

2019

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Recommended Citation

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https://collected.jcu.edu/fac_bib_2019/58

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William Penn, William Petty, and Surveying

THE IRISH CONNECTION

Marcus Gallo

During the seventeenth century, English imperialists embraced the technology of geometric surveying that intellectuals had begun to popularize during the sixteenth century. This new style of surveying, with its emphasis on quantitative measurement, differed from medieval surveys that focused on enumerating tenants' traditional rights and assessing land with qualitative descriptions. While geometric surveys could help lords modernize their estate management, overseas conquests provided the fullest demonstration of how surveyors could empower both private speculators and the state. As the land market developed throughout the spreading English empire, surveyors embraced a new mathematical and geographical literacy.¹

Although he was only a child during the conquest of Ireland, William Penn numbered among the prominent men whose Irish experience convinced him of the usefulness of geometric surveys. During the 1650s, technocratic surveying experienced a turning point with the Down Survey in Ireland, which measured Irish lands and apportioned them into English hands. Successful surveying on that island convinced English elites to export surveying to North America, along with the conceptions of private property that surveying enabled. Penn's familiarity with the effects of surveying on his family's estates deeply influenced his plans for the settlement of Pennsylvania.²

English and Irish history had intertwined for centuries prior to Cromwell's decisive colonization in the seventeenth century. Normans first invaded Ireland in 1169, and "Old English" Norman lords soon controlled the Pale around Dublin with virtual autonomy. The Old English mixed with Gaelic elites and formed

a hybrid society that became almost totally isolated from England. In the early sixteenth century, the English returned to conquer Ireland once again. Faced with staunch resistance, English elites established lordship over Irish subjects through military campaigns and institutionalized terror, such as the atrocities in Munster in 1569, when Sir Humphrey Gilbert decapitated each day's Irish casualties and decorated his camp with the heads. This reconquest took a century, culminating in 1659 with the Down Survey and the attendant redistribution of Irish lands among English landlords. English efforts took place on a huge scale, with large invasion forces followed by hundreds of thousands of immigrating settlers in the mid-seventeenth century.³

The crown employed the lure of Irish lands to finance its military campaigns. Beginning in 1565, Elizabeth authorized entrepreneurial younger sons of the gentry to form joint-stock companies to pacify specific groups of Irish "rebels" and take their lands. Many of the English conquerors came from the West Country around Devon, and some, like Gilbert and Richard Grenville, later became influential in American colonization projects. In another example, Ralph Lane left Ireland after a short stint to oversee the colony at Roanoke in 1585 and 1586. After Roanoke failed, Lane returned to Ireland for more than a decade, overseeing combat forces and establishing a plantation. The earliest attempts at English colonization often ended in military disaster on both sides of the Atlantic, but this did not stop continued invasions, and Ireland became an early model for franchising empire across the sea.⁴

The English justified their invasions in two ways: by claiming ancient Norman titles to Irish lands and by asserting that the culturally inferior Irish needed English civilization. Norman titles provided a legal right, but the cultural argument satisfied those Englishmen more deeply troubled about the ethics of conquering the Irish. Although in theory the English had reigned over parts of Ireland for four centuries, the "New" English had practically no contact with the Irish prior to their invasions. The foreignness of Gaelic Irish culture allayed English qualms. Had the Irish simply been Catholic, this alone might have justified would-be cultural imperialists. Worse than encountering Catholics, the English discovered a nation of ignorant priests and ruined churches, where unfamiliar pagan practices tinged Christian rites. English theorists like Sir John Davies claimed that the English would civilize Ireland, just as the Romans had civilized ancient Britain and the Spaniards had brought civilization to the Americas.⁵

Among Irish incivilities, perhaps the most heinous was improper land use. While the invading English had begun enclosing their commons, many Irish clung to an antiquated form of pastoral agriculture, allowing their herds to meander between open meadows. This especially held true in the upland regions dominated by the Gaelic Irish, where a lack of arable land prevented intensive agriculture, and low population densities allowed high geographic mobility. Combined with the fact that families and clans, rather than individuals, held

property, the Irish tended not to invest in improvements to their buildings and lands to the extent that the English did.⁶

In the late sixteenth century, the English colonist Thomas Smith compared the Irish to roving herdsmen like Tartars or Arabs. Edmund Spenser felt that the nomadic Irish must have been the barbaric descendants of nomadic Scythians. As late as 1655, Richard Lawrence, an English planter living in Ireland, wrote that the Irish had created a "waste Wilderness" with their lands. During the 1590s another English philosopher of colonization, William Herbert, wrote that, "Colonies degenerate assuredly when the colonists imitate and embrace the habits, customs, and practices of the natives. . . . Once you have removed those things which can alienate hearts and minds, they will both become united, first in habits, then in mind." Breaking Irish control over Ireland entailed breaking Irish culture, and that meant disrupting Irish land-use practices. Otherwise, in Herbert's view, the conquerors themselves would degenerate into barbarians, just as the Old English had assimilated into barbarous Irishness.⁷

In 1641, a revolt in Ulster by Catholic landholders prompted the final military stage of Ireland's conquest. Taken by surprise and horrified by the flight of several thousand Protestant settlers, the English hung suspected rebels without trials, specifically targeting women and other civilians. English ferocity cowed the initial rebellion but also caused many of the formerly placid Catholic inhabitants to join the revolt, including many of the Old English.⁸

Although few Protestants died in the early days of the revolt, the death toll from the unrest eventually rose to ten thousand people, evenly split between both sides. Despite the relative bloodlessness of the initial uprising, the memory of Catholic Irish atrocities motivated English actions for the next decade. In 1650, Oliver Cromwell referred to the Irish actions in the "Massacre of 1641" as "unprovoked . . . the most unheard of and most barbarous massacre (without respect of sex and age) that ever the sun beheld." Irish rejection of the obvious material benefits of English rule particularly galled Cromwell. He pointed out that the Irish rebelled even though, "through the example of English industry, through commerce and traffic, that which was in the natives' hands was better to them than if all Ireland had been in their possession, and not an Englishman in it."⁹

Meanwhile, in 1642, tensions heightened between the Crown and Parliament, giving rise to the first English Civil War. In response to the ongoing troubles in Ireland, a distracted Parliament returned to earlier models of colonization by passing the Adventurer's Act, which would grant land to participating "adventurers" in return for their financial investment in the reconquest, at the rate of one shilling per acre. This amounted to a huge discount on Irish land, which typically sold for six to twelve times that amount. In 1643, adventurers could double the amount of land they received by giving an additional quarter of the money they had originally advanced. Nonetheless, by the end of the war, adventurers had only covered the costs of about a tenth of the subjugation effort.¹⁰

Following the Doubling Ordinance, the opposing forces conducted a truce. Charles I installed a royalist governor who transferred many of his soldiers from Ireland to England to fight the parliamentarian forces. Hostilities flared seriously in 1647, following the king's initial defeat. With Parliament now in control in Dublin, English commanders conducted pitiless attacks against the rebels, including the massacre of between three and five thousand fleeing soldiers and prisoners at Dungan's Hill in August 1647.¹¹

Due to the onset of the second English Civil War, parliamentary forces in Ireland became temporarily isolated, causing them to sue for a truce with the Irish in 1649. Despite the execution of the king in January 1649, the royalists remained well organized in Ireland, causing Oliver Cromwell to bring his twelve-thousand-man New Model Army across the Irish Sea that August. Fearing that Irish Catholic soldiers could be used to advance the royalist cause, Cromwell struck quickly, massacring three thousand Irish soldiers and inhabitants at the Siege of Drogheda in September 1649, and another two thousand at Wexford in October.¹²

The bloody displays at Drogheda and Wexford encouraged a variety of other Irish forces to surrender without a fight. By May 1650, when Cromwell left Ireland to turn his attention to Scotland, almost all the principal towns of Ulster, Leinster, and Munster lay in English hands. Over the next few years, fighting in Ireland entered a new phase as royalist and Irish armies lost control of their last urban strongholds. Ireland became the site of an extended counterinsurgency operation against guerrilla units led by Catholic aristocrats. The English divided the countryside into "protected" and "outlawed" zones: in outlawed regions, the army could kill people and cattle, destroy buildings, and set fire to crops without cause.¹³

Exacerbating an already dire situation, in 1649 Atlantic shipping brought the bubonic plague to Galway in the western, heavily Catholic region of Connacht. While English scorched-earth tactics helped produce famine, military movements and forced migrations helped spread this devastating epidemic around the island. Taken as a whole, disease and starvation combined with military and civilian casualties to kill perhaps as much as 25 percent of Ireland's population of almost two million. By the 1650s, following massacres, reprisals, total warfare, and mass death, the English felt little empathy for their Irish subjects. To bring security and English civilization to the island and to pay for the subjugation effort, the conquerors now looked to engage in an unprecedented bureaucratic effort to redistribute Irish property to Protestants. In total, more than thirty thousand soldiers and 1,500 adventurers would gain access to approximately eleven million acres of land.¹⁴

The effort to survey Ireland began long before the 1641 rebellion. In 1537, Henry VIII asked for descriptive surveys of royal lands around Dublin, with an eye toward increasing rents. By the 1540s, English officials pressed for a variety of surveys and military maps. Edward VI installed Ireland's first surveyor general

to oversee crown lands in 1548. Beginning in the 1560s, English cartographers leveraged increasingly accurate surveys to produce detailed maps of contested portions of Ireland. Immediately before the rebellion, between 1633 and 1636, the English conducted the Strafford Survey in Connacht in anticipation of further colonization. This survey took the form of an index of place names and land-owners, with descriptions of the soil, its inhabitants and buildings. At the time, Ireland had not been comprehensively surveyed, and the Strafford surveyors made no attempt to measure the land or assess the value of its acreage.¹⁵

By the mid-1650s, the English government had an annual deficit of £450,000 due to its operations in Ireland. Because the English intended to pay their soldiers and adventurers with Irish land, delay in distributing those lands created additional debts. Facing these budgetary constraints, parliament passed an act to conduct a comprehensive survey of the island's forfeited lands in 1653. As a result, Ireland's surveyor general, Benjamin Worsley, began to conduct what became known as the Gross Survey. Prospective English landholders paid one pound for every five hundred acres of land to be measured and mapped. The Gross Surveyors conducted their work quickly, estimating lands rather than carefully measuring and evaluating them. Soldiers objected to this shoddy work, which halted in the fall of 1654.¹⁶

As a result, in 1654 civil administrators began to conduct the Civil Survey in counties that had not already been examined by the earlier Strafford Survey. In contrast to the Strafford Survey, the Civil Survey noted landowners along with their acreage, distinguishing between profitable and unprofitable acres. The Civil Survey used interviews with Irish locals to develop a comprehensive account of the lands in most of the island, but it created no maps. This approach harkened back to medieval methods, failing to provide the English authorities with workable documents for the military control and redistribution of the land.¹⁷

In December 1654, Dr. William Petty took charge of a renewed surveying effort that became known as the Down Survey. Dismissing prior surveys as expensive and poorly organized, he pointed out that surveyors who had actually measured land with care received less money than those who worked quickly and inaccurately. As a consequence, surveyors had relied too much on estimation and local Irish accounts. Petty's more systematic Irish surveys became a catalyst for legitimizing land seizures and reallocations.¹⁸

To remedy the failures of the initial surveys, he broke the process of surveying into its constituent parts, farming out specialties to English soldiers in assembly-line fashion: fieldwork, protracting, calculating, converting measurements, drawing maps, describing surveys in writing, and oversight. Working together, the soldiers calculated acreage from scale measurements made on paper. Petty standardized field books and issued a standard set of tools and instructions for conducting surveys. His men made qualitative judgments, defining profitable lands as "meadow, arable, [or] pasture" and dividing pasture lands into a variety

of categories: “common pasture, healthy pasture, rocky pastures, mountaine pasture, or boggy pasture.” In all, he organized around a thousand soldiers to not only measure the land but also evaluate its quality and assign it a monetary value. These men endured imperfect working conditions, including unclear boundaries between lordships, tiny fields that necessitated careful individual surveys, inadequate descriptions of the lands to be surveyed, and fellow surveyors who pawned their instruments. Cutting across the boundaries of existing domains, the Down Survey created many new landholdings and erased old property rights in the process. As a result, the outright hostility of the native Irish necessitated that a constant military guard accompanied the surveyors. Despite this, in County Wicklow, eight of Petty’s surveyors died at the hands of Irish rebels. This violence foreshadowed the later struggles of North American surveyors who often found themselves in the cross fire between legal proprietors, squatters, and Indians.¹⁹

Because the crown intended to redistribute land for the benefit of the empire, the Down surveyors paid greater attention to some lands than others. The English did not reallocate lands controlled by Protestants, so those estates did not receive surveys. Similarly, surveyors lacked interest in surveying marginal lands; Petty received £7.3.4 for every thousand acres of profitable land, and only £3.0.0 for every thousand acres of unprofitable or undistributable land. This discrepancy in pay led the disgruntled to charge that surveyors had corruptly claimed marginal lands as profitable, causing soldiers to receive land bounties of lesser value.²⁰

Although the Down Survey intended to demystify the question of landholding in Ireland, drawing precise boundaries often had the opposite effect. Squabbles over the survey occupied much of Petty’s time, and the process of land settlement dragged on slowly, despite the speed with which Petty executed the survey. Because surveying remapped economic value onto real estate, many owners felt that the surveying process had improperly evaluated their land. In addition to recipients of “profitable” lands maintaining that they had in fact received marginal lands, those who had financed their own military campaigns, the “adventurers,” relied on earlier surveys that underestimated the size of Irish lands. They used these false estimates to claim that they should receive a proportionally larger section of land, now that Ireland proved bigger than previously imagined. Ireland’s surveyor general, Benjamin Worsley, accused Petty of using his influence to assist his friends. Although governmental commissions later exonerated Petty of wrongdoing, these legal entanglements prevented the swift and regular settlement that the English meant for surveying to effect. Whether in Ireland or later in North America, the process of land settlement became messy, especially when powerful interests contested the same plots of land. As legal documents, surveys became another tool that allowed contesting parties to prolong court cases about land disputes.²¹

Between 1654 and 1659, the Down Survey had assessed and mapped virtually the whole of Ireland—an unprecedented feat in European history. English elites

acquired huge amounts of Irish land, both because the Down Survey turned up more profitable land than expected and because many adventurers and common soldiers sold their shares in Irish land cheaply to officers. Nonetheless, agents for the adventurers and officers demanded more land for payment than the government could supply, resulting in the displacement of many “innocent” Catholic Irish lords (who had not resisted English invasion) farther and farther west. Most eventually settled in the counties of Connacht.²²

With the return of the English monarchy in 1660, shortly after the Down Survey concluded, thousands of adventurers and soldiers who had allied with the republican government found it difficult to apply to the crown to confirm their claims of Irish land. Nevertheless, the survey resulted in the transfer of most of the lands in Ireland into Protestant hands. Protestants held less than one-fifth of Irish land in 1600, but more than half of that land in 1641, and more than 85 percent in 1700. As these numbers indicate, the English never confiscated the entirety of Ireland. Instead, they intended for soldiers to take up land in contiguous townships and dominate neighboring Catholics. Ultimately, this plan did not come to fruition, as some Catholic lords returned to their home provinces after years of western exile. Regardless of who ruled the great estates, Catholic tenants remained the backbone of the economy and a heavy majority of the population.²³

Despite English misgivings about Irish barbarity, the island’s people had long engaged in market agriculture. In the centuries leading up to the Cromwellian conquest, Gaelic elites operated market towns, and the Old English oversaw the regular trade of raw materials from Irish farms to other western European countries. However, the transfer of Catholic land to the English accelerated the rise of export-based agriculture in Ireland. English lords desired pasturelands that would turn the island into a center for the production of leather goods. To create these pastures, and also to ensure lines of sight for defense, the English cleared the island of trees, financing a lumber industry that deforested much of Ireland in the forty years from 1590 to 1630. From 1530 to 1730, the acreage used for agriculture increased by almost 20 percent. The “Big House,” the landlord’s home, walled and hedged off from his tenants, became the central building from which planters and overseers directed their Irish tenants’ farming activity. In addition, the English promoted the use of planned, rectilinear market towns not just as hubs for plantation agriculture but also as centers of military and judicial activity. The turn toward market agriculture accelerated throughout Ireland after the Cromwellian settlement during the 1650s, even affecting the western province of Connacht, where the English had the least penetration.²⁴

William Penn’s family benefited directly from the Cromwellian settlement of Ireland. In 1654 his father, Admiral William Penn, received estates worth £300 in rent per year “in consideration of the great losses sustained by General Pen and his wife by the rebellion in Ireland.” The family took up land in Macroom

in County Cork and bought nearby lands in Kilcrea. In 1655, Admiral Penn commanded the naval invasion of the Spanish West Indies. The expedition failed, resulting in Cromwell imprisoning the admiral in the Tower of London. After his release later that year, he moved his family to Macroom. It was there that a young William Penn first encountered Quakers.²⁵

Following the Restoration and Charles II's ascent to the throne, Ireland's titles fell into disorder as the king sought to restore land to royalist favorites. These realignments affected the Penn family, despite the admiral's support for the royalists. His lands in Macroom and Kilcrea had originally belonged to the aristocratic MacCarthy dynasty of Muskerry. In 1658, Charles II had already granted the lord of Muskerry the title of the earl of Clancarty. After regaining the throne, he took the Penn family's lands to restore them to their original Irish owners. Between 1665 and 1667, the admiral sent his son William, then in his early twenties, to advocate on the family's behalf for compensation. As a result, the crown's Court of Claims awarded the Penns a series of estates near County Cork's coastline. By 1670, Admiral Penn held sixty-eight separate holdings in three baronies, approximately 12,000 acres in all.²⁶

During the trip to Ireland in the mid-1660s, William Penn became committed to Quakerism, which resulted in his own imprisonment in the Tower of London. Upon his release in 1669, his father dispatched him to Ireland again, to manage the family estates there until the admiral's health began to fail in 1670. While Penn spent most of his time in Ireland visiting with the members of high society and his fellow Quakers, his principal business on the island was to put his family's finances on a firm footing. This meant bargaining with the locals who would rent out the family estates and overseeing disputes about the particulars of the tracts of land. Penn recorded making six separate new surveys, and he checked his findings against the Civil Survey records and official maps. To aid his understanding, Penn commissioned maps for his estates. This process became complicated by the patchwork nature of official surveys: at Geiragh and Knocknacple, he held lands for which no surveys had been made, because Protestants had previously held them. His mapmaker assumed the official outline and acreage of those holdings by comparing them to records he had already made of neighboring lands. As a whole, the Penn family estate brought in approximately £1,100 in yearly revenue at this time, about one-tenth of which went to the crown as quitrents.²⁷

Penn's attitude toward his family's lands and their inhabitants was typically English. When visiting Captain Boles, one of his father's tenants in Shanagarry, Penn commented only that the land was "well Improv'd." On the way, he traveled by "a road well Improv'd & much English." When assessing the rent for other sets of lands, he debated the worth of a windmill or included the "Considerable Improvements" on the land in the price. However, Penn "showed very little interest in the oppressed native population" of Ireland during his visits, as the edi-

tors of *The Papers of William Penn* point out. As noted by Hiram Morgan, Penn's mentions of Irish locals were perfunctory and unkind: "They are rarely surnamed, let alone first-named and they are the subject of passing derogatory remarks about their barbarous, superstitious customs." For example, Penn dismissed a local burial as "Barberous like the heathen."²⁸

While in Ireland, Penn became friends with William Petty. Penn was a guest in Petty's home in 1667 and visited with him more than once during his later trip to Ireland. It is reasonable to assume that Penn examined Down Survey maps, and possibly other records related to his estates, while at Petty's home. In 1675, Petty appealed to Penn to ask for a reduction in the quitrents that he needed to pay for his extensive Irish lands. Pressed with his own difficulties in paying quitrents, Penn lobbied successfully on Petty's behalf. Penn felt warmth toward Petty: in his letter describing these lobbying activities, he wrote, "I will run, goe, or doe ten times more for thee at any time."²⁹

Penn's experience in Ireland helped cement his conception of how a state could properly direct landownership for the benefit of the landholding class. Surveys in Ireland had made land fungible: lands need not hold their traditional values and confusing medieval land tenures if they could instead be measured for acreage and evaluated for quality. New lords like the Penns could substitute holdings in Macroom with holdings elsewhere in Cork, without much material loss. In addition, surveys effectively eliminated the rights of traditional occupants while bolstering the rights of titleholders. All the while, surveys and maps made bewildering tangles of landholdings comprehensible and tangible for non-resident landowners and potential purchasers. If anything, Ireland's surveys were not comprehensive enough: Penn found it inconvenient that the hodgepodge of Irish surveys had failed to measure and map Protestant lands, which made it necessary for him to conduct resurveys.³⁰

Over time, in the reign of Charles II, and especially in the reign of James II (from 1685 to 1688), Protestant landholders in Ireland felt less secure. Charles II had many supporters among Catholics, and James II openly supported Catholics. The government's support for old Irish titleholders soon became apparent, causing Protestants' land values to drop. As early as 1671, Petty began to write about the possibility of transplanting Irish Catholics into England and more Protestants into Ireland. His argument was social and economic: socially, Catholics would be less of a threat as minorities in England (or would strengthen Catholic interests there, a spin he put on his position once James II took power). Economically, with the Irish mostly gone, Ireland's countryside could be put to the best possible use. In Petty's view, the island could be turned into a cattle ranch.³¹

As Ireland became increasingly problematic, America began to hold increasing allure as a region where scientific management could yield profits for English landholders and the empire as a whole. By 1680, William Penn already had

experience with Quaker settlements in West Jersey. He petitioned Charles II for a province, hoping that he could both create a zone of religious freedom and permanently improve his financial situation: over the course of the 1670s, he had already amassed approximately £10,000 of debt from lavish spending. Because of Penn's personal relations with members of the court, the crown likely granted the province as a personal favor and also as a cheap way to repay a debt to his father, Admiral Penn, who had spent £11,000 supplying the government with provisions in Ireland. By 1680, the interest on this debt amounted to £16,000.³²

Pennsylvania provided an opportunity for surveying to place new values on previously untapped lands on a grand scale, and both Penn and Petty found the prospect exciting. The two friends corresponded regularly, and Petty acquired one of the first maps of Pennsylvania made after Penn acquired his proprietorship of the colony. Petty was one of the first investors to buy a five-thousand-acre plot, but did not settle his land before his death in 1687. Penn also arranged for Petty's wife Elizabeth to receive twenty thousand acres in combination with one of her relatives, but they eventually backed out of the deal and Penn found other purchasers.³³

Although Petty never settled his land, he ruminated on various schemes for how a large landholder could make money in Pennsylvania. He speculated that five thousand acres of land would need two hundred families (one thousand people) to make it productive. If they cleared all of the land quickly over the winter, one thousand acres could be left for planting, and four thousand acres for cattle. Paying for the passage of the people, cattle, food, and materials needed would amount to a cost of £30,100. Petty estimated that the returns on the rent would amount to £5,300 per year, so that a developer could expect to break even after seven years. Later, in 1686, Petty wrote up a proposal for Penn to grant him a region of bottomland laying along 12 miles of riverfront, and stretching back into the countryside for 6.5 miles. In return for this tract of fifty thousand acres, Petty would pay a yearly rent of one one-hundredth of all of the crops and animals produced on the land. Nothing ever came of this proposal.³⁴

Petty also wrote up a series of questions about Pennsylvania's native inhabitants, trying to imagine how they might be put to profitable use in the English empire. He wanted to learn demographic information, including age distributions, rates of stillbirth, and the length of time it took mothers to wean. He also inquired about the Indians' physiques, facial features, language, religion, laws, economy, and capacity to wage war, among other subjects. His final sentences addressed questions truly critical to Penn's colony: "What is their manner and rate of selling Lands to the English?" and "Is there much Lying and Fraude amongst them?"³⁵

In addition to the questions about Native Americans, Petty wrote a document entitled "General Cautions Concerning Pennsylvania," which he likely intended for Penn's benefit. Some of Petty's advice was not particularly practical; for exam-

ple, he suggested that the general population should pay to raise all the children collectively, that a single sermon should be preached in all congregations, and that "matters of fact which cannot be decided, be left to Lott." On the other hand, Petty also wanted registries set up for all contracts, and exact accounts made of arrivals, births, and deaths. Men should not study the classics, but "arithmetic & measuring & drawing." Unemployment should be avoided in a colony with such a low population density, so criminals should be punished with whippings, not imprisonment. Similarly, debtors should forfeit their land and improvements, without facing prison time. He also believed that Pennsylvania should "admit the Native Women into freedom," presumably to add to the colony's population. Petty generously estimated the colony to contain nearly fifty million acres—by charging rent of one half-penny per year, Penn could eventually make the princely sum of £100,000 annually.³⁶

Perhaps most importantly, Petty cautioned his friend to "Avoyd Stragling plantations." In America's southern colonies, no townships were surveyed prior to settlement, so the first colonists in a region chose where to purchase their own lands. This practice, known as indiscriminate location, often resulted in irregularly shaped tracts of land, where individual farms might monopolize desirable bottomlands while leaving less desirable uplands unpurchased. If Penn followed the southern model and allowed his purchasers to have plantations that straggled into the backcountry, his revenue would suffer in the unwanted gaps between settlements. Following a clear township system would also allow him to plan for urban centers, which could increase the desirability of his lands and lead to more income. Because English theorists typically justified their presence as colonizers by their proper use and improvement of the natural landscape, Petty's opinions in this regard were both practical and ideological.³⁷

While Penn did not embrace all of the particulars of Petty's plans, he did see the obvious benefits of maintaining control over land distribution in his colony. From its founding, Pennsylvania continuously maintained the office of surveyor general, whose responsibilities included managing deputy surveyors and reviewing the legality of their returns of survey for the Land Office. This highly centralized surveying structure contrasted with the decentralized surveying regime in other American colonies founded before the Down Survey, such as Virginia. Surveys would help Penn market his territory to potential buyers, keep track of purchases, and later guarantee future income in the form of quitrents. Maintaining a centralized depository for surveys connected to land sales would obviate the problems that Penn encountered trying to piece together a picture of his landholdings in Ireland.³⁸

In a variety of ways, Penn based his initial vision for Pennsylvania on Irish precedents. In April 1681, he published *Some Account of the Province of Pennsylvania*, in which he described his plan to people his colony with buyers, renters, and servants. He intended to sell lands in five-thousand-acre blocks for £100,

with a permanent quitrent of 5 shillings per year (renters and servants would receive higher yearly burdens). One-tenth of the land would be reserved permanently for his family's use. To encourage settlement, he would allow occupants the rights to the underground mineral wealth. Penn imagined that adventurers would form companies in his new endeavor, and that they could divvy up lands among themselves. He wrote, "if the persons concerned please, a tract of land shall be surveyed, say *fifty thousand acres to a hundred adventurers*, in which some of the best shall be set out for towns or cities . . . the remainder of the fifty thousand acres shall be shared among the said *adventurers* . . . The manner of the dividend I shall not be strict in." This vision harkened back to the conquest of Ireland, where "adventurers" risked their money and sought their repayment in widely separated plots of land.³⁹

Even in his early descriptions of Philadelphia, Penn painted a vision of a town that resembled the rural countryside of Ireland more than an early modern city. Penn wanted a city of ten thousand acres, with hundred-acre lots for each five-thousand-acre share in his colony. Each lot would front the river for a distance of 825 feet. Penn wanted houses "in the middle of its plot as to the breadth of the way of it, that so there may be ground on each side for gardens or orchards or fields, that it may be a green country town, which will never be burnt and always be wholesome." The result of such a distribution would have dotted a sprawling, fifteen-square-mile tract with one hundred big houses on huge farm plots, creating a miniature version of Ireland's estates. Such a city truly could never catch on fire.⁴⁰

Penn soon had to adapt his early plans to realities on the ground and the whims of his customers: in July 1681 he noted, "I cannot make money without special concessions." Unable to find enough purchasers of 5,000-acre tracts, Penn reduced the preferred size of his plots to 500 acres and began selling tracts as small as 125 acres. For a purchaser of large amounts of acreage, like the merchant Ralph Fretwell who bought 40,000 acres, Penn could discount his prices. Early purchasers would receive bonus lots in Philadelphia, which took on a new, less ambitious character. Since the site for his new colony rested on top of the earlier colony of New Sweden, whose inhabitants still farmed there, the original plan for a green country town could not be sustained. By the spring of 1682, Penn's agents could only acquire 300 acres of riverfront land for Philadelphia, and the scale of the city needed to be massively reduced.⁴¹

Because Pennsylvania was not empty, Penn had to negotiate with both Native American and European inhabitants in order to sell and settle his lands. His interest in and attitude toward Pennsylvania's native inhabitants bore little resemblance to his earlier lack of concern about the Irish. By August 1683, Penn had spent enough time with local Lenapes to answer many of Petty's questions about Native Americans in detail. He punctuated a discussion of their language, attitudes, religion, and customs with personal anecdotes—albeit without the sta-

tistical precision that Petty may have preferred. Although we have no direct evidence, it is possible that Petty's interest in Indian culture may have helped spark Penn's fascination. It is also possible that once Penn decided that it would be moral and expedient to purchase land from the Indians, he realized that he would need to understand them better. No such need arose in Ireland. With regard to land sales, Penn endeavored to treat the local Indians honestly, but he also warned his agents in 1681 that they must be vigilant when making purchases, because the Indians would "sell one another's [land] if you be not careful."⁴²

From 1682 to 1684, Penn conferred regularly with the local Lenapes, paying £1,200 in goods for the lands surrounding the site of Philadelphia. The Lenapes balked at Penn's terms as they began to understand the massive scale of Penn's undertaking and the population density that would come with his new colony, but both sides avoided bloodshed. In 1686 in central Bucks County, the Lenapes threatened to kill surveyors making further measurements without payment in full from Penn. To defuse the situation, Pennsylvania officials wrote up a deed (but never paid for the land), leaving an opening for his descendants to conduct the infamous, fraudulent Walking Purchase of 1737. With regard to the European settlers, Penn's government initially incorporated the former Swedish settlers into the court system, but his agents also systematically pressured them to sell their lands. As time passed, their numbers paled in comparison to incoming settlers, and they lost what little political clout they had. By 1700, almost half had left the colony to settle in West Jersey. This exodus mirrored a similar development in the Indian community, where disease and outmigration left the population about a quarter of the size it had been when Penn began his negotiations.⁴³

Another complication precluded the easy settlement of Pennsylvania. Penn wanted access to the whole of the Delaware River in order to control Philadelphia's route to the ocean. The title to this territory was disputed: Maryland had claimed and already settled some of the lower Delaware. The king's brother James, Duke of York, who had control over the land east of the Delaware, granted Penn what is now the state of Delaware, but his authority to do so was dubious. Furthermore, Penn believed that his charter for Pennsylvania took precedent over Maryland's northern border, which had been fixed at 40 degrees north latitude. Officials from the two colonies could not agree on a survey line, and when James became king in 1685, he ruled in Penn's favor. Much as had been the case with the allegations of corruption against Petty in Ireland, surveys alone could not solve political problems without consensus.⁴⁴

The job of regulating and mapping Pennsylvania's early settlements fell primarily to the surveyor general. Penn initially appointed his cousin, William Crispin, to fill this role. When Crispin died en route to Pennsylvania, Penn turned to the fifty-eight-year-old Thomas Holme as his first acting surveyor general. Like Penn, Holme was an English Quaker with deep ties to Ireland. As a young man, Holme had served as a captain in Cromwell's army, then transitioned to serving as a

surveyor for the Civil and Down Surveys. Through payments for his national service and by speculating on the lands of other soldiers, he amassed an estate of more than four thousand acres in Wexford, Ireland. In the aftermath of Cromwell's military campaign, Holme joined the Society of Friends and soon became one of the most prominent organizers and writers on their behalf. His religious activities and proselytization caused him to be arrested numerous times and would have made him well known to Penn. They certainly would have met during the course of Penn's time in Ireland in 1669, when Thomas Loe converted Penn (and Penn spent extended time with William Petty). It is possible that they may have met as early as Penn's initial introduction to the Quaker religion during the mid-1650s, when Admiral Penn invited Loe along with other Quaker speakers to give a discourse on their religion in the Penns' home in Macroom. By 1677, Holme had moved to live in William Crispin's house in Waterford, Ireland, where he was operating as a merchant, shipping goods to America. Given his background, Holme became an obvious choice to replace Crispin. As a mark of Penn's faith in Holme's ability, he also made him an assistant to the deputy governor William Markham, another of Penn's cousins.⁴⁵

Upon arrival, Holme had to evaluate the countryside and navigate the problem of land warrants being issued to different purchasers on a single plot of land. Because of the small size of Philadelphia, purchasers would only receive less than an acre each inside the rectilinear city, with the remainder being given to them in the "liberty lands" outside Philadelphia. In time, Holme had established a series of townships that stretched into the countryside around the city. In Penn's view, townships should "lie square," with at least ten families living in five-thousand-acre blocks, keeping their homes in the middle of the township. While Penn was still in the colony, in August 1684, he counted at least fifty settled townships. Holme's 1687 map shows a series of more or less gridlike purchases that wend their way around the tributaries of the Delaware and the Schuylkill. The grid stopped abruptly in Bucks County, where the surveyors faced Indian opposition. As time went on, this scheme for orderly development slowly eroded. Pressure to expand into the backcountry caused this neat township system to languish, and Pennsylvania's interior increasingly resembled the "Stragling plantations" that Petty had warned against.⁴⁶

Unlike many of his predecessors in English colonization, Penn harbored no illusions that his new colony would provide vast wealth from untapped mineral reserves or exotic farm products. Instead, Pennsylvania would be a site where Quakers and other Protestants could practice their religions in peace, while Penn profited from the land: a better version of Ireland. He summed up this sentiment neatly in July 1681: "Though I desire to extend religious freedom, yet I want some recompense for my trouble." Unfortunately, the colony never proved to be the financial boon that he imagined, and his finances remained precarious through-

out his life, despite his collecting more than £9,000 from over 700,000 acres of land sales by 1685.⁴⁷

Although his reach exceeded his grasp, Ireland's land distribution practices served as a model for William Penn. Given his life story, this should not be particularly surprising: Irish experiences were foundational to his identity. His path to religious conversion took place in Ireland, and Ireland was also where he began to make serious decisions about managing large estates. Penn adopted typically English attitudes about land use in his time as a lord, along with typically English attitudes about the Irish. Over time, his attitudes about people evolved, but his attitudes about land changed very little.

In 1662, when writing his treatise on taxes, William Petty had waxed rhapsodic about the prospects of the English taking control over Ireland when the country was "as a white paper." After conquering the island, surveying it, mapping it, and redistributing its lands, Ireland could reasonably appear like a white paper on which the English could write the future. One can imagine how Petty's vision could captivate an idealistic and ambitious William Penn. We cannot know for sure if Penn first glimpsed maps of the Down Survey in Petty's Irish home, but we can see the Down Survey's influence on the orderly grids stretching away from the Delaware Valley that Thomas Holme depicted on his 1687 map of Pennsylvania. Much as the Down Survey had helped turn Ireland into a "white paper," centrally organized geometric surveys allowed Penn to erase the traces of his province's previous inhabitants and make "wilderness" lands legible to educated nonlocals. Armed with maps and round numbers of acres, he could market his lands to prospective buyers in Europe and maintain control over how the colony would spread into the interior.⁴⁸

NOTES

1. On medieval surveys and the development of geometric surveys, see E.G.R. Taylor, "The Surveyor," *Economic History Review*, 17, no. 2 (1947): 121–124; D. Chilton, "Land Measurement in the Sixteenth Century," *Excerpt Transactions of the Newcomen Society*, 31 (1957–58 and 1958–59): 112; Peter Barber, "Mapmaking in England, ca. 1470–1650," ed. David Woodward, *The History of Cartography: Cartography in the European Renaissance*, vol. 3, part 2 (Chicago, IL: University of Chicago Press, 2007), 1593–1594.

2. For an introduction to the impact of Irish colonization on Penn, see Nicholas Canny, "The Irish Background to Penn's Experiment," ed. Richard S. Dunn and Mary Maples Dunn, *The World of William Penn* (Philadelphia: University of Pennsylvania Press, 1986), 139–156. For the origins of the Down Survey and its effect on English rule in Ireland, see Patrick Carroll, *Science, Culture, and Modern State Formation* (Berkeley: University of California Press, 2006), especially 81–89, 100–106. On surveying in Pennsylvania, see J. Barry Love, *The Colonial Surveyor in Pennsylvania* (1970; repr., Harrisburg: Pennsylvania Society of Land Surveyors, 2000). For a discussion of how land surveying in Penn's colony compared to contemporary settler societies, see Marcus Gallo, "Land Surveying in Early Pennsylvania: A Case Study in a Global Context," *Journal of Early American History*, 6, no. 1 (May 2016): 9–39.

3. On English imperialism in Ireland, see J. C. Beckett, *The Anglo-Irish Tradition* (Ithaca, NY: Cornell University Press, 1976), 13–27; Nicholas P. Canny, “The Ideology of English Colonization: From Ireland to America,” *William and Mary Quarterly* 3rd Ser., 30, no. 4 (October 1973): 575–598; Nicholas Canny, *From Reformation to Restoration: Ireland, 1534–1660* (Dublin, Ireland: Criterion Press Limited, 1987), 220. For estimates of British settlers in Ireland, see Wayland F. Dunaway, *The Scotch-Irish of Colonial Pennsylvania* (1944; repr., Baltimore: Genealogical Publishing, 1985), 20–25 and William J. Smyth, *Map-making, Landscapes and Memory: A Geography of Colonial and Early Modern Ireland, c. 1530–1750* (Notre Dame, IN: University of Notre Dame Press, 2006), 430–431 and 455–456 (for standing armies). Tensions between the Irish and the Old and New English around the Pale blurred into the Elizabethan invasions of Ireland: see R. H. Buchanan, “Towns and Plantations, 1500–1700,” in William Nolan, ed., *The Shaping of Ireland: The Geographical Perspective* (Cork, Ireland: Mercier Press, 1986), 87, and Smyth, *Map-making, Landscapes and Memory* for differing periodizations for the beginning of the conflict.

4. Canny, “Ideology of English Colonization”: 576–578. Audrey Horning, *Ireland in the Virginian Sea: Colonialism in the British Atlantic* (Chapel Hill: Omohundro Institute of Early American History and Culture by the University of North Carolina Press, 2013), 60–91. Lane also deployed symbolic decapitation as a terror tactic, first in the New World, then in Ireland.

5. John Patrick Montaña, *The Roots of English Colonialism in Ireland* (Cambridge: Cambridge University Press, 2011), 1–21. Canny, “Ideology of English Colonization”: 576–595.

6. Montaña, *The Roots of English Colonialism in Ireland*, 13–18. The English overstated the importance of herding in the Irish economy as a whole. See Horning, *Ireland in the Virginian Sea*, 31–37. With regard to the reality of Irish land use, the majority of Ireland prior to English invasion contained small, divided plots of land, such as balliboes and ploughlands. See J. H. Andrews, “Geography and Government in Elizabethan Ireland,” in *Irish Geographical Studies in Honour of E. Estyn Evans*, ed. N. Stephens and R. E. Glasscock (Exeter, England: Department of Geography, Queen’s University of Belfast, 1970), 179.

7. Canny, “Ideology of English Colonization,” 587. On the importance of land usage for English colonists in Ireland, see Montaña, *The Roots of English Colonialism in Ireland*, especially 22–153. Lawrence quoted in Sarah Barber, “Settlement, Transplantation and Expulsion: a Comparative Study of the Placement of Peoples,” in *British Interventions in Early Modern Ireland*, ed. Ciaran Brady and Jane Ohlmeyer (New York: Cambridge University Press, 2005), 293; Herbert quoted in Hinderaker and Mancall, *At the Edge of Empire: The Backcountry in British North America* (Baltimore: The Johns Hopkins University Press, 2003), 3. Old English: Horning, *Ireland in the Virginian Sea*, 27–28. Early Anglo-Americans decoupled the two English justifications for Irish land ownership (legal claims and material improvements to the land). In many regions, this caused proprietors who made no improvements and squatters without titles to engage in prolonged struggles over legitimate landownership. For a brief introduction to the two types of land claims, see Alan Taylor, *Liberty Men and Great Proprietors: The Revolutionary Settlement on the Maine Frontier, 1760–1820* (Chapel Hill: Omohundro Institute of Early American History and Culture, University of North Carolina Press, 1990), 24–29.

8. Micheál Ó Siochrú, “Atrocity, Codes of Conduct and the Irish in the British Civil Wars, 1641–1653,” *Past & Present*, 195 (May 2007): 55–86 at 58–62.

9. Ó Siochrú, “Atrocity, Codes of Conduct,” 59–60. Cromwell quoted in S. C. Lomas, ed., *The Letters and Speeches of Oliver Cromwell*, 3 vols. (London: Methuen & Co., 1904), 2:4,8.

10. Danielle McCormack, *The Stuart Restoration and the English in Ireland* (Woodbridge, UK: Boydell and Brewer, 2016), 5–6.

11. Ó Siochrú, “Atrocity, Codes of Conduct,” 63–73.

12. Ó Siochrú, “Atrocity, Codes of Conduct,” 73–78.

13. On the Cromwellian conquest, see Smyth, *Map-making, Landscapes and Memory*, 153–165; for an alternative view, see Carroll, *Science, Culture*, 81–83.

14. Smyth, *Map-making, Landscapes and Memory*, 158–165, 178–181.

15. On sixteenth-century surveying and mapping, see Montaña, *The Roots of English Colonialism in Ireland*, 154–212. For Ireland’s surveyors general before 1641, see W. H. Hardinge and Ths. Ridgeway, “On Mapped Surveys of Ireland,” *Proceedings of the Royal Irish Academy* (1836–1869) 8 (1861–1864): 39–55. “Strafford’s Survey of Connaught,” *The Journal of the Royal Historical and Archaeological Association of Ireland*, 4th ser., 6, no. 55 (July 1883): 176–177. For a map that was likely based on the Strafford Survey, see Smyth, *Map-making, Landscapes and Memory*, 108.

16. W. H. Hardinge, “On Manuscript Mapped and other Townland Surveys in Ireland of a Public Character, embracing the Gross, Civil, and Down Surveys, from 1640 to 1688,” *The Transactions of the Royal Irish Academy* 24, Antiquities (1873): 3–118, at 6–13. The English had similarly rushed the 1584 survey of Munster: Montaña, *The Roots of English Colonialism in Ireland*, 202–204.

17. Hardinge, “On Manuscript Mapped and other Townland Surveys,” 13–20; J. G. Simms, “The Civil Survey, 1654–6,” *Irish Historical Studies*, 9, no. 35 (March 1955): 253–263. For an example of the returns of the survey, see Conleth Manning, “Transcripts from the Civil Survey of Counties Carlow and Kilkenny,” *Journal of the Royal Society of Antiquaries of Ireland* 132 (2002): 57–76.

18. Englishmen created approximately one hundred maps of Ireland during the sixteenth and early seventeenth centuries but produced nothing that approached the comprehensiveness of the Down Survey’s map. See J. H. Andrews, “Colonial Cartography in a European Setting: The Case of Tudor Ireland,” ed. David Woodward, *The History of Cartography: Cartography in the European Renaissance*, vol. 3, part 2 (Chicago, IL: University of Chicago Press, 2007), 1672–1675. For the Civil and Down Surveys at the local level, see William Nolan, *Fassadinin: Land, Settlement & Society in South-East Ireland, 1600–1850* (Dublin, Ireland: Geography Publications, 1979), 57–83, 248–250. The Down Survey took its name from the process of scaling down the surveys from large field notes onto small maps. Petty wholeheartedly believed that applied science benefited the state. He advocated a host of measures for the government to adopt but found little support for most of his projects. See Carroll, *Science, Culture, and Modern State Formation*, especially 47, 53–106. Petty later became the principal contemporary historian of the Down Survey, and he chronicled both the execution of the surveys and the infighting surrounding their results. On Petty’s criticisms of Worsley, see William Petty, *The History of the Survey of Ireland, Commonly Called the Down Survey* (1851; repr., New York: Augustus M. Kelley, 1967), 2. On Petty’s attempts to subject politics and economics to mathematical rigor, see Patricia Cline Cohen, *A Calculating People: The Spread of Numeracy in Early America* (New York: Routledge, 1999), 30–34.

19. Petty, *The Down Survey*, 17–18, 36–38, 46–50, 53, 123, 173–175, 322–324; quotation, 36. For dangers, see Smyth, *Map-making, Landscapes and Memory*, 54–55. Petty also received a 270,000-acre estate as payment for the Down Survey. See Carroll, *Science, Culture, and Modern State Formation*, 54. For an example of Lenape Indians who killed colonists with chains and tomahawks, the tools used to mark out land in Pennsylvania, see Jane T. Merritt, *At the Crossroads: Indians and Empires on a Mid-Atlantic Frontier, 1700–1763* (Chapel Hill: Omohundro Institute of Early American History and Culture, University of North Carolina Press, 2003), 183–184. On English surveys and maps erasing Irish land use patterns, see Montaña, *The Roots of English Colonialism in Ireland*, 163–169, 180–181, 196, 204–206, 210–212.

20. On Protestant land, see Smyth, *Map-making, Landscapes and Memory*, 170; for pay rates, see Petty, *The Down Survey*, 27.

21. See Petty, *The Down Survey*, for his acerbic take on his opponents. He alleges further corruption charges in Marquis of Lansdowne, ed., *The Petty Papers: Some Unpublished Writings of Sir William Petty*, 2 vols. (1927; repr., New York: Augustus M. Kelley Publishers, 1967), 1:49–55.

22. Smyth, *Map-making, Landscapes, and Memory* 167, 177–197; on speculative practices among officers and pushing the Irish to the west, see also Nicholas Canny, *From Reformation to Restoration*, 220–221. For western Indian dislocations around the Great Lakes, see Richard White, *The Middle Ground: Indians, Empires, and Republics in the Great Lakes Region, 1650–1815* (New York: Cambridge University Press, 1991), 1–10.

23. Smyth, *Map-making, Landscapes and Memory*, 190, 196, 248, 270–273, 377, 441. For post-Cromwellian land redistributions, see also Nolan, *Fassadinnin*, 57–58, 74–75.

24. Early Irish economy: Horning, *Ireland in the Virginian Sea*, 19–25, 33–35, 87. On deforestation and farming, see Smyth, *Map-making, Landscapes and Memory*, 91–101. On the “Big House,” see Smyth, *Map-making, Landscapes and Memory*, 12, 142–146, 382–383, and Plate 1j, fig. 2.15. On towns, see, R. H. Buchanan, “Towns and Plantations, 1500–1700,” in William Nolan, ed., *The Shaping of Ireland: The Geographical Perspective* (Cork, Ireland: Mercier Press, 1986), 93–98. On Connacht, see, Jean M. Graham, “Rural Society in Connacht, 1600–1640,” in N. Stephens and R. E. Glasscock, eds., *Irish Geographical Studies in Honour of E. Estyn Evans*, 206.

25. Howard M. Jenkins, “The Family of William Penn,” *Pennsylvania Magazine of History and Biography*, 20, no. 1 (1896), 1–29, at 25–26; quotation, 25. On the invasion of the Spanish West Indies, see Carla Gardina Pestana, “English Character and the Fiasco of the Western Design,” *Early American Studies* 3, no. 1 (Spring 2005): 1–31. Mary Maples Dunn and Richard S. Dunn, eds., *The Papers of William Penn*, 5 vols. (Philadelphia: Penn Press, 1981) 1:49.

26. On the Penn family’s lands in Ireland, see Jenkins, “The Family of William Penn,” 26–27; Howard M. Jenkins, “The Family of William Penn, Continued,” *Pennsylvania Magazine of History and Biography* 20, no. 2 (1896), 158–175, at 167; Dunn and Dunn, *Papers of William Penn*, 1:39, 44–45, 570–573. The results of the Down Survey have been digitized online. To search for Ireland’s landowners in 1641 and 1670 (including Admiral Penn), go to <http://downsurvey.tcd.ie/landowners.php> [accessed June 15, 2016]. In 1670, William Petty held 310 separate properties spread across southern and eastern Ireland.

27. Jenkins, “The Family of William Penn, Continued,” 168–171; Dunn and Dunn, *Papers of William Penn*, 1:101–167, 571; quotation on 102. For a dispute between tenants, see 111. Another version of Penn’s “Irish Journal,” is available online at the Corpus of Electronic Texts of Ireland: <http://www.ucc.ie/celt/published/E660001-002.html> [accessed June 16, 2016]. For maps, see note 59.

28. Dunn and Dunn, *Papers of William Penn*, 102, 110–111, 115, 124; quotations on 102, 110–111. For Morgan’s introduction, see <http://www.ucc.ie/celt/published/E660001-002.html> [accessed June 16, 2016].

29. Dunn and Dunn, *Papers of William Penn*, 1:47, 101–107, 333–334.

30. For Petty’s proposals for a comprehensive land registry in Ireland, see Lansdowne, *The Petty Papers*, 1:75–111.

31. Lansdowne, *The Petty Papers*, 1:45–72.

32. Jean R. Soderlund, ed., *William Penn and the Founding of Pennsylvania: A Documentary History* (Philadelphia: University of Pennsylvania Press, 1983), 3–5, 19–20, 23.

33. Lansdowne, *The Petty Papers*, 2:95–98. For Petty’s purchase in Pennsylvania, see Samuel Hazard ed., *Annals of Pennsylvania, from the Discovery of the Delaware, 1609–1682* (Philadelphia: Hazard and Mitchell, 1850), 643. The Thornton and Seller map is available online: <http://www.mapsofpa.com/17thcentury/1681morden.jpg> [accessed June 19, 2016].

34. Lansdowne, *The Petty Papers*, 2:110–111, 121. Petty’s math was off—his own numbers suggested that he would break even in less than six years. Petty’s estimate of twenty-five acres per family was reasonable, but on the small side for a sustainable family farm. See

Bettye Hobbs Pruitt, “Self-sufficiency and the Agricultural Economy,” *William and Mary Quarterly* 41, no. 3 (July 1984): 334–364.

35. Lansdowne, *The Petty Papers*, 2:115–119.

36. Lansdowne, *The Petty Papers*, 2:109–120, quotations on 114–115.

37. Lansdowne, *The Petty Papers*, 2:114. On the concept of indiscriminate location, see Edward T. Price, *Dividing the Land: Early American Beginnings of Our Private Property Mosaic* (Chicago, IL: University of Chicago Press, 1995), 13–14, 21, 89, 334–335. On the legal basis of Penn’s proprietorship and the theoretical underpinnings that justified English settlement, see Christopher Tomlins, *Freedom Bound: Law, Labor, and Civic Identity in Colonizing English America, 1580–1865* (New York: Cambridge University Press, 2010), 133–190.

38. J. Barry Love, *The Colonial Surveyor in Pennsylvania*, 108–110, 123. On Penn’s landholdings and his cultivation of Quaker merchants, see Gary B. Nash, “The Framing of Government in Pennsylvania: Ideas in Contact with Reality,” *William & Mary Quarterly*, 23, no. 2 (1966): 183–209. On Virginia’s decentralized surveying regime, see Sarah S. Hughes, *Surveyors and Statesmen: Land Measuring in Colonial Virginia* (Richmond: The Virginia Surveyors Foundation and the Virginia Association of Surveyors, 1979).

39. Soderlund, *William Penn and the Founding of Pennsylvania*, 58–66, 71–72; quotation on 63. Hannah Benner Roach, “The Planting of Philadelphia: A Seventeenth-Century Real Estate Development, I,” *Pennsylvania Magazine of History and Biography*, 92, no. 1 (January 1968), 3–47, at 10.

40. Roach, “The Planting of Philadelphia, I,” 10–11, 17–22. Quotation: Soderlund, *William Penn and the Founding of Pennsylvania*, 85.

41. Quotation: Roach, “The Planting of Philadelphia, I,” 9. Soderlund, *William Penn and the Founding of Pennsylvania*, 71–72, 82. On Fretwell, see Gary B. Nash, *Quakers and Politics: Pennsylvania, 1681–1726*, new ed. (Boston: Northeastern University Press, 1993), 90–94.

42. Soderlund, *William Penn and the Founding of Pennsylvania*, 84, 312–317. On the context for Indian purchases, see Daniel K. Richter, *Trade, Land, Power: The Struggle for Eastern North America* (Philadelphia: University of Pennsylvania Press, 2013), 135–154.

43. Jean R. Soderlund, *Lenape Country: Delaware Valley Society before William Penn* (Philadelphia: University of Pennsylvania Press, 2015), 149–176.

44. Antoinette Sutto, “The Borders of Absolutism: William Penn, Charles Calvert, and the Limits of Royal Authority, 1680–1685,” *Pennsylvania History: A Journal of Mid-Atlantic Studies* 76, no. 3 (Summer, 2009): 276–300; Nicholas B. Wainwright, “Tale of a Runaway Cape: The Penn-Baltimore Agreement of 1732,” *Pennsylvania Magazine of History and Biography* 87, no. 3 (July 1963), 251–293, especially 253–254. The border was not fully fixed until the Mason-Dixon line was run between 1763 and 1767.

45. Munger, *Pennsylvania Land Records: A History and Guide for Research* (Wilmington, DE: Scholarly Resources, Inc., 1991), 32; Irma Corcoran, *Thomas Holme, 1624–1695: Surveyor General of Pennsylvania* (Philadelphia, PA: Memoirs of the American Philosophical Society, 1992), 42–83.

46. Corcoran, *Thomas Holme, 1624–1695*, especially 98–100; Holme’s map is in the frontispiece. On Philadelphia, see Dunn and Dunn, *Papers of William Penn*, 2:334, 358–360. For Penn’s 1685 description of townships, see Albert Cook Myers, ed. *Narratives of Early Pennsylvania, West New Jersey, and Delaware: 1630–1707* (New York: Barnes & Noble, 1912), 263. On surveying halting in Bucks, see Soderlund, *Lenape Country*, 174. On Pennsylvania’s subsequent land development, see Gallo, “Land Surveying in Early Pennsylvania: A Case Study in a Global Context.”

47. Quotation: Roach, “The Planting of Philadelphia, I,” 9. For sales numbers, see Soderlund, *William Penn and the Founding of Pennsylvania*, 5.

48. Charles Henry Hull, ed. *The Economic Writings of Sir William Petty*, 2 vols. (Cambridge: Cambridge University Press, 1899), 1:9.