, "Roanoke Island: America's First Science Center," 20.

²⁰ *Ibid.*, 17.

²¹ Hariot, *A briefe and true report of the new found land of Virginia*, 10.

²² Noël Hume, "Roanoke Island: America's First Science Center," 14-28.

²³ Gary C. Grassl, "Joachim Gans of Prague: America's First Jewish Visitor," *Review of the Society for the History of Czechoslovak Jews* 1 (1986-87): 53-90. Quinn believes that Gans was clearly "a major figure and his choice to go to Roanoke indicated that minerals—gold, silver, copper, lead, iron—were significant objectives in the colony's activities" (personal communication from Quinn, 27 March 1993).

²⁴ Donald, *Elizabethan Copper: The History of the Company of Mines Royal, 1568-1605* (London: Pergamon Press, 1955), 76. Donald uses the term "the Company of Mines Royal," although the arms issued "Aug. 26, 1568. Anno 10, Eliz.," entitle it "the Society of the Mines Royal."

²⁵ Domestic State Papers, Elizabeth I, vol. 226, no. 40 (covering A.D. 1589). "To the Righte honorable our very good Lordships the Lordes of her majesties moste honorable pryvie Counsell. 17 September 1589 from the Maior and Aldermen of Bristowe [Bristol] with the examination of Jochim Gaunz." This document declares that the city fathers of Bristol had arrested Gans for denying the divinity of Christ before a Christian minister—a capital offense. This happened after Gans had returned from America. He defended himself by declaring that he did not believe any Christian doctrines, because he had not been raised as a Christian. He affirmed that he was a circumcised Jew born in the city of Prague and that he had never been baptized. Nevertheless, the Bristol officials decided to send him for trial to the highest court of the land, the Privy Council in London. It was around this time that Gans translated a treatise by the German mineral expert Lazarus Ercker into

English. It provided the English with a scientific guide to the production of saltpeter, an essential ingredient of gunpowder as well as an important flux for metallurgy. The manuscript, which is preserved in the Hatfield House near London, is dedicated to Secretary of State Sir Francis Walsingham, the head of the Privy Council. Gans concludes his translation as follows: "Knowing therefore your Honor to be a profitable [productive] member of the Commonweal has caused me to dedicate this book unto your Honor, and although it be small yet is it profitable for many. Hoping that your Honor will take this small travail in good part and favor it under your protection. Hoping thereby to be defended from all adversaries in this my good meaning, beseeching God to bless your Honor with happiness of long life to continue. Your Honor's most humble at commandment, Joachim Gaunz of Prague" [emphasis added]. Gans's manuscript bears no date, but since it is addressed to Walsingham, it must have been written before 6 April 1590, the date of his death. In it Gans asks nothing for himself—no monopoly, no special privileges. He offers his work to the English freely so that they can make saltpeter at good profit. All that he asks of the highest English official is protection "from all adversaries." What adversaries could Gans be facing? The manuscript on saltpeter must be seen as an inducement to Walsingham to defend him before the Council against the blasphemy charges. Gans apparently wanted to prove to Walsingham how useful he could be to the English alive and productive. And to make his point, he chose a key subject—saltpeter—so important to the English defense industry in the struggle against Spain. Did he write this book in prison while awaiting trial—perhaps in the Tower? If so, there would have been precedents. Nothing is known about the deposition of Gans's case. The records of the Privy Council covering this time period have been lost through fire, but we would certainly know from other sources had Gans been executed. Gans was probably forced to leave England. No tombstone bearing the name Joachim Gans has been found in the Old Jewish Cemetery of Prague, where David Gans is buried. Therefore, it is unlikely that he returned to the city of his birth.

²⁶ Jirina Šedinová, "Ergänzung zur Abhandlung über David Gans," *Judaica Bohemiae* 12, 1 (1976): 30.

²⁷ *The New Encyclopedia Britannica*, 1974 ed., *Micropaedia*, 5:766.

²⁸ Quinn, *The Roanoke Voyages, 1584-1590: Documents To Illustrate the English Voyages to North America Under the Patent Granted to Walter Raleigh in 1584* (New York: Dover Publications, 1991), 1:123, n. 3.

²⁹ Personal communication from Quinn (11 Sept. 1992).

³⁰ Quinn, *Set Fair for Roanoke*, 92.

³¹ Samuel Eliot Morison, *The European Discovery of America: The Northern Voyages AD 500-1600* (New York: Oxford University Press, 1971) 632. Morison states: "The names of the colonists...are preserved for us by Hakluyt. . . . There were a couple of German miners, and a Jewish mineral expert from Prague named Joachim Ganz, who appears on the list as Doughan Gannes." Noël Hume suggests that in addition to Germans, miners from Cornwall, England, also took part in the pioneer settlement: "With the expedition having Raleigh's input, and he being a West Country man, it seems likely that Cornish miners may have been recruited" (personal correspondence, 9 Oct. 1996).

³² *Elizabethan Keswick: Extracts from the Original Account Books 1564-1577, of the German Miners, in the Archives of Augsburg*, transcribed and translated by W. G. Collingwood (Highgate, London: Titus Wilson, Publisher, 1912), 33, 48 and 177 for the years 1567 to 1571. The Account Books of the Society of the Mines Royal are preserved in the Augsburg Stadtarchiv in the form of twelve large document files written in German and entitled "Die Keswicker Bergwerke betreffend." They may contain clues toward the identification of the miners on Roanoke Island.

³³ "Who's Who in the Roanoke Colonies?" Presentation by William S. Powell (University of North Carolina) at National Park Service Symposium "Roanoke Decoded," Elizabeth II Shrine Club, Manteo, Roanoke Island, NC, 14 May 1993.

³⁴ Friedrich Hassler, "Augsburger Kaufleute und Tiroler Bergarbeiter im 16. Jahrhundert in England," *Beiträge zur Geschichte der Technik und Industrie: Jahrbuch des Vereines Deutscher Ingenieure*, ed. Conrad Matschoss (Berlin: Verlag Verein Deutscher Ingenieure, 1927), 82.

³⁵ Notes by Daniel Höchstetter, Jr., dated October 1633 and entitled "English Bookes left in my Study." Entry in notebook kept by Daniel, Jr., now in the Duke of Northumberland's manuscript collection in Alnwick Castle, England (His Majesty's Manuscript Commission Sixth Report, No. Y II 7, p. 121 r). Reproduced in *Daniel Hechstetter, the Younger: Memorabilia and Letters*,

1600-1639, *Copper Works and Life in Cumbria*, ed. George Hammersley (Stuttgart: F. Steiner, 1988), 126.

