vourable balance of trade'. Misselden, then, was not concerned with regulating the exchanges. But he *did* want the state to force a favourable balance into being by subsidizing exports, restricting or prohibiting imports, and cracking down on the export of bullion. In short, he called for the usual set of mercantilist measures. Misselden was largely concerned to defend his Merchant Adventurers. Like Wheeler a generation earlier, he maintained that his company was not at all a monopolist, but simply the organization of orderly and structured competition. Besides, wrote Misselden, his Merchant Adventurers exported cloth to Europe and therefore fitted in with the interests of England. The truly evil firm was the privileged East India Company, which had a decidedly unfavourable balance of trade of its own with the Indies, and which continually exported bullion abroad.

Misselden now entered into a series of angry pamphlet debates with Malynes, who replied in the same year with *The Maintenance of Free Trade.* (Neither party, of course, had the slightest interest in what would now be called 'free trade'.) In 1623, Misselden accepted a post as deputy governor of the Merchant Adventurers in Holland, perhaps as a reward for his stirring defence of the company in the public prints. But, in addition, the East India Company, seeing in Misselden an effective champion and a troublesome foe, made him a member and one of their commissioners in Holland during the same year. As a result, when his second pamphlet, *The Circle of Commerce*, was published in 1623, Misselden displayed a miraculous change of heart. For the East India Company had been suddenly transformed from villain to hero. Misselden, quite sensibly, now pointed out that while the East India Company did export specie in exchange for products from the Indies, it can and does *re*-export these goods in exchange for specie.

The outstanding defender of the East India Company in the early seventeenth century was one of its prominent directors, Sir Thomas Mun (1571–1641). Mun was early engaged as a merchant in the Mediterranean trade, especially with Italy and the Middle East. In 1615, Mun was elected a director of the East India Company, and after that he 'spent his life in actively promoting its interests'. He entered the lists on behalf of the company in 1621, with his tract, *A Discourse of Trade from England unto the East-Indies.* The following year he and Misselden were both members of the Privy Council committee of inquiry. Mun's second and major work, *England's Treasure by Forraign Trade, or the Balance of Forraign Trade is the Rule of our Treasure*, taking a broader view of the economy, was written about 1630 and published posthumously by Mun's son John in 1664. When published, it carried the stamp of approval of Henry Bennett, secretary of state in the Restoration government, and also an architect of England's mercantilist policy against the Dutch. The pamphlet was highly influential and was reprinted in several editions, the last being published in 1986.

Thomas Mun set forth what would become the standard mercantilist line. He pointed out that there was nothing particularly evil about the East India Company trade. The company imported valuable drugs, spices, dyes and cloth from the Indies, and it re-exported most of these products to other countries. Overall, in fact, the company has actually imported more specie than it has exported. In any case, the focus of English policy should not be on the specific trade of one company or with one country, but on the overall or general balance of trade. There it must make sure that the country exports more than it purchases from abroad, thereby also increasing the wealth of the nation. As Mun succinctly put it at the beginning of *England's Treasure*: 'The ordinary means to increase our wealth and treasure is by foreign trade, wherein we must ever observe this rule: to sell more to strangers yearly than we consume of theirs in value'. To that end, Mun advocated sumptuary laws banning consumption of imported goods, protective tariffs, and subsidies and directives to consume domestic manufactures. Mun, on the other hand, opposed any direct restrictions on the export of bullion, such as conducted by the East India Company.

Mun was wise enough in combating the fallacies of Malynes and Misselden. Against Malynes, he pointed out that the movements of the exchange rate reflect, not the manipulations of bankers and dealers, but the supply and demand of currencies: 'That which causes an under or overvaluing of monies by exchange is the plenty or scarcity thereof'. Misselden had advocated debasement of the currency as a means of increasing the price level. Such increase, Misselden had argued in pre-Keynesian fashion, 'will be abundantly recompensed unto all in the plenty of money, and quickening of trade, in every man's hand'. As a leader of the Merchant Adventurers, Misselden was undoubtedly highly interested in the spur that debasement would give to exports. But Mun denounced debasement, first, as bringing confusion by changing the measure of value, and second by increasing prices all around: 'If the common measure be changed, our lands, leases, wares both foreign and domestic, must alter in proportion'.

Neither did Mun bend his energies towards an export surplus because he was enamoured of the idea of accumulating specie in England. Adhering to the quantity theory of money, Mun realized that such accumulation would simply drive prices up, which would not only be to no avail but would discourage exports. Mun wanted to accumulate specie not for its own sake, nor to drive up prices at home, but to 'drive trade', to increase foreign trade still further. An expansion of foreign trade *per se* seems to be Thomas Mun's main objective. And this overriding goal is not very puzzling from a leader of the great East India Company.

Furthermore, foreign trade, for Thomas Mun fully as much as for Montaigne, increased the national power – as well as the power of English traders – at the

expense of other nations. England and her inhabitants only wax great at the expense of foreigners. As Mun put it succinctly, in trade 'one man's necessity becomes another man's opportunity', and 'one man's loss is another man's gain'. In an odd prefigurement of the Keynesian view that national debt held at home is immaterial because 'we only owe it to ourselves', Mun and his fellow mercantilists considered internal trade unimportant because there we only transfer wealth among ourselves. The export balance in foreign trade then becomes of crucial importance, so that the export merchant becomes by far the most productive occupation in the economy.

That Mun was far from being a primitive inflationist is seen by the scorn he properly and contemptuously heaped upon the common plea – and favourite mercantilist complaint – that business and the economy were suffering from a 'scarcity of money'. (The conclusion invariably drawn from such analysis is that the government was duty-bound to do something quickly to augment the money stock.) Mun wittily riposted in his *Discourse of Trade*:

> concerning the evil or want of silver, I think it hath been, and is a general disease of all nations, and so will continue until the end of the world; for poor and rich complain they never have enough; but it seems that the malady is grown mortal here with us, and therefore it cries out for remedy. Well, I hope it is but imagination maketh us sick, when all our parts be sound and strong...

Thomas Mun may have been the most prominent and sophisticated of the early seventeenth century mercantilists in England. Yet, as Schumpeter points out, these were all pamphleteers not particularly interested in analysis of the economy, special pleaders rather than aspiring scientists.[7]

Perhaps the best economic analyst of all in this period was Rice Vaughn, whose *A Discourse of Coin and Coinage*, though published in 1675, was written in the mid-1620s. Vaughn, in the first place, held that the disappearance of silver during this period was the effect of what we now call 'Gresham's law': the bimetallic undervaluation by the English government of silver as against gold. Since silver, rather than gold, was the money for most transactions, this undervaluation had a certain deflationary effect. In the course of his tract, Vaughn pointed out that an export surplus will not have the desired effect of bringing precious metals into the kingdom, if the value of the gold or silver pound in England is low in terms of purchasing power; for then goods will be imported instead of the monetary metals, and the export surplus will disappear.[8] Vaughn was also astute enough to recognize that prices do not all move together when the value of money changes: for example, that domestic prices usually lag behind the debasement or devaluation of money standards.

Most importantly, Rice Vaughn, remarkably, harked back to the scholastic continental subjective utility and scarcity tradition in the determination of the

values and prices of goods. Vaughn concisely pointed out that the value of a good is dependent on its subjective utility and hence demand by consumers ('Use and delight, or the opinion of them, are the true causes why all things have a Value and Price set upon them'), while the actual price is determined by the interaction of this subjective utility with the relative scarcity of the good ('the proportion of that value and price is wholly governed by rarity and abundance').[9]

10.6 Prophet of 'empiricism': Sir Francis Bacon

The status and reputation of Sir Francis Bacon (1561–1626) is one of the great puzzles in the history of social thought. On the one hand, Bacon was universally hailed as the greatest man of his age. Over a century later, in the great manifesto of the French Enlightenment, the *Encyclopédie*, Bacon was hailed extravagantly as 'the greatest, the most universal, and the most eloquent of philosophers'. Yet what had he actually accomplished to warrant all the accolades?

This prolific statesman and writer, with great fanfare and self-advertisement, in a series of books from the 1600s to the 1620s, set forth a series of injunctions about *the* proper method of scientific inquiry into the world, including social as well as natural sciences. Essentially, Bacon wrote numerous exhortations to everyone else to engage in detailed factual investigation into all life, all the world, all human history. Francis Bacon was the prophet of primitive and naive empiricism, the guru of fact-grubbing. Look at 'the facts', all 'the facts', long enough, he opined, and knowledge, including theoretical knowledge, will rise phoenix-like, self-supporting and self-sustained, out of the mountainous heap of data.

Although he talked impressively about surveying in detail all the facts of human knowledge, Bacon himself never came close to fulfilling this monstrous task. Essentially, he was the meta-empiricist, the head coach and cheerleader of fact-grubbing, exhorting *other* people to gather all the facts and castigating any alternative method of knowledge. He claimed to have invented a new logic, the only correct form of material knowledge – 'induction' – by which enormous masses of details could somehow form themselves into general truths.

This sort of 'accomplishment' is dubious at best. Not only was it a prolegomenon to knowledge rather than knowledge itself; it was completely wrong about how science has ever done its work. No scientific truths are ever discovered by inchoate fact-digging. The scientist must first have framed hypotheses; in short, the scientist, before gathering and collating facts, must have a pretty good idea of what to look for, and why. Once in a while, social scientists get misled by Baconian notions into *thinking* that their knowledge is 'purely factual', without presuppositions and therefore 'scientific', when

what this really means is that their presuppositions and assumptions remain hidden from view.

The mystery, then, is why Sir Francis Bacon's dubious achievement garnered so much praise. One reason is that he succeeded in capturing the *Zeitgeist*: he was the right man for his notions at the right time. For Bacon came after two centuries of sniping at scholasticism, which was now ripe for an open and all-out assault. Echoing many other thinkers of past generations but putting it squarely and bluntly, Bacon divided all knowledge into two parts, divine and natural. Man's knowledge of supernatural and spiritual matters came from divine revelation, and that was that. On the other hand, knowledge of material affairs, man and the world around him, was wholly empirical, inductive, arrived at through the senses. In neither case was there any room for human reason, that great conduit of knowledge lauded by classical philosophy from the Greeks to the scholastics. Knowledge of spiritual and divine matters was purely fideistic, the product of faith in divine revelation. Earthly knowledge was purely sensate and empirical; there was no room for reason there either.

In ethical and political philosophy, then, Bacon found no room for the classical doctrine that human reason supplies knowledge of ethics through investigation of natural law. Instead, ethical knowledge is purely relative, the tentative accumulation of mounds of unsifted historical data. And if there is no rational knowledge of ethics or natural law, then there are no natural rights limits to be placed on the power and actions of the state. Curiously enough, Bacon had the best of both worlds by proclaiming that endless arrays of facts were not just the only conduit to knowledge, but that they would enable man to arrive at an ethics that would improve his life. The ultimate purpose of engaging in all the fact-grubbing was utilitarian. Yet how he expected valid ethical laws to emerge out of all this busy empiricism was left unexplained.

Recent research, however, has cleared up some of the lacunae in Bacon's methodological position. For it turns out that much of Bacon's vaunted 'empiricism' was not just ordinary science, but the allegedly empirical mystical mumbo-jumbo that various renaissance thinkers had cobbled out of the 'Ancient Wisdom'. Renaissance mysticism was a pseudo-science that combined the occult and magic traditions of the hermetic literature, with that of a Christianized version of the Jewish Cabala. A year after Bacon died, his proposed despotic utopia, the *New Atlantis* (1627) was published. In the renaissance mystic tradition, Bacon proposed a utopia ruled by enlightened despots, in which all men are happy and content. Happiness was achieved because Adam's sin was not, as in the standard Christian tradition, trying to know too much and to become in some sense divine. On the contrary, the mystical hermetic view held that Adam's sin was turning his back on the Ancient Wisdom that could have been revealed to him. In contrast, man will now be made happy because

wise rulers, possessed of this divine knowledge, will guide man to perfection and happiness by fulfilling his true God-like nature. In Bacon's utopian novel, the symbols he used heavily – such as the 'rose' or 'rosy' cross – reveal Bacon's closeness to the newly founded and mysterious Rosicrucian Order, which added to the rest of the Ancient Wisdom the pseudo-science of alchemy, in which man becomes as God in helping to create the universe.[10]

The arrogant Baconian claim to be the prophet of the only true scientific method takes on a high irony when we realize that Francis Bacon's vision of science was close to that of the magic-oriented occultists of the Rosicrucian Order. And since renaissance occult 'knowledge' was definitely part of the new spirit of the age, and later even of the allegedly 'rational' Enlightenment as well, Francis Bacon may be considered far closer to the *Zeitgeist* of his day than current Baconians would care to acknowledge.

Francis Bacon was also in tune with the *Zeitgeist* in another way. The simple-minded proclamation of the absolute power and glory of the English king was no longer as tenable as it had appeared to the Anglican theorists of the sixteenth or even to Bacon's absolutist contemporaries of the early seventeenth century. The naive argument by 'correspondence' – the analogies to the lordship of God, the head on a single man's body, and to the king as head of the great body politic – was no longer being accepted as self-evident truth. The new discoveries, and the expansion of the economy and of the nations of Europe into new worlds, made the older view that any change wrought by human beings merely corrupted God's static order of nature increasingly untenable. The idea that every man and group was born into a divinely ordained fixed order and station in life was rebutted by the increasing mobility and social and economic progress of the western world. And so the old admixture of the material and the divine into one heady brew of unquestioned absolutism could no longer command respect. A new fallback position for the state and the monarch was necessary, one more in tune with the new fashion of 'science' and scientific advance.

And so the 'scientific realism' of Sir Francis Bacon was perfectly suited to the new task. The idea that the king was quasi-divine or received an absolute divine imprimatur would no longer do. Sir Francis Bacon in the service of the state was far more the 'realistic political scientist' heralded by Machiavelli. Indeed, Bacon consciously modelled himself on Machiavelli's teachings. Like the neo-pagan Machiavelli, Bacon called upon his prince to do great deeds, to achieve glory. He particularly called upon the king to achieve empire, to expand and to conquer territories overseas. Domestically, Bacon was what might be called a moderate absolutist. The king's prerogative was still dominant, but this should be within the ancient historical constitution, and should follow the law, and there should be at least discussions and debates in the courts and in Parliament about royal decrees.

Bacon went beyond most other apologists of empire by declaring it a high moral duty of the king to expand, as well as preserve, the 'bonds of empire'. The duty to conquer went even beyond Machiavelli, who worried about undue speed in achieving conquest. To stand ready to serve the high duty of expanding empire, the British nation had to be trained in the study of arms and particularly in naval prowess, and had to display the virtue of fortitude, to be 'stout and warlike'.

This brings us to the last and not the least of the reasons for Bacon's enormous influence beyond the merits of his achievements. For Sir Francis Bacon, Baron Verulam, Viscount St Albans, was one of the leading politicians and members of the power élite in Great Britain. He was, first, the youngest son of Sir Nicholas Bacon (1509–79), a close friend and brother-in-law of Sir William Cecil, Lord Burghley, a leading aide to Queen Elizabeth. As a result, Nicholas Bacon became Privy Councillor, Lord Chancellor, and the Lord Keeper of the Great Seal.

Francis Bacon was, therefore, born with a silver spoon. As a young attorney, Bacon became an MP and, in 1591, a confidential adviser to the earl of Essex, favourite of the queen. As Essex began to lose favour with the queen, the ever alert Bacon sensed the shift in the wind and turned against his old patron, taking the lead in the condemnation that led to Essex's execution. To explain this sordid affair, Bacon was assigned by the queen to write what became the official public denunciation of Essex. Later, to quiet a festering canker of criticism, Bacon was moved to write an *Apology* for his own treacherous role in the Essex affair.

Despite Bacon's apologia, the queen, for obvious reasons, continued not to trust him very much, and political preferment eluded the highly placed courtier. Under the new king James I, however, Bacon came into his own, his career propelled by his cousin Thomas Cecil, the second Lord Burghley. In 1608, Bacon became the king's solicitor, and then attorney-general. Finally, in 1617, he followed in his father's footsteps as Lord Keeper of the Great Seal, and the following year became Lord Chancellor.

After three years in the nation's highest political post, however, Sir Francis Bacon was laid low. Charges of systematic bribery and corruption against him were proved and he then confessed his guilt, retiring to private life and to pursuing his publishing career. Characteristically, while Bacon admitted to taking bribes, he claimed that they never affected his judgement, and that his 'intentions' had remained forever 'pure'. Judging him by his own empirical method, however, one may be permitted to be sceptical of such 'metaphysical' claims.

In the narrowly economic sphere, Bacon's output was sparse and his opinions unremarkable, except for their scarcely being in the forefront of modern or scientific advance. On the balance of trade, he took the standard broadly

mercantilist line. Thus, in his 'Advice to Sir George Villiers', written in 1616 but only first published in 1661, Bacon hailed the export 'trade of merchandise which the English drive in foreign parts'. The crucial point of the trade is 'that the exportation exceed in value the importation; for then the balance of trade must of necessity by returned in coin or bullion'. On the ancient question of usury, Bacon took a surprisingly reactionary and moralistic stand, calling for its prohibition on moral and religious grounds. More interestingly, he also declared that allowing high interest rates restricted beneficial agricultural improvements on behalf of riskier (and presumably less worthy) projects – an indication that some of the clamour to repress usury came from blue-chip investors who balked at the competition of more speculative borrowers willing to pay higher interest. In a similar vein, Bacon also attacked the charging of interest because it drew men from their appointed callings and brought them income they did not really 'earn'.

10.7 The Baconians: Sir William Petty and 'political arithmetic'

Since Bacon's thought fitted well into the spirit of the age, it is not surprising that he developed enthusiastic followers. One little recognized follower was Thomas Hobbes, the philosophic apologist for monarchical absolutism who, on the eve of the Civil War, was searching for a 'modern' defence of monarchical despotism which relied neither on the outworn correspondence theory of order, nor on the Grotian variant of natural law as did his friends in the Tew circle. Grotius's conservative version of consent theory held that the right of sovereignty had indeed originated with the people, but that the people, at some murkily distant point in the past, had surrendered their sovereignty irrevocably to the king. This defence of royal absolutism had been continued in England by the Tew circle, Hobbes's only disagreement being that each individual, in the last analysis, had the 'right of self-preservation' and therefore had the right to disobey any orders from the king that were tantamount to the particular individual's murder.[11] But more importantly, Hobbes's political theory forswore scholastic natural law methodology for a 'modern' mechanistic, scientistic methodology far more in keeping with Francis Bacon. This shift is not surprising, considering that Hobbes served his philosophic apprenticeship as secretary to Bacon himself. Later on, in addition to a life in service to the royalist Cavendish family, Hobbes served as a mathematical tutor to the future King Charles II.

The leading Baconian in political economy, who was also fittingly a pioneer in statistics and in the alleged science of 'political arithmetic', was the fascinating opportunist and adventurer Sir William Petty (1623–87). Petty was the son of a poor rural cloth-worker from the county of Hampshire. He learnt Latin at a country school, and was put to sea as a cabin-boy at 13. When his leg was broken at sea, he was put ashore in France by the captain.

Petty got himself admitted to the Jesuit university at Caen by applying for admission in Latin. There he received an excellent education in languages and mathematics, supporting himself by tutoring and trading in custom jewellery. Soon, Petty was off to Holland to study medicine; there he became friendly with Dr John Pell, professor of mathematics at Amsterdam. Travelling to Paris to study anatomy, Petty was armed with an introduction by Pell to Thomas Hobbes. Soon, Petty became Hobbes's secretary and research assistant, and from Hobbes imbibed Baconian and Hobbesian empiricism, mechanism and absolutism. Through Hobbes, Petty also joined advanced circles, including new scientists plus the philosophic friends of science. We must remember that science did not enjoy the professional specialization of the twentieth century, and new scientific discoveries were often made in an atmosphere of scientists surrounded by dilettantish philosophical cheerleaders. Through Hobbes, Petty participated in the Parisian circle of Father Marin Mersenne, which included scientists such as Fermat and Gassendi as well as philosopher–mathematicians Pascal and Descartes.

After a year in Paris, Petty returned to England in 1646 to continue his medical studies at Oxford. Armed again with an introduction opening crucial doors from Professor Pell, Petty was embraced by the man who has been called 'the master of ceremonies to the new learning', the enthusiastic Baconian, half-English Prussian immigrant from Poland and exile from Catholic rule, Samuel Hartlib (1599–1670). Pell was Hartlib's earliest disciple, and his first job had been schoolmaster at a school run by the wealthy and well-connected Hartlib, whose father had been 'merchant-royal' to the king of Poland. With Hartlib's backing, Petty's career at Oxford now zoomed upward with incredible speed. Petty was welcomed into a circle of mathematicians, scientists and physicians who had gathered at Oxford to escape the Civil War and engage in multi-partisan, trans-religious Baconian science. This group, which called itself the 'invisible college', not only received Petty warmly but they even met periodically at his lodgings which, being at an apothecary's house, was convenient to scientific and alchemical experimentation in drugs. Hardly did Petty become a fellow of Brasenose College in Oxford than he was made vice-principal, and hardly did he become a physician when he was made professor of anatomy. Finally, Hartlib got his friend and protegé Petty made professor of music in 1651 at the Gresham College in London, a new college dedicated to the experimental and mechanical arts. Petty apparently taught the applied mathematics of music. At only 28, William Petty had been vaulted to the top of the academic profession. The rapidity of Petty's climb was undoubtedly aided by the fact that the new republican regime tossed out previously openly royalist incumbents, and the 'invisible college' Baconians were able to sail under the colours of value-free, Baconian science.

Hartlib also wrote voluminously inductive histories of trade, especially agriculture, helping to further the Baconian programme. Hartlib himself was a friend and disciple of his fellow-Baconian, the mystical millennialist Czech theologian and educationist Johann Amos Comenius (1592–1670). Comenius, a bishop in the pietist Hussite Moravian church and an exile from Catholic rule, was employed by the Swedish government to organize its school system. He went beyond Bacon to invent a new hermetic religious system, pansophism, which promised to combine all the sciences in a mystical road to all knowledge. Hartlib subscribed to these gnostic tenets, and he also followed Bacon in outlining his own new utopia, which he called *Macaria* (1641).

Hartlib and Comenius were the favourite philosophers and theoreticians of the puritan country gentry, the party of the Pyms and the Cromwells. Indeed, in the summer of 1641, when the country Puritans thought that they had successfully achieved lasting rule under the king, Parliament eagerly brought Comenius to England, and it was during the Autumn that Hartlib published his *Macaria*, a welfare state utopia he expected to institute in England. Arrived in England, Comenius drew up his own plans for a pansophical 'reform', or transformation of the English educational system, led by a 'pansophical college'. Comenius proclaimed 'that the last age of the world is drawing near, in which Christ and his Church shall triumph,... an age of Enlightenment, in which the earth shall be filled with the knowledge of God, as the waters cover the sea.'[12]

The renewed outbreak of the Civil War put an end to plans for quiet social and educational reconstruction, and so Comenius returned to the continent of Europe the following year, 1642. But Hartlib and the others remained, and continued under munificent puritan patronage; during Cromwell's Protectorate, these Baconians flourished, and Pell and other Hartlib disciples were used by Cromwell as envoys to various Protestant countries in Europe.

One of Hartlib's favourite continuing projects was to try to found new colleges and institutions to promote the new science. One prospective donee was the wealthy, aristocratic, and much younger friend, the distinguished physicist Robert Boyle (1627–91). At one point, Hartlib tried to get Boyle to finance William Petty in compiling a 'history of [all] trades'; at another point Petty, in his first published work at the age of 25, urged Hartlib to finance a new college to advance 'real learning', which would be a '*gymnasium medicum* or a college of tradesmen'. This college, wrote Petty, would provide 'the best and most effectual opportunities and means for writing a history of trades in perfection and exactness...'[13] Neither of these particular projects was to pan out.

No sooner had William Petty reached the apex of academia in 1651, however, and before giving his first lecture, than he left the university world

for good. He was out to make a fortune, and he saw his opportunity in the midst of Cromwell's devastating conquest and decimation of Ireland. A fellow Oxford 'invisible', Jonathan Goddard, had gone off to become physician-in-chief of Cromwell's army in Ireland, and had returned two years later to the prestigious post of warden of Merton College; taking a two-year leave from Oxford, Petty went to Ireland as Goddard's replacement. When Petty got to Ireland, he found a golden opportunity to make his fortune. Cromwell had despoiled Irish lands, and decided to pay his soldiers and the financial supporters of his military campaign by handing out conquered and confiscated Irish land. But to parcel out the land, it first had to be surveyed, and this task was being conducted by a surveyor-general, a friend of Petty and Hartlib, Dr Benjamin Worsley, a fellow-physician who had published influential pamphlets that led to the Navigation Act of 1652, a mercantilist measure for the subsidizing and privileging of English shipping. Petty, however, did not let friendship stand in his way. Reaching Ireland in the autumn of 1652 and sizing up the situation, Petty launched a propaganda campaign denouncing the alleged slowness of Worsley's survey, and promising to perform the task himself in a mere 13 months. Getting the job in February 1653, despite the ferocious opposition of Worsley, Petty indeed completed the task on time.

With the huge sum of cash earned from this job, Petty set about accumulating ownership of the confiscated Irish lands: some lands he acquired in lieu of cash payment; others he got by buying land claims from needy English soldiers. By 1660, William Petty had accumulated Irish landed estates totalling 100 000 acres, making him one of the largest landowners in Ireland. In fact, his eventual accumulation of Irish land was still greater, for by the time of his death in 1687 Petty owned 270 000 acres in south Kerry alone. By the late 1650s, Petty was back in London, serving for a time in Parliament and renewing his friendships in scientific circles.

Back in England, Petty joined a Baconian–Hartlibian circle headed by another German emigré, Theodore Haak, the organizing secretary of Comenius's English disciples. Other members included Dr Jonathan Goddard, now Protector Cromwell's personal physician; and the famed architect Christopher Wren, whose first architectural work was a transparent three-storey beehive-like structure built for Hartlib. The group met largely in the Oxford home of Cromwell's brother-in-law, John Wilkins, whom the protector had made ruler of Oxford University.

The Baconians, it must be understood, though flourishing under Cromwell, were never truly committed to any particular form of government. Like Bacon himself, they could flourish under an absolute monarchy. Monarchy, republic, Parliament, Crown, Church – all these forms of government made no particular difference to these 'scientific', 'value-free' would-be rulers of the nation. So long as the regime was sufficiently statist, and at least nomi-

nally Protestant, the polity could afford ample scope for the dreams of power and 'science' held by these Baconian philosophers and men of affairs.

Hence Petty and his colleagues, always seekers of the main chance whatever the government, were well placed when the Stuart monarchy was restored in 1660.[14] Petty himself was well received at the court of Charles II, who granted him a knighthood, and in 1662 Petty's and his colleagues' Baconian dreams culminated when Petty became a founding member of the newly chartered Royal Society of London for the Improving of Natural Knowledge. The Royal Society was specifically dedicated to the Baconian project of empirical observation and experiment, first to the study of the natural world and technology, and then to the study of society.[15] Throughout his life, Petty remained an active member of the Royal Society, especially contributing to its studies of the history of trades and technology. Petty's own contribution, 'political arithmetic', or statistics, he saw as the application of the empiricist Baconian programme to the social world.

True to Petty's goal of 'empirical' science, each of his studies was designed to promote his own economic or political advancement. His major publication, a *Treatise of Taxes and Contributions*, was published in 1662, and went into three further editions in his lifetime. Petty, however, was disappointed, since the tract did not lead to his hoped-for public office or political influence. Petty's later tracts were written, but not published, in his lifetime, the others being published in 1690 or later, after his death. This was because, in the words of a generally admiring historian, they were written 'not for publication but for circulation in the corridors of power or with a view to acquiring influence and jobs – which he never managed to obtain.[16] And even though Petty's daughter, from a marriage a few years later, was to give rise to the aristocratic Shelburne and Landsdowne families, Petty derived little enjoyment from his vast ill-gotten lands in Ireland, since he had to spend half his days in that country, defending his claims from lawsuits from royalist claimants, or his lands from 'bandits' who believed that he had despoiled their land.

As befitted a presumed experimental scientist, Petty claimed several important inventions, only one of which, however – the double-hulled ship – ever came to fruition. He spent a great deal of money building several versions of this ship, but they all suffered from the same problem: even though very fast, they all 'had an embarrassing tendency to break up in a storm', a defect, we are told, 'in which Charles II took a certain amount of malicious glee'.[17]

What then was there about Sir William Petty that, despite his gifts, his seizure of the main chance, and his powerful friends, brought him up sharply against a 'glass ceiling', that limited his political influence and his power at court, and that led even the king of England to treat his discomfiture with

'malicious glee'? Apart from his sabotage of Benjamin Worsley, the problem was that Petty could not resist the impolitic dig, whether he was wickedly mimicking the aristocracy at a party, or was reproving His Majesty's policies in the very pamphlet he was writing to court the king's favour. Not being a gentleman by birth, Sir William could ill afford to act less than a gentleman to his betters.

While publishing his *Treatise of Taxes*, Petty delivered several papers to the Royal Society on the histories of the dyeing of cloth, and shipping, advancing the Baconian history of trades programme. His major work, the *Political Arithmetic*, was written in the 1670s and published posthumously in 1690. The goal was to show that England, far from suffering from a decline as commonly believed, was actually wealthier than ever before. In the *Political Arithmetic*, Petty claimed to eschew mere 'words' and 'intellectual arguments', and state only 'arguments of sense' – that is, derived from sensate facts of nature, which could all be boiled down to 'number, weight, and measure' – a slogan which he enjoyed repeating on many occasions. Thus, at the end of an essay on algebra, Petty grandiloquently maintained that he had at last applied algebra 'to other than purely mathematical matters, viz: to policy, by the name of Political Arithmetic, by reducing many terms of matter to terms of number, weight, and measure, in order to be handled mathematically'.[18]

In fact, there is virtually no mathematics in Petty; what there is are statistics, loosely gathered, and arbitrarily asserted, employing many hidden assumptions, to arrive at preordained ideological conclusions.

As William Letwin writes, in his rewarding study of Petty:

> Petty's way with numbers, here as always, was utterly cavalier. The facts, whatever they were, always had a congenial way of upholding Petty's conclusions. Or rather, Petty's factual assertions did; for he was not averse to citing authorities mysterious, unknown, and even non-existent, when he needed their help.

Letwin then cites the conclusion of Major Greenwood, a modern historian of statistics: 'It is not I believe too cynical to say that any calculation Petty made would have produced war losses around 600,000'.[19] At one point, Petty actually submits the justification for his arbitrary figures and assumptions that they make no difference anyway since the figures are not totally false, and therefore can illustrate the method of arriving at knowledge. But fake illustrations, of course, are scarcely an advertisement for the method of political arithmetic. Thus Petty tried to come to conclusions pleasing to the king – that England was gaining not declining in wealth – by borrowing the spurious precision of numbers and the prestige of science. Sometimes his conclusions were so wildly optimistic as to abandon all sense: as when he claimed that it was 'a very feasible matter, for the King of England's subjects, to gain the universal trade of the whole commercial world'.[20]

In the course of his discussions, Petty delivered himself of some economic theories – *qualitative* not quantitative theories we might add – in violation of his stated programme. They were either not very remarkable – urging the king not to levy taxes that are so high that they will lead to severe declines in output or employment – or incorrect, such as attributing the value of goods not to the demand for them but to their costs of production.

Indeed, the quality of Petty's economic reasoning was generally that of a jejune mercantilist. Like all early modern writers, with the exception of Botero, Petty was a naive expansionist on population: the more people, the more 'income' and output will increase. Like mercantilists generally, Petty counselled and identified with the aristocratic power élite rather than with the labourers. His yen for increased or 'full' employment stemmed from a wish to increase the national output at the command of the state and employed by the élite. So little was Petty, like most mercantilists, concerned for the labouring classes that he denounced them for becoming more idle and drunken whenever their real wages rose. Petty, in fact, was more imaginative than his mercantilist confrères in proposing a governmental price-support scheme for keeping up the price of corn – specifically in order to prevent real wage rates from ever rising and thereby keeping the workers' noses to the grindstone and preventing them from enjoying more idleness (or leisure). Petty, indeed, denounced these labourers as 'the vile and brutish part of mankind'. Sometimes Petty's imagination ran away with him, his zeal for increasing the labouring population of England leading him to recommend, in the *Political Arithmetic*, forcibly moving the bulk of the population of Scotland and Ireland to England, allegedly in 'their own interests', so as to increase English productivity and to raise rents in England.[21]

The seventeenth century enthusiasm for the sciences, building upon the quasi-underground age-old numerological mysticism of the hermetic and cabala tradition, led to an arrogant frenzy of enthusiasm for quantitative and mathematical study of social life as well, among the scientists and especially their cheering sections. The eminent Harvard sociologist Pitirim Sorokin has perceptively referred to this frenzy, from that day to the present, as 'quantophrenia' and 'metromania'. Thus, writes Sorokin:

> The mathematical study of psychosocial phenomena was especially cultivated in the seventeenth and the eighteenth centuries. Spinoza, Descartes, Leibnitz, Newton... and others, began to build a universal quantitative science, *Pantometrika* or *Mathesis universae*, with its branches of *Psychometrika*, *Ethicometrika*, and *Sociometrika* designed for investigating psychosocial phenomena along the lines of geometry and physical mechanics. 'All truths are discovered only through measurement', and 'without mathematics human beings would live as animals and beasts', were the mottoes of the Social Physicists of these centuries.[22]

William Letwin writes perceptively of this metrophrenic phenomenon among the Baconians of England during the Stuart Restoration period. The 'scientific revolution' of this period, writes Letwin, 'owed much of its vigor to faith...the simple belief that many things in nature, as yet mysterious, could and should be measured precisely'. Unfortunately, 'Hand in hand with this revolutionary ideal went a devout but misplaced notion that to measure and to understand were one and the same. Restoration scientists believed that to cast a mathematical mantle over a problem was tantamount to solving it'. As a result, Letwin goes on,

> The scientists united themselves in the Royal Society and set off on an absolute orgy of measurement....the virtuosi continued, endlessly and pointlessly, to record, catalogue and count. The best minds of England squandered their talents in minutely recording temperature, wind and the look of the skies hour by hour, in various corners of the land. Their efforts produced nothing more than the unusable records.

This impassioned energy was turned also to the measurement of economic and social dimensions of various sorts. The search for number, weight and measure was conducted in the happy belief that good numbers would inevitably make for good policy.[23]

Unfortunately, this quantophrenia and metrophrenia seems to have taken over the modern economics profession. Fortunately for the development of economic thought, however, the quantophrenic enthusiasm in the social sciences dribbled away after the effusion of some Baconian writers in the 1690s. It would be nice to think that this decline was speeded up by the brilliant and devastating satires directed against the Baconians in the 1720s by the great Tory libertarian Anglo-Irish satirist Jonathan Swift (1667–1745). In his classic *Gulliver's Travels*, Swift effectively lampooned the crazed scientists of Laputa and elsewhere who were putting into effect what would now be called the Baconian 'research programme'. Finally, in 1729, Swift followed up this satire with his famous *Modest Proposal*, what Letwin justly calls 'the last word on political arithmetic as an instrument of social policy'. For Swift went after Petty, taking as his text Petty's claim that the more people the better, and in particular, Petty's serious proposal, in his *Treatise of Taxes*, to cure Ireland's alleged cause of poverty, underpopulation, by urging government subsidies for births among unmarried Irish women. The subsidies were to be financed by a tax on all Irish, especially on Irish men. The subsidies were only to be allowed if the woman kept records registering each father's time of cohabitation, and signed agreements by the father on the disposal of the children.

Swift's *Modest Proposal* satirized every aspect of Petty's style, from the solemnly avowed absurd policy proposals, to the fake precision of the numerological style. Thus, the *Modest Proposal* doggedly stated: