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This is an approach to world history from a distinctive perspective. It looks at the role information has had in the unfolding of the past. The understanding of what information is, and how it can and should be used, emerges as a major theme in cultural, intellectual, political, social and economic history. The use of information helps mould societies, but, in turn, information — and, in particular, the institutions and social practices that acquire, use and retain it — helps determine the understanding and employment of information. As a result, this book focuses on the relationship between information and society. In doing so, it concentrates on the last half-millennium because it shows how the changing understanding and use of information were important to the onset, character and development of the modern age. Change, both within and between societies, is considered in particular in terms of the synergies between information and power. Moreover, these relationships help constitute the modern world and provide important clues to the future.

Information, power and modernity, of course, are movable feasts, each difficult to fix in a definition that makes sense across cultures and periods, let alone all cultures and all periods. You may think you know them when you see them, but others will have a different view. Therefore, to write about information, power and modernity together, to consider their interrelationships, and the significance of the latter, may seem doubly problematic. In graphical terms, what are the axes?

The problematic character of the subject is even more apparent if the intention is, as here, to link the question of the relationship between information and modernity to the rise of the West. Both topic and discussion lead to difficult, indeed troubling, issues of cultural bias, notably so of teleology and triumphalism. These problems are stated at the outset because readers need to be aware of them. They are relevant to the conceptual, methodological and historiographical questions raised by this book.
The tendency, in recent decades, has been to address the rise of the West by both problematising and qualifying it. Problematising this rise has entailed drawing attention to what are variously presented as the harsh, distorting and negative aspects of Western power including Western intellectual assumptions and cultural programmes. Qualifying this rise has meant focusing on the degree to which Western power and its strategies were heavily dependent, for implementation and sometimes ideas, on non-Western societies, groups and concepts. Moreover, qualification of Western power also arises by emphasising the degree to which non-Western societies long remained resilient in the face of Western power, while remembering that both West and non-West are abstractions, each of which comprehends significant variations, geographically, chronologically and thematically. Thus, the topic and methods of world history, a subject greatly advanced in recent decades, challenge traditional definitions and accounts of the rise of the West.

Allowing for these points, and without any sense of triumphalism, it was, nevertheless a case of victorious Western forces in Beijing, Baghdad and Constantinople at times between 1860 and 1922, and not vice versa. Western power rose not only to unprecedented heights for the West, but also for the rest of the world, with empires created on which the Sun never set. Spain was the first of these empires, with the establishment of its colony in the Philippines in the late 1560s, and the nomenclature was fixed by naming this archipelago after Philip II of Spain.

The relationship between this global power of the West and the Western ability to impose its information systems on the rest of the world seems clear; but the more general linkage of information, modernity and Western power invites discussion. That discussion is the particular subject of this study.

Information systems are significant because information is 'constructed', that is, collected, systematised and utilised according to predetermined categories. Thus 'description' is also construction. Information, indeed, covers the spectrum from raw 'data' to systems of 'knowledge'. Each is also a 'construct' in its own way. Moreover, assumed binaries, such as ideology and belief versus information, need to be considered in terms of such 'constructs' and also with reference to the overlapping stemming from the degree to which information is not readily distinguished from a range of related and often overlapping terms and concepts. These include data, science, knowledge, propaganda and rumour. Moreover, in discussing information technologies, there is a conflation of the message and the medium caused by their mutual dependence.

The significance of information also partly lies in its importance for the cultural development of the human species, and this form of development has occurred far faster than biological evolution. The ability to learn language was crucial to cultural development and, just as language offered information, so information was expression through language. A mathematical dimension was also present, although this was more significant for intellectual development than for broader cultural trends. At the same time, as a cultural product (rather than simply as an expression of technological possibilities), information lacks the precision or rational clarity that might be anticipated: it is both contested as a category and part of the sphere of debate and contention. This sphere incorporates the topics covered in this book.

In writing this book, I have incurred a large number of debts. First and foremost are those to other academics. I have read more widely for this book than for any of my other works and, in doing so, have moved far from the (often misleading) comfort blanket of familiar or semi-familiar sources and literatures. At every stage, I have been fascinated by the intellectual richness of what I have encountered. The challenge in an academic world that is truly wide-ranging is to glimpse and understand more than a tiny fraction of the scholarship available. If I have not succeeded, the faults are all mine and not those of others, but reading widely has given me many opportunities to think across disciplinary and other barriers. Already, I am aware that the interest and content of my teaching have been enhanced, and the long-held relationship between research and teaching seems fully vindicated.

I am particularly thankful to those who have taken the time in busy schedules to comment on the whole or parts of earlier drafts: Nick Baron, Tim Black, John Blair, Cynthia Brokaw, Lucille Chia, Kai-wing Chow, Malcolm Cook, Alan Forrest, John Gascoigne, Bill Gibson, Nelson Gray, Paul Harvey, Eddy Higgs, Ian Inkster, Angus Lockyer, Derek Partridge, Kaushik Roy, Ken Swope, Peter Waldron, Peter Wiseman, Tony Woodman and Neil York. I have also benefited from discussions with George Elseithiou, Sarah Hamilton, Tim May and Bob Higham. They are not responsible for any errors that remain, and do not necessarily agree with all my arguments.

I am very grateful to those who have supported this research: the Leverhulme Foundation and the University of Exeter. The grant of one of the Foundation’s Major Research Fellowships has been crucial to the success of this project from its inception. I am most grateful to Geoffrey Parker and Brian Blouet for acting as my referees and to the Foundation’s assessors. The university has proved a very supportive environment.

I have benefited greatly from the opportunity to travel widely, which has provided important perspectives. I would like to thank those who helped with my visits to Antigua, Belgium, Belize, Canada, Colombia, Costa Rica, Cuba, France, Germany, Honduras, India, Italy, Japan, Malaysia, Mexico, Qatar, Singapore, Sri Lanka and the USA. The opportunity to conceive and present a programme on the Industrial Revolution for the BBC proved most rewarding.
I am delighted that this book has appeared with Yale University Press, a publishing house that has handled my most significant works. I would like to pay testimony to over twenty-five years of friendship with Robert Baldock, a prince among publishers.

I see education as the trust between the generations, and particularly so with the subject to history. Education for me focuses on helping others develop their individual potential. The range and ambition of this book reflect that approach. I introduce and discuss ideas not in any sense that readers should necessarily agree but so as to stimulate their thoughts and views.

So also with friends and their central importance in my life alongside family. Friendship reflects our own past, and offers companionship and zest in the present, and hope for the future. I have been very fortunate in my friends, and none more so than with former students who have become friends. Indeed, two students from Durham days in the 1980s, Patrick Deane and Glenn Hall, are close friends who have helped in dark moments in my life. I record and celebrate my friendships with dedications in my books. Indeed, Robert Baldock is one dedicatee. I am particularly proud of former students who have not only become friends but have also followed an academic course. Kate Davison is not only a special person but also a former student with a diamond-sharp mind who has gone into the eighteenth century. This book is dedicated to her in the hope that she will throw light on that most fascinating of periods. That she currently works on laughter in eighteenth-century England is apt as she brings smiles to so many.
Introduction

How we understand the world is a measure and forcing-house of intellect, but also a definition of capability, and thus power – the power to know, to analyse, and to plan and act employing both knowledge and analysis. This book will take information as a cause, measure and product of power, and show how the relationships between information, modernity and power changed, and how these changes made the modern world. This book therefore discusses the relationship between information, and its use notably to affirm and strengthen power, and the making of a modern world in which Western analytical methods and concepts based on the acquisition, analysis and flow of information have played a central role.

Information, modernity and power are porous categories, necessarily so in the case of this book to allow it to encompass the variety of working definitions by period, area and topic. Thus information covers flows of information and the media of information exchanges, such as printing presses, telegraphs and the Internet, as well as categories and uses of information. The latter are frequently discussed in terms of ‘know-how’, technical knowledge and scientific knowledge. These differing forms of information overlap and interact, not least as information expands and changes with use.

In a historical context, the search for, acquisition and assessment of information, and the development of information systems, throw light on the interrelated categories, issues and questions of comparative capability, the rise of empires and the eventual success of the West (Christian European civilisation) in the nineteenth century in becoming the wielder of global power and, more significantly, the dominant source of concepts and practices used there and elsewhere. Today, there is an emphasis on the extent, quantity, speed and range of information as characteristics of the present state of humanity. Great powers are now in part defined by their unprecedented information reach, notably their ability to develop and deploy space-based systems that interact in real
time with Earth-users; and this unprecedented capability adds a new definition to the understanding of imperial strength. The USA dominates current capability, but the attempts of other powers and would-be powers, notably Russia, China, Japan and the European Union, to acquire and/or develop these capabilities are notable.

The very definition of criteria and values of power was bound up in the rise of the West, as was that of the criteria and values of information and its classification. Existing and, even more, increasing knowledge of the outside world led to pressure on the existing typologies and analyses by which information was understood, acquired, organised, presented and utilised. A classic Western assessment took the form of cartography (mapmaking). In 1973, the International Cartographic Association defined a map as 'a representation, normally to scale and on a flat medium, of a selection of material or abstract features on, or in relation to, the surface of the earth or a celestial body'. Such a definition consigns non-scale maps to a second-class status, an approach that underestimates non-Western cartographic traditions.

The World Question

Accounts of the rise of the West frequently offer teleology and, sometimes, triumphalism or, worse, determinism. In contrast, to take the 'realist' side, there is a need to understand the potential of non-Western empires into and in the eighteenth century, and, in the case of China and Burma, into the early nineteenth. This point leads to an assessment favouring the idea that (in information and power) the West gained a relative advantage that it was able to use successfully only relatively late and, then, with a sharp divergence from non-Western capability. This divergence was heavily dependent on contingent factors, notably those responsible for the rise of Britain's global power, as well as the particular political problems of China in the nineteenth century. Moreover, the rapid period of divergence saw an attempt by non-Western powers to close the gap, especially so in the case of Japan, which in 1904-5 was able to defeat Russia.

A focus on a relatively late divergence is different from the more conventional alternative of a process of steady divergence between West and non-West from the fifteenth century. The latter period was nevertheless significant as the age of the Western Renaissance, of mapping employing a rectangular grid, of the spread of printing using movable metal type and a press, of Western 'new monarchies', and of successful Western voyages of exploration to the Americas and South Asia.

Chronology is not the sole issue. In addition, as an instance of the presentism that is so potent in history, at once in the past and accounts of the past, any discussion of the causes of the rise of the West can lead to vexed controversy. The response to Niall Ferguson's *Civilization: The West and the Rest* (London, 2011), a somewhat congratulatory account of this rise, amply illustrated this point. Clear-cut accounts of Western proficiency invite critical debate, indeed hostile discussion, and notably in the present context. These accounts are held to reflect unwelcome and misleading ideas about Western cultural superiority.

Part of the problem in this debate is the belief that responsibility for the present and, separately, the prognosis for the future can be established by allocating blame for the past. In practice, linkages between past, present and future are more problematic and less clear-cut than such a practice suggests. However, interpretations emphasising cultural causes of developments do tend to place a stress on deep history, notably because of the tendency to take an essentialist view of culture.

Two recent issues have pushed this question of the validity of deep history to the fore. First is the relative (not absolute) decline of the West vis-à-vis East Asian societies, an issue that emerged with the rise of Japan from the 1960s and, more clearly, with that of China from the 1990s. Second is the supposed 'clash of civilisations' between the West and Islam, a theme of Samuel Huntington's problematic book of that name. Both issues are important in the modern world, although, despite assertions to the contrary, they are not necessarily the central themes of human development, and certainly not in comparison with the rapid and unprecedented rise in the world's population, which reached seven billion in late 2011 and is projected to rise by another billion in the next eleven years.

The extent to which topics of current concern can be profitably discussed in terms of developments centuries ago is unclear, and there is certainly no fixed relationship between past and present. For example, the modern, international, capitalist, democratic, widely trading character of Japan today was scarcely prefigured by the isolated Japanese state of the seventeenth and eighteenth centuries and, although values have been traced from one to the other, this process has also been contested. Nor does a largely rural Middle East, under Ottoman (Turkish) imperial rule from the 1510s to the 1910s, viewed in a context, from the late seventeenth century, of expanding rival empires, necessarily provide much guidance to the urban, overcrowded, self-determining and quasi-democratic region of today, although there are significant links in terms of the difficulties of establishing and sustaining a viable civil politics.

Similarly, to focus on the subject of information, linking the geocoding of the current GIS (Geographical Information System) used for surveillance and cruise missiles with the earlier assignment of formalised street addresses, allowing individuals to be located, is to join very differing contexts and purposes of information. At the same time, in both instances there is a common theme of
power, and it is not automatically helpful to differentiate the uses of power between states from those within them.

Despite real or apparent discontinuities in these and other cases, there is nevertheless a chronological coherence to the issue of modern power thanks to the very theme of Western potency, albeit a coherence that is very rough at the chronological, geographical and thematic edges. This potency was scarcely a question for much of the world's population prior to the sixteenth century but, thereafter, there was a growing awareness of Western power and, in some circumstances, a need to react to it. If the history of China in the sixteenth, seventeenth and eighteenth centuries does not revolve around this impact, nevertheless there were Western traders in Macao from the mid-1500s and Western bases on Taiwan in the seventeenth century (until 1662). Although defeated there by the Chinese in the mid-1680s, the Russians had advanced into the Amur Valley, and they remained on the Sea of Okhotsk and in eastern Siberia.

More profoundly, Western developments in theoretical and applied science in the sixteenth to eighteenth centuries were not matched elsewhere. These developments certainly owed much to origins in earlier non-Western achievements, notably Islamic mathematics and the major contributions of Islamic scientists between the ninth and eleventh centuries, especially under the patronage of the Baghdad-based Abbasid caliphs. The Islamic world proved important to the transmission of the intellectual world of Classical Greece. The closure of the School of Athens in 529 by the Byzantine emperor Justinian reflected a concern about the heretical consequences of Aristotelian thought. However, the tradition continued in Sasanid Persia (224–642), an empire that included Baghdad and much of modern Iran, before influencing the Muslim Abbasid empire after the Sasanids were overthrown by Arab invaders. Many of Aristotle's (384–322 BCE) works were translated into Arabic there in the early ninth century, as were other Classical works, such as those of the Greek medical writer Galen (c. 130–201). Moreover, there were important advances in science in Baghdad, including the development of experimental chemistry in the ninth century by Jabir Ibn Hayyan.

However, Muslim fundamentalism affected free thought in Baghdad from the mid-ninth century. Moreover, a similar tension was seen elsewhere: for example, in Morocco and al-Andalus (Andalusia) in the eleventh to thirteenth centuries. At the same time, translations of Aristotle and other Classical writers helped ensure that the Arab world served as an important source of ideas for Western Christendom. Latin Arabists proved significant for this cultural transmission. Furthermore, influences continued. For example, Arab visual culture and optics affected the Renaissance, as in the work of Biagio Pelacani.

A focus on earlier advances in the Islamic world does not address the issue of the capabilities and human capital that the West acquired through subsequent developments and which non-Western societies failed to match. The origins of the scientific and information inputs for the current debate on global warming are notable in this context. Indeed, Western capabilities and human capital helped give shape to human history over the last half-millennium. Information was both a major aspect of these developments and the means by which knowledge of them was spread.

Moreover, information relates both to the realist discussion of what was happening, and to ideas of progress that helped shape the perception of developments and of relative capabilities. Access to material in the outside world, and to the ‘news’ – as category, means and content – contributed to the latter. The role of information in facilitating the spread of ideas of progress is significant for the understanding of the nature and causes of power. Information was cause and outcome, a form of knowledge, and also a social product shaped by demands, institutions and practices.

### Space and Time

Recorded in a number of systems and variety of means, notably in calendrical, oral, numerical and pictorial systems, information occurred in large part in terms of a space–time matrix, which helps explain the attention in this book devoted to maps. Cartography reflected and presented both knowledge about the wider world and the way in which this information was understood. Maps therefore capture cultural assumptions about territory that were to be important to ideas and practices of appropriating, and to the shifting debates about information and power. In reflecting notions of cultural status and superiority, and resulting positionings, maps were of particular importance at a time when the West came to engage with non-Western societies across the world.

The axes of space and time were linked, not least in terms of the relationships between human and sacred space and time that for long played a major role in human assumptions, that shaped experience and that helped explain the linked significance of astronomical observation, astronomical record-keeping and calendrical systems. With similarities as well as differences, the development of history – in the modern sense of a narrative and analysis of change in human society (as opposed to an account of divine intervention) – rested in part on an understanding of the significance of time. In order to create the past as a subject, it was necessary to appreciate its separation from the present. Similarly, geography required the detachment of the human sphere from aspects of sacred space.

The separation of past from present did not have particular weight for societies that put an emphasis on cyclical theories of time, and thus on a return, in the future, to the present, and on a desire to re-create the past. This emphasis
was especially the case for peoples who focused on the rhythms of the seasons which dominated agriculture, fishing and forestry, which were the activities that determined livelihoods in pre-industrial times. Even industry and trade were affected, as the water and wind energies that were crucial as power sources were changed by the turn of the seasons; as were the interplay of winds and currents, and the melting of the snows and the beginning of the growing of grass (for draught animals), which set the terms for the possibilities and timing of long-range trade by sea and land.

A materialist account, however, has its limitations. The varied interpretation of time is also a consequence of the diverse nature of creation and revival myths, and of ecclesiological accounts of time and of divine intervention. Religious accounts were of cultural weight (and remain so), and in societies that looked to the past for example and validation - societies that were referential of, and referential to, history - this weight was of great significance. Astronomical movements of planets and of the Sun and Moon were considered in terms of journeys in the sky made by the celestial gods.

Furthermore, the interaction of human and sacred space did not generally encourage a sense of major divine development through human time. This interaction involved events - the works of divine providence, the actions of prophets and the activities of priests, or the malignant doings of diabolical forces and their earthly intermediaries such as witches. However, this sort of 'news' was part of a religious world-view that linked past, present and future within a prospectus of essential stability.

In considering such a world-view, it is important not to counterpoint reason and religion, or human and providential history, as if these provided clear contrasts. For example, for many writers of the (Western) Classical period, such as the influential Roman historian Livy (c. 59 BCE–17 CE), in a work that ended on the upswing of the establishment of the Pax Augusta, a central problem was that of explaining failure. A common way to do so was to argue that omens, signs of divine intentions, had been ignored by humans. Conversely, success could be attributed to following the correct omens; for example, in terms of delaying battle until the right sign was seen. However, as the Athenian historian Thucydides (c. 460–c. 400 BCE) pointed out, there were 'omens of various kinds.' Moreover, writers took different positions. The surviving sources indicate what one particular writer thought at one point in time and space, often in opposition (open or implied) to what other people at the time took for granted. Thus, Thucydides was sceptical of omens and ironical about those who believed in them. The Greek historian Herodotus (c. 485–425 BCE), on the other hand, was a believer, and it is unclear which view was the majority one. The Old Testament's account of the history of Israel in the two Books of Kings provides another example of history explaining failures in terms of the ignoring of divine injunctions.

Religious authority also played a role in the authentication of records, and thereby in accounts of past and present. Thus, in the Roman empire in the first two centuries CE, seals were inscribed with religious imagery, record offices were often located in temples and written attestations sometimes included a religious oath. The role of socio-cultural norms was also shown in the degree to which high-status witnesses were seemingly preferred. Information therefore was socially expressed as well as constructed, stored as well as accessed.

The explanatory focus on omens can be described as an expression of religious conviction, but it also represented an attempt to provide a rational account for developments that might otherwise appear arbitrary: rational in so far as respect for oracles was an accepted way of reasoning at the time, with oracles providing a rationalisation for events happening. There was the assumption that timely or accurate adherence to prophecy would produce the desired results with regularity - a naturalistic assertion of cause and effect. In his Cyropaedia (The Education of Cyrus), the Greek historian Xenophon (c. 435–354 BCE) declared the lesson of history to be that of respecting omens, specifically in avoiding the risks of hubris and misgovernment.

Ancient Chinese beliefs, most prominently advanced by Confucius, made similar points. Ritual propriety was a key element, defining behaviour and explaining success in terms of a conservative code. At the same time, there was variety of opinion and practice. Other Greeks made different observations about the purpose of history. For the Romans, the stress was not on oracles, but on following appropriate rituals, notably observing auspices. More generally, in both the West and China, space and time were constructed in terms of religious values that also made sense of social and political realities.

History, an understanding of the past and of the reasons for events, was valuable because the past was similar to the present and the future, and was not regarded as clearly different. The alternative approach, emphasising the difference of the past, is an aspect of modernity. Most Greek historians saw history as providing moral instruction, with piety not being the sole virtue that had to be imparted. To Polybius (c. 200–118 BCE), a Greek writer in the service of Rome, the work of historians could provide useful lessons: 'Fortune has guided almost all the affairs of the world in one direction and has forced them to incline toward one and the same end; a historian should likewise bring before his readers under one synoptical view the operations by which she [Fortune] has accomplished her general purpose.' Polybius's point was that the histories of all the different parts of the Mediterranean world had converged in his time into a single story: the conquest of most of that world by the Romans. Whereas Polybius's recent history could be authenticated by reliable memory, the Greek writer Plutarch (c. 46–c. 120 CE), in justifying his attempt to write the lives of two legendary characters, Theseus and Romulus, wished to 'succeed in purifying Fable, making
her submit to reason and take on the semblance of History. This mythological narrative was to be converted into what purported to be the 'real', as thus more usable, history of the distant past. The rationalisation of incredible mythological stories was a familiar task for the writers of Antiquity, especially historians, while history itself was related to moral exhortation. 18

The recording of geographical information was another means of purifying fable and producing usable information. The major extensions, thanks to the conquests of Alexander the Great and the Romans, of the world readily known to Classical commentators provided geographers, such as Eratosthenes and Strabo respectively, with much fresh material and ideas, the two frequently being linked. Roman territorial expansion and the subsequent need to protect the frontiers of Roman rule helped lead to an increase in geographical information, as well as improvements in the accuracy of maps. 19 Power was also served, as maps provided a way to display strength and purpose. This presumably was why Julius Caesar was (later) held to have ordered the surveying of the known world, a mission recorded in the Hereford mapa mundi of c. 1290 CE. 20

Reading omens was an aspect of a wider process of using knowledge, based on an experience of the past and an understanding of the present, to seek truth about the future. This wisdom was linked to astrology, which was a matter not only of personal horoscopes but also of what, for the Babylonians, is usually referred to as judicial astrology, which related to kings or countries as a whole. 21 These beliefs helped explain the need to note divine purpose through measuring time, an important drive in the presentation of mathematical knowledge. 22 Measurement brought together the overlapping categories of cosmology, religion, ritual, symbolism, architecture and the economy. 23 In contrast, although symbolism was also significant, it played a lesser role in the development of numerical and writing systems, which took shape in southern Mesopotamia in about 3500–3300 BCE (the period in which towns were first established), as well as in subsequent systems of coinage and weights and measures.

Time was seen as a sphere in which human agents acted and were acted upon. 24 Providentialism and storytelling were ways to understand this interaction, helping to ensure that myth was not a separate category to other accounts of causation and change. Herman the Archdeacon, a monk at the wealthy abbey at Bury St Edmunds in England in the 1090s CE, implied an interplay between chaotic worldly forces, to which God usually permitted directing power, and merciful divine regulation, which occurred particularly in 'ages of mercy'. Hence a central task of the chronicler was to provide information on this divine intervention, notably via the miraculous career of the local saint, king and martyr, St Edmund. Information and intervention served to display the potency and, thus, power of the saint, 25 and that in a competitive context in which monasteries vied for patronage.

Information about martyrs and relics was also of interest to bishops as it helped strengthen their claims to metropolitan status. Information about the ongoing miracle-working powers of relics thus also entailed a retrospective rewriting of saints' legends as new priorities were added. Local histories often sought to join the account of the locality and its particular historical rights, rites and magic with national and universal history. Such conjunctions occurred, foremost, in retelling and justifying the protection offered by rulers, notably their grants of land and privileges and, secondly, in relating signs of the central events of Christian revelation. Divine providence was a key theme and means, and the extent to which histories were written by those with clerical education, interests and careers affected their tone. 26

Yet, although religious themes were very important, time in the (early) medieval West was neither understood in a primitive fashion nor exhausted by the issues of liturgical time. 27 The Anglo-Saxon monastic scholar Bede (c. 673–735 CE) and many of his Irish contemporaries divided time into three kinds: natural, human/customary and divine. The first of these was rigid and linear, and the second was open-ended, defined only by artificial means and otherwise amenable to the influence of human actions. Eighth- and ninth-century Western historians were generally attached to the creativity of the human present and an undefined future. Believing in Judgement Day at the time of Christ's Second Coming was not the same as believing that everything was already mapped out. Generally the rhetoric surrounding the Last Judgement and the Apocalypse was that, since their timing was unknown and they could come at any moment, it was necessary to think carefully about how choices in the present would play out in the future. This perception contributed to a situation in which present was distinguished from past, creating new opportunities as well as closing off what became anachronistic because it was less relevant.

Although there were earlier analogues such as Roman annals, medieval Western chronicles were an innovation rather than a continuation of earlier traditions. These chronicles began in forms such as Easter annals, king-lists and chronological lists of benefactors, many of them compiled by monasteries to help them date documents. They could begin at fairly arbitrary points: at least, not at any clear point of origin in the sense of origin myths. Indeed, most of the 'great' canonical medieval chronicles, for example, that of Orderic Vitalis (1075–c. 1142), the Anglo-Norman author of the Historia Ecclesiastica, were mainly interested in their own time or a generation or two before. 28

Such processes were scarcely restricted to the West, although alongside similarities come differences, if not contrasts, with cultures presenting the past in distinctive fashions. In India, ancient Vedic literature, later epics and medieval tales of the past all used mythmaking to capture essential relationships. 29
At the same time, epics were altered to take note of changing circumstances. Thus, the Mahabharata (c. 400 CE), the world’s longest epic poem, in its various redactions saw the addition or substitution of contemporary peoples, kings and regions. A similar process occurred with the sacred Hindu texts known as the Puranas, which transmitted traditional knowledge.20

Religions rely on a deep time of inherent truths that is not to be effaced by human history. Moreover, issues of divine intervention and religious purpose remain central in some cultures. Indeed, in traditional East Asian Buddhist societies, it is impossible to separate past from present. Hence, the very different, detached approach to the past – for example, in modern Japan – is an aspect of the Westernisation project that has been going on for about 150 years. It is unclear, however, that the cultural and ideological impact of this project is as powerful as a Western perspective might suggest. Concern about the continued strength of religious views helped ensure that Communist regimes launched campaigns against what they presented as superstition.

For much of history, limited literacy led to an emphasis on community agencies for the assessment and transmission of news: families, kinship, communities, and religious and economic groups, such as confraternities and guilds. Memory represented the key approach to the past and to geography. The development of a different situation around the world was far from simultaneous and is still incomplete today in some areas such as New Guinea. In addition, traditional forms of historical consciousness – especially the notion of the past, particularly ancestors, as present21 – may appear redundant, not least in terms of the modern scholarly understanding of the past, but they have value as indicators of still-widespread public attitudes. Indeed, the continued role of providentialism and the great popularity of astrology round the world provide clear indications of widespread beliefs in otherworldly factors in explaining events, as well as (in the latter case) of the strength of cyclical interpretative trends. In addition, psychological factors, rather than mechanistic ones, whether or not expressed in the current terms of the chemistry and physics of the brain, bulk large in human attitudes and motivations. Moreover, it is mistaken to view rising literacy as incompatible with an all-embracing religious worldview. In some Muslim countries, this rise was actually linked with a religious resurgence in recent decades. In a very different context, the Protestant Reformation of the sixteenth century saw a linkage between Protestant activism and literacy.

Nevertheless, literacy permitted a new perception of space and time, as both could be readily presented in written form. If language was the ultimate network, written forms offered additional benefits to those provided by speech. Indeed, the space–time matrix, never fixed, was remade in the West from the fifteenth century, a theme of chapters three to five here. This process greatly affected the nature and availability of information in the West, with the exploitation of technological and intellectual possibilities playing a major role. Change came from a variety of directions. Significant elements included the impact of printing with movable metal type. Thanks to printing, traditional communal ways of mediating between individuals or localities and the external world were increasingly joined by more uniform ways to produce and reproduce information and to mould thought and opinion. Change was important, but also incomplete, necessarily so due to extensive illiteracy.

However, the extent and consequences of change represented significant aspects of developments not only in the West, but also in the West’s position in the world. The Western trans-oceanic voyages of the fifteenth century were on a different scale from the air and space travel of the twentieth century, while the mathematical possibilities of twentieth-century computers were very different from the potential offered to and by humans half a millennium earlier, notably with the geometry and grids employed in cartography. Nevertheless, despite these differences, there was a common theme of new opportunities. This theme contributed greatly to a new awareness, in the Renaissance West and subsequently, of change through time as a transforming, rather than a cyclical, process,22 and thus of the sense of modernisation and modernity. Although it remained significant, tradition became less important as a source of reference, while experience of the new was now more significant in the use and understanding of empirical methods and reason. Separately, there is an emphasis for both periods, the Renaissance and the twentieth century, on information as power, a product of power and a cause of it. As another cause and characteristic of modernity, the long run of relative Western power, influence and capability from the fifteen century helped provide a period of time that could be defined in those terms.

**Acquiring and Using Information**

This book considers the growing emphasis on information in understanding both the world and, more specifically, policy options; and in how best to implement the resulting choices: in other words, strategy in its broadest understanding and implications. The use of wide-ranging information was seen in Antiquity, and major empires, such as Han China and Rome, had to reconcile commitments across large areas. Indeed, if that process, of information acquisition, process and use, is seen as modern, then the modern state can be glimpsed two millennia ago.

However, the scale and sophistication of the process in pre-modern times were not those of twenty-first-century states. Indeed, the character of information management can be presented as a defining characteristic of modernity, and thus of modernisation, with the scope and tempo of information demands,
acquisition and use all increasing with modern government, and taking the
form of complex feedback mechanisms. This process was linked to questions
of state definition and development, spatial awareness, social differentiation,
and imperial expansion and activity, each of which was important, although to
differing extents in particular contexts. The significance of information is such
that the modern state has been presented as an information system.

It is necessary to consider, and for all periods, both the processes by which
information is acquired and disseminated, and the analysis and understanding
of information: telegraphs as well as theories. Both hard and soft power were of
crucial importance to the way in which states governed their inhabitants, and
also sought to control their neighbours, and information both aided the use of
hard power and was a key aspect of soft power. Indeed, information, as part of
the language of power, was an aspect of its legitimisation and normative codifi-
cation, a process readily seen with cartography and with other systems and
practices of categorising and representing information.

Thus, there was an interplay between the symbolisation of knowledge, itself
an aspect of the image of power, and the mechanisms of knowledge display and
use, mechanisms that took on some of their utility as a use of power because of
their relationship to its image. The repeated transition from symbol to
mechanism, and vice versa, was part of the broader politics of knowledge,
namely, its implementation in terms of new uses and needs.

The exigencies of war comprised one of the major drivers of this process,
and at the level both of individual states and of international systems. Emperor
Napoleon III of France (r. 1852–70) tried to run the Crimean War (1854–6)
from Paris by telegraph, and the (British) Royal Navy used radio to speed its
warships in the First World War (1914–18), while steps were successfully taken
by the British at the outset of the latter conflict to cut German submarine tele-
graph lines and to seize German colonial radio stations. The modern use of
GPS systems in warfare, notably by American forces in the conquest of Iraq in
2003, can be set in a chronological context. In turn, these exigencies of war
were in part framed by the changing potential of information usage.

War, its strains and needs, was also important to the conceptualisation and
treatment of information. Thus, in Germany, the move of anthropology, from
a subject with an essentially liberal approach to the differences between peoples,
to a more hostile notion of race science, owed much to the antagonisms of the
First World War. Research reflected and contributed to this new emphasis, with
the anthropological consideration of Allied prisoners of war, including colonial
soldiers from British and French Africa, being deployed to emphasise differ-
ence. The Germans criticised the use of such soldiers in Europe.33

More generally, tensions between information as freely available, the free
trade of wisdom, a theme particularly present in the eighteenth-century Western

Enlightenment, and contrary views of information as a resource that had to be
harnessed in a competitive context, gathered pace with the international com-
petition of the twentieth century. This competition led to considerable investment
in science as well as in other forms of information gathering and analysis that
could be seen as useful. Moreover, a norm of such governmental intervention
was strengthened.

War was not the sole driver of change, nor the understanding of contexts
of space and time the sole information needs. For example, the appreciation
and depiction of space through diagrams, charts and maps were a key product
and shaper of information demands, but should also be contextualised in terms
of the possibilities and requirements of other information systems, including
population censuses, tax registers, land surveys and classification models.

Control and finance were central drivers in these spheres. The understanding
and perception of the availability of resources was (and is) central not only to
detailed planning, but also to the processes of anticipating resources that
underlie planning. This point is valid for all levels of governmental sophistica-
tion, and for private as well as public concerns. Such understanding makes it
possible to anticipate and manage risk, and, again, such management is highly
significant in planning processes, and in their success.

The resources-information relationship is scarcely limited to government.
It is, for example, found from the outset in agriculture, in the understanding
of water sources and utilisation, and also in deciding how best to use the soil.
Topography, growing conditions, rainfall, drainage, and soil type and quality
all required careful understanding.35 The information, however, was essentially
limited in character, being specific to particular communities, and thus part of
the commonplace information system of most of human history once perma-
nent agriculture began.

In contrast, far-flung mercantile networks, which coexisted with local agrarian
patterns, had a distinctive economic need for information. They required not
only the linkage of information as well as particular means to transmit it, but also
a different level of information provision. Governments, both secular and reli-
gious, also had specific requirements. Alongside similarities between secular and
religious institutions, there were also contrasts, with the second kind of govern-
ment being more concerned to establish the degree of religious observance by
the people.

Information therefore is a key way by which society and, more specifically,
power operates and develops.35 This operation is the case whether information
is seen as 'intelligence' in a formal process, itself a process with its own chron-
ology, and a subject with its own specialist literature; or as the - far more
influential - informal processes of information acquisition and assessment.
These processes are crucial, even if the formal concept was not developed or
established in bureaucratic systems. Usage and practice were central elements of information acquisition and assessment, but information, to be part of a system, had to be stored and integrated with other material for analysis and dissemination, and thus had to be acquired and conveyed in ways that permitted storage, integration and effective usage. Possibilities for improvement in the sense of greater effectiveness were well-nigh continuous. These points can be made about societies across time, and made repeatedly, which raises the question of the appropriateness of the information revolutions that are spotted so often, notably by recent commentators.  

The general applicability of these points also raises the problem of whether, and when, to engage with the issue of modernity, and how to approach, define and chart it. A conventional approach to considering modernity would be to focus on rationality, a rationality in which processes of cause and effect appear informed and appropriate in modern eyes, which is a crucial caveat. This approach, however, opens us up to issues of presentism, taking an overly contemporary view on past periods for example, about assuming as normative ideas such as political self-determination, democracy and secularism that may very much push presentist analyses to the fore. Indeed, a narrative of Western progress that differs significantly from the emphasis on secularism has been offered in terms of the formative impact of the use of reason by medieval Christendom. This approach is itself controversial, not least because the dependence of this Western usage of reason both on the earlier Classical world and on advances in that of Islam has been argued.

The discussion also throws light on the difficulties of assessing the nature and employment of reason. Critics of the emphasis on medieval Christendom are apt to argue that its thought was overly deductive and to contrast it with the developments, summarised as the Scientific Revolution and linked to experimentation, that became prominent in the West from the seventeenth century. The extent to which religious articles of faith such as the Trinity and the Virgin Birth are themselves rational is a different issue; these articles also raised issues of authority. ‘We want no curious dispute after possessing Christ’, a comment by a rigorous Church Father, Tertullian (c. 160–220 AD), was scarcely a position that encouraged discussion. At the same time, other medieval authors took a different view.

While the relationship between Christianity and reason has been a long-standing topic, a key theme in intellectual thought, notably from the 1960s, has been the contextualisation of the criteria classically offered in the conventional approach to modernity. Ideas of rationality have been exposed to highly critical scrutiny; not that this process never happened in the past. The same process has been extended to many of the forms of information, such as the book, the letter, maps, dictionaries and indices, as well as to many of its processes, such as authorship, to many of the categories, such as objectivity and experimentation, and many of the means: for example, description. The extent to which the terminology of modernity and its use were moulded by historical norms (the presentism of the past), as well as related linguistic and socio-political practices, emerges clearly from the critical literature. For example, modernisation theory, an American thesis influential at the time of US intellectual and political assertiveness during the Cold War, has been exposed to contextualisation.

More generally, information, as a form of power and the means to greater power, attracted considerable attention from the 1960s, with the ideas of the French philosopher Michel Foucault (1926–84) proving particularly influential. Authority has been scrutinised and criticised by Foucault and his followers, with the use of information by authority in order to cement control proving a prime topic for analysis and cause of criticism. This criticism extends to the process of history, a key form of information that enshrines or contests collective memories and other cultural forms. Historical understandings have been historicised, not least in the debate about how best to teach world history, and to locate the West within this.

There has also been interest in the extent to which some information, and certain types, producers and users of information, classification and analysis, are privileged, while others are slighted. Thus, in information networks, information does not necessarily circulate equally; indeed, the condition of a network is that there is no equality of circulation, nor of access to the network.

As both patterns of authority in information, and the value of and values placed upon information, are shown to vary greatly, there is an emphasis on specific, indeed partisan, judgements. Nevertheless, there still appear to be questions that are pertinent across time. In particular, what information was available for governance, and how far was governance defined in terms of information, especially secular information? What did information mean as a concept, practice and analytical system, and how was it developed? How far and why did information change away from long-standing ideas; for example, of the secret magic of the sovereign, with his special powers and special understanding of justice? These powers rested in the blood quality of dynasty and ruler, and in their intermediary and intercessionary roles with sacral power. Does this, and other questions, require a contrasting understanding of a non-providential secular sphere and, if so, how did a belief in such a sphere develop and manifest itself?

How far, in opposition to the role of individual rulers, did governance come to require a standardisation of rule in which there was a degree of order and predictability that was not dependent on the individual ruler? In the latter case, do we see governmental structures, with integrated information systems, and, if so, when, and how, did information methods and goals become different from those evident earlier?
Modernity's Onset

These questions intersect with the debate about the onset of modernity, for the latter is classically defined in the West (although not in China) as occurring in the hundred years beginning in about 1450, thus providing a starting point for what was subsequently termed the early-modern period, an age usually seen as ending in the late eighteenth century with the French Revolution, which began in 1789, and with the less easily dated onset of the Industrial Revolution in Britain. A host of developments jostle for attention in the discussion of the onset of modernity and the beginning of the early-modern period, with linkages (many noted by contemporaries) but no clear causal relationship between these developments. Among those that deserve particular discussion are the changes summarised as the Renaissance, the age of Western (trans-oceanic) discoveries, the Protestant Reformation, the impact of gunpowder, and printing. There is also a focus on government, with changes seen in both international and domestic spheres.

The idea of a new Western international system was closely related to that of 'new monarchies', and thus to the wars they engaged in, and the means of warring involved. Writing in 1769, the influential Scottish historian William Robertson linked the changing state system discerned in the Renaissance, notably with the beginning of the Italian Wars in 1494, to internal development in the Western states:

> during the course of the fifteenth century, various events happened, which, by giving princes more entire command of the force in their respective dominions, rendered their operations more vigorous and extensive. In consequence of this, the affairs of different kingdoms becoming more frequently as well as more intimately connected, they were gradually accustomed to act in concert and confederacy, and were insensibly prepared for forming a system of policy, in order to establish or to preserve such a balance of power as was most consistent with the general security.\(^9\)

Interaction in terms of a system was a key theme, with the balance of power suggesting a rational measure of strength, and one that could be analysed. The states ruled by these more powerful 'princes', such as Charles VIII of France, or Ferdinand and Isabella of Spain, the last the patrons of the explorer Christopher Columbus, were to be referred to as 'new monarchies', and they were to be discussed in terms of characteristics of greater capability, notably more bureaucratic governance. Information is a key element of this process and was clearly seen as significant given the surveys of wealth and other resources to which states resorted. In English history, *Domesday Book* (1086) is the most famous instance.

The entire governmental system was affected by the issue of reliable information. In a largely pre-statistical age, it was difficult to obtain the information necessary to make what would now be seen as informed choices, or to evaluate the success of policies. Moreover, these problems extend to modern scholarly evaluation of choices and success. Most central governments of states prior to the nineteenth century had only a limited awareness of the size or resources of their population, although limited is a term that can be variously contextualised and assessed. This situation affected their ability to set what would now appear to be realistic goals for recruitment and taxation, and to monitor these goals.

As a consequence, the scholarly value of considering policies in such terms can be queried. Yet, such an enquiry also takes an absolute approach that may be challenged. Although fifteenth-century Western government was scarcely bureaucratic or information-rich by the standards of the late nineteenth century, and certainly did not match its fifteenth-century Chinese counterpart (and not only in scale), it is also possible to put an emphasis, for the fifteenth century, on aspirations and incremental change. The significance of incremental, rather than revolutionary, change emerges frequently in history.

Linked to this, however, comes the problem of assessing change and, in particular, discussing development, with everything that word is usually held to mean in terms of progress. Presentism, both that of the period in question and that of current values, plays a role in assessing what was incremental and what was more radical and transformative, in deciding how to describe them and in considering the relative significance of different types and rates of change. For example, in some respects, as far as the West was concerned, the governments of the sixteenth century were not only less impressive than that of the Roman empire, they were also less ready to seek to follow some of that empire's policies: for example, in the dispatch of agents from the centre. In addition, in so far as there were attempts to increase governmental capability, these were not new in the early-modern period, however defined.

Medieval Anticipations

In order to redress the habit of ascribing excessive novelty to the governments of the early-modern West, it is important to note medieval anticipations. Two such were the pursuit of information and the emergence of coherent groups of professional administrators. In England, *Domesday Book* represented the first attempt by a monarch to establish the ownership and value of landed property across the country. It drew on the testimony of local people, but also on the documentation of landownership produced for local sheriffs prior to the Norman Conquest. Thus, *Domesday Book* was a stage in a longer move from
oral evidence to written documents, a change to which the development of wills contributed greatly. *Domesday Book* was to be referred to by Prince Albert, husband of Queen Victoria and a keen moderniser, in 1859 in his opening address to the annual meeting of the British Association for the Advancement of Science.

After *Domesday Book*, there were further moves in England to assess resources as the basis for taxation. In addition, coherent groups of professional administrators can be seen from the reign of Henry I (1100–35). In England, as elsewhere, these *curiales* were mostly 'new men' who were resented by better-born nobles. This process is part of the social politics repeatedly associated with the quest for new government, including the acquisition of information which both helped this new class of professionals to pursue their tasks and provided them with power.

Thanks to such officials, the enforcement of royal justice and the collection of royal revenues improved, and the processes of government became more effective and regular. The production and retention of information were important to these developments. Regular record-keeping was seen in England, notably with the exchequer pipe rolls from the mid-twelfth century, and the close and patent rolls of the chancery from just after 1200. Records of royal and manorial courts were increasingly preserved from the thirteenth century. Tax lists provided much data, while compiling such lists posed problems for government that had to be overcome. For example, the grouping of settlements into wills was important for tax assessment in fourteenth-century England.42 The processes of government became more fixed, with normative assumptions both an aspect of government activity and a form of knowledge. The governmental structures of the sixteenth-century West looked back to medieval developments.43 At the same time, bureaucratic practices of government took a while to develop.

As another example of an important long-term trend, the spread of the market economy, a process that certainly did not begin in the West in the fifteenth century, encouraged a monetarisation of other aspects of life. Large amounts of coinage were produced. The sceatta coinage in circulation in the Low Countries, northern France and eastern England during c. 680–740 ran into many millions; there were about thirty million coins in circulation in England in c. 720. Metal-detector finds show that these coins were distributed very widely across the countryside. Far from being an elite or controlled currency, coins were used by many to participate both in local trade and in the very extensive trade across the Channel and the North Sea.

Monetisation had consequences for both government and for the world of commerce. It furthered the quest for information to locate wealth, and a related determination to utilise information in order to use this wealth—unsurprisingly so, as taxation lent added flexibility to government, in everything from political patronage to the raising of military forces.

New financial instruments were devised to ease credit and borrowing, including bills of exchange, which were currency exchange contracts that also acted as credit contracts. Western merchants responded not only to economic need, but also to Church hostility to lending, which was presented as usury and stigmatised through its association with Jewish moneylending.44 The Church itself was a major financial and economic player, which needed to move significant quantities of money around a far-flung system. In the shape of monasteries clearing the unfarmed 'waste' and producing goods for sale, such as wool from Cistercian abbeys in Britain, the Church was also an important cause of change. The rise of trade and money in Western life affected social assumptions and practices. As goods, services and land were commodified, so markets for their trade developed. At the same time, this process should not be seen simply as the rise of capitalism, important as the link was, because other types of social value remained prominent, as did different forms of economic activity. Resources were not simply seen as forms of capital, while communal patterns of life, work-organisation and exchange all remained significant.45

Alongside more information, there were also improvements in efforts to use it. In the twelfth-century West, there emerged a series of devices to help organise books and knowledge, including tables of contents, folio numbering, indexes, concordances, digests and encyclopaedias.

Developments were scarcely limited to the West. Indeed, the governmental sophistication seen in China long predicted that in Western Europe; and this point does not arise simply from subjective considerations of relative sophistication. Moreover, China, was part of a trading world that stretched, via Persia, Southeast Asia and India, to the Middle East and East Africa, and this world provided opportunities for the spread of inventions, concepts and beliefs, as well as goods. Furthermore, via the Middle East, many of these affected the West prior to the more direct links created by the Mongol expansion.46 The unprecedented geographical range of Islam provided an important cultural space for transmission, indeed a culture that spanned large parts of Asia, North Africa and southern Europe.

Alas the transmission of ideas and practices, there were also important parallel developments: the interaction and relative importance of these processes is often unclear. As an instance of parallel developments, also seen earlier with Han China and Imperial Rome, the production of documentary records increased with the expansion of the Eurasian population in the thirteenth and early fourteenth centuries.47

These points can be made not only about the Middle Ages—adopt subsequent Western terminology—but also about earlier ages. If the accumulation,
circulation, categorisation and analysis of information are to be seen as aspects of modernity and modernisation, then there are important instances in the ancient world. The idea of much information then as being restricted and often secret, due to its sacral nature and consequences, has been questioned. For example, the study of transmission of texts in ancient Mesopotamia (Iraq) has suggested that secret knowledge circulated widely. At the same time, although the increase of writing across time provided more opportunities for spreading and recording information, writing for long also had some of the character of a magical activity. In practice, there was no simple dichotomy between tradition and modernity, let alone between elements presented as idealistic or non-rational, and those seen as 'real', or between the spiritual and the secular.

The intellectual achievements of the ancient world were considerable, including in understanding the spherical shape of the Earth, and there were significant technological developments, notably in hydraulics. There were also changes in the presentation of knowledge. In the West, the scroll was replaced by the codex, a (manuscript) volume in pages, early in the first millennium CE, although there was a reversion to the roll in twelfth- to sixteenth-century English administration.

The limitations of the technical base, both in the ancient world and in the Middle Ages, however, restricted the capacity for scientific development, including improvements in communications. These limitations were seen, for example, in the serious experimental deficiencies of scientific instruments, as well as in computational machines.

Technological and scientific understanding was related to the belief that the human capacity to understand a logically conceived universe reflected the divine will both for humans and for the universe. This belief added a different level of utilitarianism and functionality to the interest in acquiring information and understanding. This interest was not just a matter of the classical 'high' Middle Ages, which are juxtaposed with the Renaissance in order to debate ideas of continuity and contrast, but was also seen in the early Middle Ages. For example, knowledge was more organised in the eighth and ninth centuries than is conventionally anticipated in the Dark Ages. Writers and libraries collected and organised material. The Etymologies of Isidore, archbishop of Seville (c. 560–636), available across the West by about 800, was an important instance of an encyclopaedia. There were also attempts to collect outdated material as in the ninth-century library of the monastery of St Gall, with this material being seen as offering an opportunity for critical thought. Bede's 'On the Reckoning of Time' reflected complex exercises in temporal conceptualisation. Highly original as a practical scientist, Bede was convinced that the divine plan could and should be revealed in all its complex perfection by precise enquiry. However, Bede's focus on the correct date of Easter does not accord with modern scientific priorities.

The expression of the belief in divine purpose in a logically conceived universe varied across the world and through history, but it was significant in what was to be termed the scholastic humanism that was important to the development of Western culture. Emerging in Paris and Bologna, Western Europe's leading intellectual centres in the first half of the twelfth century, a period that saw a revival in the study of Roman law and Classical philosophy as well as the systematisation of canon law and theology, this humanism was essentially optimistic. It assumed benign purpose, knowability and the possibility of aligning human life with both the divine creation and the intention expressed in this creation.

These assumptions remained central to Western thought and policy thereafter, at least until the twentieth century, and the ideas of modernisation and information discussed in this book can be considered subservient to them. At the same time, the relationship between medieval Christian thought and the subsequent nature and development of Western ideas has been a matter of considerable controversy. In place of the thesis of a rejection of anarchism in order to move forward – a development linked variously to the Renaissance, the Reformation and the Scientific Revolution – has come a more complex account. The latter relates partly to the developments of that period, 1450–1750, and also to more recent changes in scientific understanding and their apparent consequences for differences in method between science and religion, notably in accounts of causation.

In addition, there is now an emphasis on the considerable intellectual, scientific and technological achievements of the Middle Ages. These were seen across much of the world, including China, India, the Islamic lands and Europe, while New World civilisations, notably the Mayan and Inca, were also impressive. The centrality of religious thought was such that developments in what today might seem to be other spheres were at least partly dependent on this thought and, indeed, the notion of a separate category is not appropriate. For example, the discussion, in the thirteenth- and fourteenth-century West, of the relationship between appearance and reality, a discussion that was significant both for an understanding of thought and for developments in art, was also related to philosophical and religious issues bound up in such questions as Christian visions, scriptural exegesis and confessional practice. This relationship was significant in encouraging an interest both in how humans acquired knowledge and in scepticism arising from perception. This approach was an important change (for some) from Aristotelian understanding, since the latter presented a ready link between phenomena and human appreciation of them.
Moreover, the study of mathematics and what would later be termed science at universities led to a degree of rejection of the Aristotelian inheritance, with William Heytesbury (in Oxford) advancing what is now called the mean speed theorem, the description of the velocity of an object falling under gravity, while John Buridan (in Paris) developed ideas relevant to what would later be called momentum and inertia, and Nicole Oresme (also in Paris) took forward the mean speed theorem and plotted the speed of an object against time. The work of these and others looked towards the later theories and research of Copernicus and Galileo.55

Science was relevant for its utilitarian functions, but could also be regarded as an adjunct of theology, and thus valuable and useful from another viewpoint. Belief in this relationship reflected the sense of knowledge as a unity, with God's work and intentions reflected across the material world. This attitude was seen in the work of the Jewish philosopher Moses Maimonides (1135–1204), who drew on Classical Greek thought as well as Islamic influences. Similarly, Christian thinkers such as Roger Bacon (c. 1214–94) sought better to understand the workings of a cosmos created by a Christian God, which was to be a long-standing theme in the relationship between science and Christianity. Science therefore was not a separate category. An English Franciscan friar who was aware of intellectual developments in the Arab world, Bacon emphasised facts, experimentation and useful knowledge in his Opus Majus (1260s).56

Useful knowledge, however, should not be defined simply in modern terms. For instance, in Bacon's view, the balance of the four humours was important for the health of rulers and their realms; this balance was also a theme in the alchemical prophecies frequently offered in England in the second half of the fifteenth century. A period of political instability and civil war, such as that of the Wars of the Roses (1455–85), was understood by at least some in these prophetical terms.57 Furthermore, Bacon played a role in alchemical thought. Alchemical prophecies served as an indication of the varied ways in which time and events could be understood.

In addition, prior to the Renaissance, and very differently to emphases on astrology and alchemy the meaning of time was offered anew in the West as a result of changes in the tradition of history writing. From the thirteenth and fourteenth centuries, the monastic tradition of such writing generally lacked vigour. Linked to this, in place of a stress on the Christian viewpoint of universal history emerged a sense of history as the humanistic narration of politics, both of the Classical world and of the kingdoms and cities of the modern world.58

There was no uniform Christian practice in terms of what would subsequently be seen as scientific method. Ideas of knowability were linked to the development in the West of scientific empiricism in works of the twelfth century, notably by Adelard of Bath, William of Conches and Thierry of Chartres. Their arguments in favour of a method that combined induction with deductive thought were related to a readiness to accept contingent and changing results, notably in place of clear-cut certainty. Doubt that was to be clarified by information deployed by a God-given human intellect was crucial in the assertion of this new rationalism.59

In the approach of these thinkers, the reality of fact was not seen as incompatible with theory, but the latter had to accommodate the former. This attitude became more prominent, not only in science but also in learned opinion, judicial and medical practice, and religious thought. The authority of Church Fathers was challenged, while the account of Creation in the first part of Genesis was glossed in terms of a departure from strict literalism. This approach offered a workable space and method for what can be seen as science.

However, the emphasis on contingent and changing results was to be inhibited by the subsequent interest of Western scholastic thinkers in a systematic rationalisation that did not welcome doubt. Nor did scholastic thinking find much room for unstable and historicist categorisation. Academic views could be criticised as heretical.60 In the thirteenth century, Thomas Aquinas (1225–74), an Italian Dominican friar who lectured in Paris and Cologne, synthesised the existing doctrines of the Schools (proto-universities) with the works of Aristotle, translated from Arabic versions available in Spain and Sicily or directly from the Greek. The impact of scholasticism serves as a reminder of the problems with the presentation of the past in terms of a linear development, let alone progression. Looked at differently, scholasticism represented the tendency to order and classification that is a central element in the drive to acquire and use information. As Anthony Grafton has pointed out, information cultures 'interfere with one another'.61 The tendency to order in scholasticism was also seen in many non-Western societies.

Irrespective of the character of academic thought, there were significant developments in technology in the West (and in China), with, for example, a greater use of wind and water power than in the Classical world. There were also developments in the use of blast furnaces for iron productivity. Printing was a key invention, occurring in China no later than the eighth century. The first extant complete printed book (produced as a scroll) in the world, a copy of the Diamond Sutra, dates to 868. However, there is controversy among specialists about how quickly and thoroughly printing made its mark on Chinese society. Some argue that the impact was almost immediate and profound, pointing to first-hand accounts of the easy availability of texts in the eleventh and twelfth centuries, that is, during the Song dynasty (960–1279). The printing of books and other materials such as ephemera, for example, was sufficiently commonplace for different socio-economic groups to be familiar with the uses of print – although that did not necessarily mean that there was a decline
in scribal culture. Others, pointing to contemporary complaints about the difficulty of getting books, argue that the impact was gradual and uneven, and that it was not really until the late sixteenth and seventeenth centuries, and the publishing boom of the late Ming dynasty, that printed texts (by then most commonly string-bound, forming a codex) became widely available.

At any rate, print became more prevalent in China far earlier than in the West, both due to the continuity in the written culture and to the relative simplicity of xylographic printing. In addition to the use of print by Buddhists and Daoists, the Song state also started to compile and print many non-religious works, largely for scholarly use (including for the government exams), and this development stimulated private and commercial publishing as well. Moreover, given the economic and cultural developments under the Song, this period became seminal for the growth of printing.

In the West, far from a static medieval period being followed by a transformation from the fifteenth century linked to printing, there was already change, as far as the world of books was concerned, related to both production methods and audiences. In the fourteenth and early fifteenth centuries, there was a manuscript boom that included inexpensive formats such as tracts. Although manuscript books and other works could emphasise international themes, notably those of Christendom, they were also linked to a rising public opinion related to a developing sense of national identity, for example, in England and France.

As another significant instance of change, this time in economic transactions, the development of information transmission had been seen with the business letter, particularly in the West from the thirteenth century, and with couriers organised by commercial consortia, which helped facilitate dealings at a distance while also changing the nature of mercantile links. In government, politics and personal relationships, there were similar changes, all preceding the arrival and impact of print. Indeed, the production of manuscript books by the later medieval period reflected a range of contexts and sites in which books were of interest, including monasteries, universities and shops. Books were commissioned and collected by different institutions, and were read and retained for varied purposes.

There was no stasis, therefore, prior to the use and spread of printing with movable type. Indeed, the earlier variety in manuscript books proved important to the overlap with printed ones. Alongside the important role, in manuscript book production, of authorities and control in the shape of religious institutions and the suppression of heterodox books, notably those of the English Lollards, came significant entrepreneurship, with booksellers, stationers and scribes producing works for profit.

Technological knowledge and change were also long-standing – and evidence of practical rationality – and did not originate in the early-modern period. This point was especially true of hydraulics, mills and weaponry, although, certainly in the case of mills, there was also a reluctance to abandon traditional techniques of construction and use.

More generally, aside from the important transmission of knowledge by example, seeing machines working and acquiring copies, there were written works detailing operating methods. For example, in 1424, the engineer Konrad Gruter wrote on hydraulics, mills and military matters for Eric VII of Denmark. Areas that were short of water had a particular need for hydraulic technology. Thus, a complex hydraulic system supplied the Moorish Alhambra palace in Granada.

The use of water showed an improvement in technique in the West. In place of the Roman practice of open-air masonry canalways, there was a development in city supplies of underground pipelines, often lead, supported by reservoirs and settling tanks. In addition to water supply, there was water transport. There was also an intermeshing, as in the Thames system, of high-level canal construction projects with a multiplicity of small-scale local systems using very minor watercourses.

Conclusions

A stress on change and development in the West in 1450–1550 can lead to an unwanted primitivisation of the Middle Ages and its information practices. This primitivisation was part of the process by which Western commentators from the Renaissance on repeatedly separated out the Middle Ages in order to disparage them, and thus to create a clear basis for proclaiming the advent and the virtues of subsequent modernity. Such an approach provides an overly static account of a millennium of human history. It is more appropriate to begin anew in the next chapter by considering the situation at the global scale, and then to trace through some of the consequences of what became the West's new trans-oceanic position.
Government and Information

The Nature of States

Government and information are closely linked. Even localised government, which is largely face-to-face, requires information, albeit this information may be less formalised than that for, and produced by, bureaucratic structures. As far as the latter are concerned, the presence and activity of government were frequently necessary to information gathering and analysis, while access to information was seen as central to government. Moreover, the rise of what is presented as the modern state can be treated as being in a synergy with that of modern information systems, the quest for them and their provision. By their nature, administrative effectiveness and centralisation are both dependent on information. Centralisation entails taking decisions at a distance, and that capability requires information about the area for which the decision is being taken and, subsequently. As a result, decisions can be appropriate and their implementation can be checked. Information is both the content and the means of decisionmaking.

However, although such a functional account appears natural and necessary, history is also lived and experienced in the short term, and the processes that appear so clear-cut in the long term are less so in the short. In part, the latter point depends on a reconsideration, first, of the nature of the early-modern state, notably, but not only, in the West, and, secondly, of the related argument that states during the sixteenth and seventeenth centuries became considerably stronger, both more ambitious and more effective. The thesis tends to focus on changes in relations between centre and localities, as well as on a series of developments, notably those described as the Military Revolution, the growing state role in the economy referred to as cameralism and mercantilism, and increased state influence over churches, religious life, and spheres such as education and poor relief that had previously been very much the responsibility of churches. These developments can be separated out, but, common to all, there is the question of the extent to which changes arose as an intended result of planned policies. The contemporary use, indeed conception, of information is germane here.

It is also possible to suggest that ‘states’ were not only weak but also subject to outside pressures which they had only a limited ability to mould, let alone determine. Such a stress on weakness leads to a focus on the attitudes of those able to influence governments, as well as on state policies understood as reactive in this environment. This results in a different assessment of the nature and use of information to that offered above. Indeed, the focus becomes political rather than governmental, with the key question being the nature of crown–elite relations, and the means of government being that of the crown issuing orders that it knows will meet with a ready response, in large part because it is reacting to elite visions, or is at least responsive to them.

This process was also true of authority and power more generally. Thus, the Spanish Inquisition, traditionally treated as a potent instrument of control for both Church and state, and, indeed, as a key force opposed to modernity, has instead been presented as serving to respond to economic and cultural grievances in society, with the institution, dependent on information from the population, being manipulated accordingly by the use of false testimony.

The contrast between this situation and contemporary theories of optimising power through bureaucratic expansion and efficiency is not only functional. In addition, in comparison to modern notions of government, the state and the use of information, ideas about these in the sixteenth and seventeenth centuries were very different. In the West, political culture stressed the ideal of a Christian community, with monarchs, such as the ‘Most Christian King’ of France, presiding actively in defence of the faith and their subjects. The obligations of monarchs included swearing to defend religious orthodoxy at their coronations. The related model of good kingship and willing obedience by subjects was matched by the reality of the politics of patronage.

The latter was a social and political relationship that placed obligations on both parties even though they were greatly differentiated by status. Nevertheless, there was no simple distinction of government and subjects. The social privileges of the aristocracy made this particularly so, for rulers and greater aristocrats shared glorious lineages and a similar lifestyle, which encouraged aristocrats to expect that they would not be classified and dealt with like other subjects. Tension, indeed, could focus on royal favour for ministers, such as Armand, Cardinal Richelieu (1585–1642) in France and Gaspar, Count-Duke of Olivares (1587–1645) in Spain, who appeared to reject this scenario by lacking aristocratic support and breaching the conventions of aristocratic political society, notably the idea of special privileges. In contrast to the modernising,
information-led account of bureaucratic governance, the continued importance of informal channels of authority in political and governmental systems in which bureaucracy played only a limited role focused attention on such ministers, and also ensured that the role and skill of individual monarchs were important. Thus, information became a matter of having ‘the ear of the king’, and the content of information was what might seem relevant to the monarch. Correspondingly, reports about other states frequently focused on royal health, intentions and advisors.

These points are significant when considering a key aspect of government, and therefore an important context for information: the relationship between centre and localities. Members of the elite owned and controlled much of the land and were the local notables, enjoying social prestige and effective governmental control of the localities. Power was delegated. In contrast, central government lacked the mechanisms to intervene effectively and consistently in the localities, unless with the cooperation of the local elite. This situation did not change until the last two centuries, notably the twentieth century, and the political history of information can be considered in these terms. Central government meant, in most countries, the monarch and a small group of advisors and officials. The notion that they were capable of creating the basis of a modern state is misleading, although an exception may be suggested for China where the resources and scale of government were greater.

Returning to the West: in addition, in what was in very large part a pre-statistical age, the central government of any large area was unable to produce coherent plans for domestic policies based on the premise of change and development. Without reliable, or often any, information concerning population, revenues, economic activity or landownership, and lacking land surveys and accurate and detailed maps, governments operated in what was, by modern standards, an information void. Information by socio-economic group, a central facet of modern state information systems, played little part.

Efforts were made to improve the situation: for example, by sponsoring mapmaking. However, without the reach of modern governments, those of the early-modern period relied on other bodies and individuals to fulfill many functions that are now discharged by central government, and these bodies and individuals reflected the interests, ideology and personnel of the social elite. As landowners increasingly used cash rents (rather than rents in kind) to take production from tenants, so they had access to much information about local resources, and had to employ it to ensure their income.

At the level of the state as a whole, whatever the rhetoric and nature of authority, the reality of power was decentralised and consensual. For example, in England in the fifteenth century, postmortem inquisitions identified and valued land held by deceased tenants-in-chief of the crown, and also identified heirs. The escheator, a royal official, would enpanel a local jury to provide required answers. However, this process carried the risk of a tendency, due to this local role, to undervalue land so that less would be owed to the crown.

In the West, religion, education, poor relief and health were all focused on the parish, which represented the close and mutually supportive interrelationship of Church and state at the local level, and also ensured that those who paid knew those who received, a key piece of information lacking today – and which affects modern attitudes to taxation. Social welfare and education were largely the responsibility of ecclesiastical institutions or of lay bodies, often with religious connections, such as, in England, the Society for the Promotion of Christian Knowledge, established in 1698, which encouraged the foundation of charity schools in the early eighteenth century. Education in England had to be paid for by the pupil’s family, which was generally the case in the grammar schools, mostly sixteenth-century foundations, or by a benefactor, dead or alive; education was not supported by taxation, although there was some free schooling in certain parishes. In Scotland, there was a stronger tradition of obligation: an Act of Parliament of 1496 made education compulsory for the eldest sons of ‘men of substance’. An Act of the Privy Council of 1616 decreed that there should be a school in every parish. After the Reformation, schools and universities in Scotland came under the control of local authorities. The regulation of urban commerce and manufacturing in Britain was largely left to town governments. As an aspect of a more general military entrepreneurship, the colonels of British regiments were often responsible for recruiting men, and for supplying them also, and vice-admirals had to protect the coast using their own resources and money obtained by salvage. In contrast, the British navy was administratively, as well as militarily, impressive, and its control and logistics were largely centralised as well as wide-ranging.

Most crucially, the administration of the localities, especially the maintenance of law and order, both in Britain and elsewhere in the West, was commonly left to the local nobility and gentry, whatever the formal mechanisms and institutions of their authority. In this sense, Britain was an aristocratic society, and this was not a system that could be readily circumvented. When James II (r. 1685–8) intervened and appointed Catholics as lord lieutenants of the counties, this policy proved of limited value to him as the new men lacked the stature and connections of traditional aristocratic holders of the office.

Despite the constitutional differences between the British Isles and most Continental states, the shared reality at the local level was self-government by the notables and their supporters, and, at the national level, a political system that was largely run by the elite. However, this dominance was qualified, as far as politics and parliamentary rule were concerned, by strong traditions of popular independence, especially in the major towns.
of his ironic poetic epic *Don Juan* (1824), the British poet Lord Byron (1788–1824) stressed the dominance of electioneering by the elite, whatever their theoretical political differences: 'the “other interest” (meaning/The same self-interest, with a different leaning).

The essential element for stable government was to ensure that the local notables governed in accordance with the wishes of the centre, but means and outcome were largely achieved by giving them the instructions that they wanted, this desire proving the key political information in the governmental system. For the notables, it was necessary both that they received such instructions and that they got a fair share of governmental patronage. This system worked and its cohesion, if not harmony, was maintained, not so much by formal bureaucratic mechanisms as by the patronage and clientage networks that linked local notables to those wielding national influence and enjoying access to the monarch.

The Church was an important addition, not least because it acted to help inculcate obedience. In part, this involved the somewhat passive role of praying for the sovereign, but a more active stance was also taken. Thus, the Austrian clergy were ordered in 1782 to read all government decrees from the pulpit, on behalf of a ruler, Joseph II (r. 1780–90), who in practice pressed for change with relatively little concern about its acceptability.

The relationship between centre and localities was of greater importance in the early-modern period than subsequently, because, prior to the urbanisation of the nineteenth and twentieth centuries, when a large percentage of the world's rural population moved to the major urban areas, the bulk of the population lived not only outside these areas but was also relatively less subject to surveillance or ready influence by the agencies of central government than was to be the case subsequently in urban areas. This geographical character of societies has to be kept in mind in any discussion of information because power and authority had spatial dimensions (and altering spatial dimensions) that it is all too easy to forget or neglect.

Space and Information

The changing relationship of power and authority to space was of varying significance. For example, the spatial dimension of information gathering had a different impact from that of confronting and overcoming rebellion. One element, notably for information, was set by practicalities. Fernand Braudel, the great historian of the sixteenth-century Mediterranean world, referred to distance as the 'first enemy' and news as a 'luxury commodity'. Indeed, governments were at the mercy of rumour and speculation, hindering confident decision-making. Communications were not only slow and uncertain, but also frequently such that information could only be confirmed by waiting for subsequent messages. Moreover, uncertainty about the speed, and indeed arrival, of messages ensured that they were often sent in multiple versions by separate routes simultaneously: for example, from Constantinople (Istanbul) to Paris by sea all the way to Marseille and then overland, and/or by sea, via the Adriatic, to Venice and then overland, and/or overland to the west coast of Greece, then via the Adriatic to Venice and then overland, and/or overland via Vienna. From India to Britain, routes ran via the Middle East and also by sea around the Cape of Good Hope.

Rulers and ministers frequently complained that their orders were exceeded or otherwise misunderstood, while local representatives retorted that orders were outdated. However, it was difficult to provide instructions that would comprehend all eventualities or, alternatively, to respond adequately at a distance to fast-changing developments. The slow and uncertain nature of communications ensured that considerable discretion had to be left in what was often an information void. This void, moreover, helped encourage the spread of rumour, which overlapped with news because of the difficulty of checking reports.

In response, there were attempts to improve communications. The most international government agency of the West, the papal chancellery, had developed an efficient courier system in the fourteenth and fifteenth centuries, albeit one that was geographically limited. More generally, there were significant improvements from the fifteenth century. A postal courier system was developed in Renaissance Italy, and was then extended into northern Europe in 1490 by Maximilian, King of the Romans (heir to the emperor). Initially a system for the ruler, (rather like its Chinese counterpart), the expanding Habsburg postal network, which was run under contract by the Taxis company, was opened up to the public in the early sixteenth century, although France did not follow suit for a century.

The existence and openness of the Habsburg postal system were crucial for the development of the press in the West, as private intelligence could readily be conveyed by it. The postal system focused on cities, which became ever more important to information networks, not least because they tended to contain those with linguistic skills and the ability to see the value of information. At the same time, alongside the interest in news, it was widely believed that secrecy was the best means to thwart enemies and lessen dissent. Moreover, governments developed interception and espionage to keep up with developing postal networks.

Special couriers could speed up the system: for example, taking messages from Milan to Venice in twenty-four hours, and from Rome to Venice in fifty in the early sixteenth century. Alonso Sanchez, Charles V's envoy in Venice,
reported in 1526 that it took twenty days of hard riding to get a message from Venice to Vienna. Special galleys could help at sea, so that a message from Constantinople to Venice, sent on up the Adriatic from the Venetian colony of Corfu by galley, could reach its destination in days.10

There were incremental improvements to communications on land in the sixteenth to eighteenth centuries in the West, notably as a consequence of road-building, for example in France, especially in the eighteenth century, and of the replacement of ferries by bridges. The latter reduced the problems for crossing rivers created by the weather, notably spring spate as the snows melted, but also winter freezing and summer droughts. Moreover, the postal network improved, as gaps between the stages narrowed, and also spread. In 1693–4, for example, Saxony inaugurated a weekly post from the United Provinces and improved the service with Hamburg, so that a reply could be received in eight days: a valuable link between the continental interior and a major port. A new service from Saxony to Nuremberg was opened in 1699.11 A royal proclamation of 1635 encouraged the development of a postal service in Britain. The information available for travellers increased, as it did in China where the publication of route books, notably Huang Pien's The Comprehensive Illustrated Route Book (1570), made journeys easier for private travellers.12

However, despite improvements, there was no transformation in communications on land until the nineteenth century. Speed was determined by animal endurance and muscle. Rainfall affected roads, while both snow melt and heavy rains could make it impossible to pass rivers by fords or ferries: the water was too deep and flowed too fast, and river valleys flooded. In January 1715, the British envoy in The Hague noted the problems created for travelling from Antwerp: 'The breaking of the frost had rendered the roads, and especially the passages by water so very difficult.'13 Rivers were also affected by drought, freezing and weirs, and mountain crossings by ice and snow.

Moreover, although there were significant improvements at sea, especially better rudders, and, in the eighteenth century, an enhanced awareness of the position of ships thanks to the ability to measure longitude, there was no transformative improvement until the nineteenth century when steam power was applied at sea. Maritime routes were also affected by heavy seas, and by strong winds or the absence of wind, as well as by ice and poor charts, which increased the risk of running aground, especially on the approach to ports. For example, the sand bars near the coast in the southern Baltic were poorly charted.

The world before telegraphs, railway and steamships posed major challenges for the transmission of information. It is not surprising that details of the movements of letters and couriers, and of their all-too-frequent mishaps and related uncertainties, crop up regularly in the correspondence and diaries of the period. The acquisition and use of intelligence were important both for domestic security14 and for international relations.15 They proved particularly significant for the effective deployment of scarce resources.16 However, as a result of the nature of the information communication system, bold proposals for far-flung combined operations — such as fifteenth-century plans for joint attacks by Persia and the West, notably Venice, on the Ottoman empire, and sixteenth-century schemes for concerted action by Portugal and Ethiopia against the same, and by France and the Ottomans against the Habsburgs — were necessarily limited in their impact. So also was the diffusion of new attitudes, such as those developed in revolutionary America and France in the late eighteenth century. Thus, innovations, for example diplomatic representation in the West from Christian Africa in the fifteenth or the sixteenth century,17 or, the reception of Pacific Islanders in the West in the eighteenth century, did not have the consequences that might have ensued had information flows been more rapid.

At the same time, there were improvements in the infrastructure within the West, notably with postal services, and these helped with the distribution of news. Warfare, especially the Thirty Years' War (1618–48), encouraged a demand for news.18 Moreover, improved postal services in the West, alongside a greater volume of travel, encouraged the idea of the 'Republic of Letters', or res publica literaria, which had developed in the fifteenth century linked to humanist ideas related to the revival of Latin learning.19 Individual careers also reflected the extent to which it was possible to work across territorial boundaries. While religious division could hinder this process, it could also foster it due to the diasporas created. Denis Papin, who, in 1707, produced a working steamship, was a Huguenot (Protestant) refugee from France who was, at the time, professor of mathematics at Marburg in Hesse-Cassel (Germany) and, both earlier and later, lived in England, seeking and obtaining the support there of the Royal Society.20

The Strength of Governments

To a small degree, problems of uncertainty about journeys stemmed directly from the deficiencies of central and local governments, especially in road repair, which generally proved beyond their capacity. Looked at differently, and offering a contrasting view of the need for information and the response to this need, roads could be said to be fit for purpose as defined in terms of the combined capacities and interests of the varied levels of government: the rapid and predictable dispatch of messages was not of sufficient concern to ensure that rulers leaned hard on local élites to improve roads.

Alongside the view that new agencies and means of authority represented improvement or progress in some fashion, contemporary cultures of authority
were such that they were generally not regarded as a desirable step, but, at least initially, as an extraordinary measure, indeed as the product of particular failures, notably on the part of rulers. Thus, in England, the very use, in 1655–7 by Oliver Cromwell’s Protectorate, of major-generals as agents of local control and godly purpose, providing information accordingly, helped to undermine the fragile legitimacy of the government, which anyway suffered greatly from its origins in republican regicide.

The habit of obedience towards authority was matched by a stubborn, and largely successful, determination to preserve local privileges, in part by rejecting demands for information that might be used to curtail these privileges. The focus of authority was often a local institution or a sense of locality, rather than a distant ruler.

Alongside serious political costs, there were also important practical issues about the value of extending central governmental control into the localities. Aside from the payment of the agents, an issue that could make the very process of administration a matter of their own benefit, there was the question of oversight. Central government agencies, whether or not defined as ministries, lacked the facilities, techniques and understanding to oversee officials in an effective fashion. Disobedience, disaffection and corruption characterised much government. Office was widely seen as a source of personal and family profit, and financial irregularities flourished.

Clientage, both in the West and elsewhere, helped government, whether public, seigneurial or ecclesiastical, to work, and to work effectively, but the relationship of clientage to processes of modernisation is unclear. At one level, clientage was an aspect of the widespread ‘privatisation’ of government functions, although that term can be misleading as it implies that these functions should obviously have been under the control of government. This is an approach that frequently involves an anachronistic working back from modern ideas.

Tax-farming was an important aspect of this process, and also indicated the variety of contexts within which information was acquired and used, as well as problems of later judgement. It involved the granting out, for payment, of the right to collect taxes, and ensured that the resulting officials were employees not of the ‘state’ but of private bodies. Far from being a flawed aspect of government and information usage, tax-farming was an effective way to raise revenue. It was made more necessary by the ability of tax-farmers to provide credit, both from their own resources and by drawing on domestic and international credit networks, the latter both entailing information requirements.

Tax-farming short-circuited the administrative deficiencies of government, not least the difficulty of creating a tax-raising system that would be able to raise taxes from those eligible to pay but that would not use up a major portion of the yield itself in the process. Tax farming did the latter, but without the problem of paying and controlling officials. Indeed, the information available to government often revealed the extent of inefficiencies and corruption among its own officials, as in 1682–4 when William Culliford, the surveyor of the Customs, investigated the situation in southwest England and south Wales.21

Furthermore, tax-farming helped cope with government’s cash-flow problems and, in particular, with the difficulties in ensuring long-term borrowing in the absence of a developed revenue system. The ability of the tax-farmers to provide credit is reminiscent of modern practices, such as Public Finance Initiatives (PFIs) in Britain. In light of this, the customary scholarly teleology in the nineteenth and twentieth centuries that rejected such a sharing of roles and power in favour of the rise of the bureaucratic state looks less certain from the perspective of current procedures.

Tax-farming was symbolic of much of government, including the source, ownership and use of information. The potential for power created by notions of sovereign authority, and arising from the resource base, could not be realised by government; instead, it was necessary to turn to the compromises and exigencies of partnerships. In part as a result of the limitations in the information at the disposal of government, the most effective way to govern was, as already noted, in cooperation with those who wielded social power and with the institutions of local authority. Far from seeking to foster a new ruling group, including new information facilities, to serve political, administrative and social needs, most rulers sought to employ the traditional elite, a means best served by maintaining existing governmental practices. In contrast to the present situation, not least in regard to seeking the mandate of the future and pursuing new forms of efficiency, this process established a powerful continuity with past practices, which was appropriate in an age in which legitimacy and legality were derived from them.

Thus, there was no ‘big bang’ of new forms of government. This was true of the West, both in the age of the so-called ‘new monarchies’ in the late fifteenth and early sixteenth centuries, and at the high point of what was subsequently termed absolutism in the late seventeenth century. Similarly, there was no significant transformation in forms of government in China, India or the Ottoman and Safavid empires, although changes of dynasty brought major discontinuities in the politics of power. The region where the greatest transformation in forms of government occurred was in those parts of the New World brought under Western control. The most important developments that occurred in the West were, first, the need to address the issue of governing trans-oceanic territories, and, secondly, the subordination of traditional ecclesiastical interests in Europe during the Reformation. Across the board outside the colonies, new governmental agencies supplemented, rather than replaced,
existing administrative systems – necessarily so, as the number of officials in these agencies was limited and they operated in a world that was resistant to new pretensions on the part of government.

There was change, although it was not always easy to judge. The demand for official identity papers – passports or certificates – from travellers became normal in the West by the late fifteenth century, notably in France from the 1460s. On the one hand, this process appears very modern, bringing together the growing pretensions and power of authority, and the development of techniques of identification and recording.22 However, the frequency with which the demand to register aliens and others was repeated also reflected the difficulties of ensuring compliance with new regulations. This was a general problem.

As administrative organisations, both lay and ecclesiastical, largely reflected the values and methods of the social system, the modern connotations of the term bureaucracy are inappropriate here, and this situation greatly affected the context within which information was accumulated and assessed. Appointment and promotion generally resulted from social rank, patronage and inheritance, which, in combination, defined merit. The significance of social rank created particular demands for information. Coats of arms and other aspects of heraldry were thus important aspects of information systems in which individual and family assertion vied with attempts to maintain order. Forms of display varied. Alongside traditional devices – such as coats of arms and drawings of family descent, often in the form of a tree, in the homes of the elite, as well as grand funerary monuments, for example in the cathedral at Tallinn (which was converted to Lutheranism) – came attempts to use new forms, notably the culture of print, in order to assert lineage and priority.

Given this social and cultural context, it is unsurprising that there was little in the way of a distinct bureaucratic ethos. Concepts of fidelity and clientage, and attitudes of status, characteristic of the aristocratic social system, illuminated policy and provided much of the texture of administration. The habit of regarding office as personal property was deeply ingrained.

Using Information

Nevertheless, there was a greater attempt to retain documents as archives, notably in Simancas (Spain) from 1545 and Florence from 1569. Moreover, the volume of documents retained rose considerably; for example, for the French secretary of state for war from the 1680s.23 Military needs led to much of the accumulation of information, as with the English militia for which the county lords lieutenant were responsible; subjects had to serve and to provide weapons and the 'musters' listed both. National surveys of trained seamen in the late seventeenth century, notably in France, sought to address the needs created by the development of large fleets in a period of acute international competition.24

Alongside secular bodies came the efforts of ecclesiastical counterparts, some of which had a longer track record in this field. For example, the 1688 earthquake that destroyed much of the Italian city of Benevento, a papal possession, was followed not only by the rebuilding of its churches by Archbishop Vincenzo Orsini (later Pope Benedict XIII), but also by the preservation and cataloging of their archives.25 A different aspect of the concern with documents was provided by the rise of antiquarianism and the ability now to publish the results of such research, as with Richard Carew's Survey of Cornwall (1602).26

The role of documents, both in government activity and in scholarship, reflected a more general commitment to experience as a basis for credibility, an empiricism seen in science, philosophy, judicial practice, theological arguments and travel accounts. Experience had scarcely been absent earlier, but authority and reliability had been established largely in terms of political and social status, notably (especially in the law) the rank, prominence and reputation of the witness, rather than as a result of what had been seen. This new focus on experience was also significant for the process of questioning interpretations, and thus establishing them by means of a system of disputation.27

Moreover, especially from the seventeenth century, the incessant nature of international competition led in the West not only to attempts to utilise the resources of society, a traditional objective, but also to a renewed wish to understand those resources and to appreciate and assess the wealth-creating nature of economic processes and social structures. Such an appreciation was seen as a basis for the pursuit of measures to increase wealth. These attitudes are generally called mercantilist or cameralist, although they were not identical. To the mercantilists, bullion (gold and silver) constituted and was the measure of wealth, whereas for cameralists it was principally a medium of exchange. The pursuit of measures to increase wealth required information, planning and a notion of secular improvement.28 Whereas, in the sixteenth century, much of the drive behind manufacturing and mercantile projects involved entrepreneurs seeking profit through governmental support, notably the granting of monopolies, the emphasis in the seventeenth century was on direct state activity.

In France, a country that under Louis XIV (r. 1643–1715) set an influential model for government in the West, Jean-Baptiste Colbert, in effect the finance minister, established a corps of inspectors designed to provide information about manufacturing and to implement royal degrees. Colbert wanted production quantified so as to help him understand and, thereby, be able to manage developments. His initiatives in the 1660s were to be significant to the
development of a long-standing statistical basis in French government, a basis that allowed for the pursuit of informed policies of change. In 1663, royal officials in the French provinces were instructed to compile information about the areas under their jurisdiction. This represented a means of control very different from those of royal visits and the related personal links advocated, for example, by Frederick William I of Prussia in 1722 in his written instructions for his heir. Thus, some of the norms of the information state were set before the social and institutional basis for bureaucratic predictability could be established. Drawing first on the Dutch and subsequently on the British, the French government was also to make a major effort to emulate successful foreign technology, a process that was highly important in the diffusion of information.²⁹

Secular improvement – the capacity of, and need for, humans to better their condition on Earth, improvement achieved through state action – might be one definition of the modern governmental use of information. The idea developed in the West of the state as an initiator of legislative and administrative rules designed to improve society and increase its resources: the theory and practice of cameralism. The two goals were seen as directly linked. Some envisaged a central role for the state, represented by an absolute sovereign authority assisted by a corps of professionalised officials. Indeed, the development of written law, at the expense of unwritten custom, represented an important move in this direction because the written law was unified, not particularist. In cameralist theory, the state’s legislative scope was universal, covering the mores of subjects as much as their economic activity, because the ability of a subject in the latter regard was held to be dependent on the former. It was therefore appropriate to gather information on moral behaviour, and to understand this behaviour in terms of information that could be gathered: for example, the rate and frequency of the taking of communion. Thus, the linkage would be: disciplined society, plentiful resources and a strong military.

Cameralist and related ideas indicate the degree to which eighteenth-century Enlightenment attitudes towards government and the purposes of the Western state (and therefore attitudes to non-Western states) were prefigured by, and in large measure based upon, the goals and practices of what has been termed the well-ordered police state.³⁰ In turn, these goals and practices of sixteenth- and seventeenth-century Western governments drew on the corpus of legislation passed by medieval towns: there was a continuity of regulation and planning, albeit on a different scale.

Such an account helps explain a rising need for types of information in the West. Descriptive statistics owed much to work in Germany, the centre of cameralism, notably by Hermann Conring and Gottfried Achenwall. However, it is important not to translate a discussion of need and of intellectual advances too readily into an account of what actually happened. Indeed, there was a very clear gap between initiatives and legislation and, on the other hand, implementation and administrative and social practice, a gap both clarified by information at the disposal of states, and also concealed by it.

The creation of new administrative bodies did not end this contrast, although it did provide opportunities for gathering new information. Established on a permanent basis in 1527, the Florentine Health Board might appear a major new adjunct to government, not least because, although initially created to respond to the plague, by the early seventeenth century it had become a more wide-ranging body for the maintenance of public health. The Board dispatched physicians to examine particular epidemics and also sought to use systematically collected information, demanding in 1622 that local authorities report on the state of sanitation. However, in a reminder of the reliance of government on consent, neither the local authorities nor the people proved ready to respond to the advice of the Board. Policymaking in public health was not greatly carried forward in Tuscany during the sixteenth and seventeenth centuries, despite its being a compact state with a resident ruler (unlike Naples) and a relatively good tradition of urban regulation.³¹

Grain supply was generally closer to the heart of government than public health, since a shortage of grain and a rise in its price could easily lead to public disorder, a prospect that is topical again today. Famine also had a totemic quality as an indication of negligent and immoral rule and/or a lack of divine support. As a result, governments gathered information on, and often intervened in, the grain market. In England, government policy was regularised with the issue of Books of Orders from 1586. Justices of the peace were obliged to determine the availability of surplus grain and to ensure that it was brought to market. Focusing on distribution and allocation as cause and solution ensured a need for information, and the resulting documentation was voluminous, providing data on topics such as the size of households.³² There was similar concern elsewhere in the West and also in China.

Whatever its limitations, the potential of government, particularly as a means to mobilise the resources of society in order to maximise the public welfare, however defined, was increasingly discussed and grasped in the West from the seventeenth century. Pressure for stronger and more uniform administration, a system with particular requirements for information, clashed with traditional concepts of rulership. The latter were mediated through a governmental practice reflecting privileges and rights that were heavily influenced both by the social structure and by the habit of conceiving of administration primarily in terms of legal precedent. This was a situation that did not call for the creation or understanding of new forms of information. Thus, the idea of a contrast between new ideas of government and established social practices has
to be qualified by the extent to which cameralists sought to work through traditional institutions.

Nevertheless, linking up to the Scientific Revolution, however tangentially, there was a clash between a new mechanical/unitary/natural-law concept of monarchy and an older one that was traditional/sacral/corporate/confessional. This clash can be connected to that between the ideas of a territorial state, in which a particular law prevailed and was developed by the government, and that of international values and codes in which ethnic and/or religious status was more significant. In the case of absolutism, the term used to describe much Western monarchical government in the seventeenth century, it is possible, in accordance with the mechanical/unitary/natural-law concept of monarchy, to emphasise the role of novel ideas about authority and government in ministerial circles, not least those that sought to define new theories of the purposes, roles and rights of the state, and to abstract government from inherited legalistic suppositions. It is also pertinent, in contrast, in explaining the goals, nature and limitations of government, to stress the more functional and pressing need to fund warfare. Both approaches have to take note of the extent to which the power of the landed aristocracy continued to determine the contours of government.

Little of this was new and, indeed, rather than seeing the West in the sixteenth and seventeenth centuries largely in terms of modernity, and shaping any discussion of bureaucratisation and information accordingly, it is again pertinent to note continuity with medieval circumstances. For example, attempts by rulers to enhance their authority and power at the expense of other bodies, such as town oligarchies, were long-standing; Emperor Frederick Barbarossa fought the cities of the Lombard League in the late twelfth century. The practices of secret government that undercut theories of bureaucratisation, or, rather, showed how difficult it was to match the nature of government to the reality of court politics, were also long-standing. As a consequence of such political and practices, the teleology of modernisation looks problematic, certainly if presented in terms of bureaucratisation.

Assessing the novelty and modernity of the early-modern period in the West not only requires discussion of the continuity between, say, the fifteenth and sixteenth centuries, but also necessitates asking how far the sixteenth century can be seen in terms of a resumption of developments after the long demographic, political and psychological downturn stemming from the crises of the fourteenth century, of which the Black Death was only the most prominent. Thus, the so-called 'new' Renaissance Western monarchies of the late fifteenth and early sixteenth centuries can be regarded as another stage in a long-term development of order and public authority; not identical with, but similar to, thirteenth-century Western monarchies. This perspective can be extended by treating the various crises of the seventeenth century and, in particular, the protracted end to population growth as a return to the fourteenth century.

A consideration of the sixteenth and seventeenth centuries in terms of a longer cycle of growth and decline helps us to recover the perspective of most contemporary commentators and to appreciate their frequent reference to past examples. Such an approach, moreover, captures an important truth about the limitations of the linear notion of change, and of the positioning of information accordingly.

It is also possible, rather than stressing change, to emphasise political compromise as a response to a widespread and severe mid-seventeenth-century climatic, economic, social, and political crises, and to link the West and China accordingly, as each experienced recovery from crisis in part in terms of such a compromise. These compromises, in turn, became the basis not only for a degree of governmental and political stabilisation, but also for the organisational development that can be seen in the eighteenth century alongside, certainly in the West, intellectual enquiry about new solutions.

In addition to the emphasis on continuity or, at least, continuities, it is necessary to point to new uses of information. In part, this was a matter of the deployment of the printing press. For example, the issues posed by religious authority were a major cause of the production of relevant printed material. There was also, as a significant development, surveillance that resulted in the generation of information about popular attitudes and that sought to control these attitudes, notably religious ones. Moreover, as already indicated, cameralism and mercantilism represented significant state-wide attempts to pursue planned improvement.

Political Arithmetic

Political arithmetic also pursued improvement through state action. The term was coined by 1672 by William Petty (1623–87). Educated in Caen, Utrecht and Leiden, the last two the major Dutch universities, and thus embodying international links within the West, Petty sought to use knowledge for the public good, an approach that drew on ideas associated with Francis Bacon and Thomas Hobbes. Bacon saw parallels between the laws of nature and those of civil society, and was an advocate of the reform and standardisation of English law. Petty's application of mathematical reasoning and knowledge to government policy was seen most clearly in his survey of Ireland in 1654–5, which provided the means to redistribute 8.4 million acres of land from Catholic to Protestant owners, thus grounding the Protestant Ascendancy underlined by Oliver Cromwell's recent conquest of the island, as well as making money for himself. Petty also carried out a census in Ireland in 1659.
The greater information available on Ireland was part of a pattern by which states gathered material on subordinate territories. This long-standing process became more apparent in the early-modern period as more data were recorded and as more initiatives were taken to gather it in. It overlapped with the world of publicly available information, as material was published on areas in Europe that had hitherto been obscure to distant audiences: for example, Guillaume Le Vasseur's description of Ukraine. Le Vasseur, a French military engineer who served with the Polish forces in Ukraine, also produced the most detailed maps so far of Ukraine. Thus, the processes of information gathering seen with trans-oceanic expansion were also present in Europe, although there were contrasts as well as similarities.

In the British Isles, the discontinuities stemming from the civil wars of 1638–51 and the republican revolution encouraged speculation about new purposes and methods for government, as well as actual innovation. Information served Petty as a means to understand the operations of society and, thus, to provide a way to improve it—the last a key theme. His plans included the compulsory movement of English and Irish people in order to lessen differences between the two countries, a process that would then be taken further by intermarriage. In this case, information was linked to coercion.

Political arithmetic was deployed by Petty as the means for a rational statecraft, with rationality understood as grounded in mathematics, an approach also seen with Thomas Hobbes, with whom Boyle and Petty had close connections. A Baconian science, political arithmetic denoted the conduct of policy by statesmen who had information about the numbers of people and their wealth, and guided policy accordingly. The expression 'political arithmetic' reflected the spread of numeracy among the literate and the notion that the presentation of knowledge and ideas in mathematical form could be useful in policy terms. A founding member of the Royal Society, Petty wrote works including a Treatise of Taxes and Contributions (1662).

Political arithmetic also gained authority as a form of discourse about statecraft, which in turn helped shape assumptions about how the latter should operate. Thus, the proposition of power was expressed in terms of a rationality based on functional values presented in mathematic forms. As such, developments in Britain reflected and contributed to a language of statecraft in which terms and ideas focused on economics emerged. Political arithmetic lent itself both to the formulation of government policy and to the argumentation required in the lobbying that followed the more frequent meeting of Parliament after the Glorious Revolution of 1688–9, not least as Parliament came to play a key role in the politics and processes of commercial regulation.

Petty was not alone. His friend John Graunt (1620–74), a cloth merchant, analysed London's mortality figures in terms of what would now be called a time-series, assessing change through time. In doing so, Graunt captured the potential of political arithmetic for understanding social developments and looked towards the use of actuarial statistics in discussion in the 1700s about public insurance. Charles Davenant (1656–1714), appointed inspector general of imports and exports in 1703, was responsible for producing fiscal data that were supposed to inform government and parliamentary policy. Earlier, as a commissioner of excise, Davenant had confronted the problems posed in ensuring the accurate gauging of casks. The need for standard measures and practices was a key issue.

Although presented in an impartial fashion, information was often partisan. Thus, Davenant's Reports to the Commissioners for Public Accounts (1712) served the agenda of the Tory government in demonstrating that trade with France could be beneficial, whereas that with the Dutch had harmed Britain. In 1713, the government unsuccessfully tried to get Parliament to approve a trade treaty with France.

In medicine, there were calls for a mathematically minded practice, especially by Archibald Pitcairne (1652–1713), the Edinburgh-trained professor of medicine at first Leiden and then Edinburgh, who used the mathematical and mechanistic character of astronomy as a model for the medical understanding of the human body. His Leiden lectures, given in 1692, were eventually published in Latin in 1717 and appeared in English as The Philosophical and Mathematical Elements of Physick in 1718. In Edinburgh, Pitcairne's theory had already played a role in the bitter personal and political factionalism of the 1690s, but was also challenged on intellectual grounds, notably on the applicability of mechanistic philosophy to the human body, a thesis contested by Edward Eizat in his Apollo Mathematicus, or The Art of Curing Diseases by the Mathematicks (1695).

Conversely, supporters pressed for the use of mechanistic mathematics as a basis for medical deduction. In the event, the stress on an empirical reliance on observation prevailed over the argument that theoretical principles familiar from mathematics should come to the fore. Nevertheless, the latter helped lead to the emphasis on statistical methods seen with the evaluation of smallpox inoculation in the 1720s and the increase in quantitative reasoning after 1760, an emphasis that looked towards the development of public health as a concept and practice in the West in the early nineteenth century. Although statistics were employed to advance particular interests, the vitality of eighteenth-century statistics as a whole emerges clearly. More generally, whereas Petty and the political mathematicians grasped how information could be used for statecraft, the degree of governmental engagement was limited. Petty had many ideas, but few were taken up.

A parallel to the use of mathematical information was provided by the rise of the footnote, notably in Pierre Bayle's Dictionnaire historique et critique
Such developments were aspects of a more general consciousness about the category of the 'fact'. The use of the latter term spread greatly; for example, in England from the mid-sixteenth century. The legal grounding of the fact as evidence in law was particularly important. It was not unrelated to social assumptions, notably the greater value of testimony by those who were of status, but there were also institutional practices that helped prevent a simple reliance on such assumptions.

Conclusions

The public context of information changed in the West as governments in the later seventeenth century sought to understand and utilise their resources in a fiercely competitive international system and against a backdrop of demographic, environmental and economic difficulties. This utilitarian drive for accurate information interacted with broader cultural and intellectual developments. In the latter, the use of what were presented as facts spread in the West, not least in the discussion of the unexpected, whether in news, travel or marvels. Scientific experimentation and debates about religious issues were both aspects of this wider engagement with fact, which was not therefore simply driven by science.

Looked at differently, there was no clear divide segregating science from other kinds of enquiry. Indeed, Newtonianism was seen by some to betoken a general approach that could, and should, be applied across human knowledge. The role of John Theophilus Desaguliers (1683–1744), an active Newtonian scientific lecturer, in the development of Freemasonry in Britain in the early eighteenth century indicates the way in which new approaches to knowledge and values took a variety of forms, some of which overlapped and interacted.

The useful malleability of information and the rate at which it was accumulated nevertheless posed major problems of organisation and exposition. In response to apparent overload, a range of devices was employed by institutions and individuals. These devices were not new, but they were pushed forward by the scale of the material now available. Archives and systems of record-keeping were the key response for institutions, and they were encouraged by such developments as the systematisation of diplomacy so that correspondence was retained and filed. At the individual level, there was a resort to commonplace books. There was also a use of book wheels so that volumes could be consulted more readily. The volume of information available to governments and individuals was to continue to rise greatly in the eighteenth century, as was the problem of how best to use it. The pressure to classify material, and devise new systems accordingly, owed much to this volume.

The social location of rising information usage was also significant. In the West, particularly in the Dutch Republic and, subsequently, Britain, a marked development in bourgeois values, as well as of practices focused on commerce rather than rentier activities, played a role in the formation of social attitudes. Aristocratic lineage and behaviour remained significant, but the role of trade, an activity that required frequent information, was important in the growth of a new social politics that operated at more than the urban level. This was a social politics in which information and science played a positive role, providing not only valuable knowledge but also a positive image of appropriate purpose and useful wisdom.
necessary in order to connect and make operable the large number of networks that comprise it. The vulnerability of such systems poses an issue for their future development.

Conclusions

Presentism is a major issue when looking at change. Indeed, scepticism about whether a revolution, in terms of transformative change in capabilities in information technology, is here, or just around the corner, rests in part upon the misleading characterisation by such arguments of the earlier situation in order to emphasise features of a supposed transformation now. In reality, the argument that it is only now that information is interactive and dynamic is flawed. On the other hand, the scale, range and speed of information are all different today from what they were fifty years ago, just as they were different fifty years ago from the situation fifty years before that. Moreover, the rate of change in information technology is speeding up, helping enhance the capacity to store (and, at least, in the short term) store information, and thus to contribute to the collective learning that is important to the general nature and regional character of human development.

This study has indicated not only that the process of change in information technology is a long-standing one, but also that it is centrally linked to politics and power in the widest sense. As such, the use of information in understanding the internal dynamics of states, and also their relationships with one another, is a crucial topic. The resultant need to understand and order information is a key theme, but one that is not fixed in any single sense of modernity: other than the awareness that change is a continual aspect of modernity. Greater quantities and new types of data will continue to be collected and disseminated by increasingly complex technological methods, but this process will still be subject to forms and ideas of interpretation and distortion in its presentation and use. Moreover, there is a mismatch between the enhanced technology of data acquisition and the slower rate of improvement in the technology for analysing data. As a result, there has been great interest in companies that can manipulate and manage large data sets.

Information is classically located in terms of a functional approach to modernity, with statistics both cause and consequence of the development of the modern state. The availability and analysis of information are seen in terms of big government, able to plan and execute policies in an informed and predictable fashion, and also capable of integrating feedback readily into decision-making and policy implementation. In this scheme, information clarifies the links between the individual and the general, and thus permits the descriptive and prescriptive understanding of social laws. Information therefore apparently makes policy objective and, thus, both successful and unchallengeable.

This understanding of modernity, however, has always been contested because of the consequences of the power and powers it entailed. Change, whether not presented as reform and modernisation, has aspirations and results in terms of existing circumstances that are disruptive and challenging. For example, plans to reform education in Hungary in the eighteenth century were distrusted as it was feared that the increased power for government it entailed would mean more power for Catholics. Furthermore, change itself, whether or not seen in terms of the condition of being or becoming modern, is unwelcome to many because of hostility to the idea of change, because of the disruption it brought and because of support for existing arrangements, notably the values of continuity and tradition. Issues of legitimacy also played a role, as the traditional could most readily be presented as legitimate.

Opposition to change was also prompted by what happened or appeared to happen when change was pushed hard: for example, the impact in the West of the French Revolution and in China of the Self-Strengthening Movement. At the same time, as a reminder of the diversity of both West and non-West, the impact in the West of the French Revolution was far from uniform.

Despite hostility to programmes for improvement, they remained strong, being encouraged, in particular, by the democratisation linked to the spread of
mass education, the right to vote and national education over the last 150 years, as well as by ideologies that lay claim to the mandate of improvement. The technological transformations of the nineteenth and twentieth centuries also encouraged a sense of the potential and inevitability of change (as well as speeding up the dissemination of information on how things worked) and, indeed, reached to include the potential for altering the human body and mind, and thus the capacity to incorporate sensations and memories. The idea that biology itself is an information system with genes as key players, not least because they encode past information, notably the relationship between organism and environment, is a potent instance of the range of application of the term and concept information, and the related porosity of other disciplines.

The classic exposition of modernity was challenged in the late twentieth century. In part, the challenge reflected growing uncertainty about the values of centralisation and state control, and their ability to deliver improvement, as well as, in many cases, more specific hostility to Communism. Moreover, a more cautious assessment of the capability of states proved a potent criticism of ideologies of facile optimism about change. The long-standing tendency to associate political modernity with bureaucratic statehood had positioned information as the characteristic and servant of the latter, and as the enabler of the former. The teleology central to this account is intellectually questionable, while the value of powerful states became more contentious, at least in the West, as a result of the history of the twentieth century, notably the role of Nazi Germany and the Soviet Union.

Instead, alternative strategies for governance and for the provision of social value became more prominent, not least due to the new salience of the concept of human rights. The long-standing critique of knowledge as a system of power, a critique that was greatly strengthened by intellectual trends from the 1960s, also contributed to the caution about both modernity and demands for information.

The resulting location of information thus comes to the fore. As suggested throughout this book, the idea of information as far from neutral – indeed, as a form of power, both on the global scale and within politics – is pertinent. So also is the view that the lack of information and understanding reflects and sustains powerlessness. The Test, a prominent London newspaper, claimed on 12 February 1757: ‘The mechanism of government is too intricate and subtle, in all its various motions, for a common eye to perceive the nice dependencies and the secret springs, that give play to the complex machinery; and, in consequence, the generality of people while the great political movements are passing before them, are full of undiscerning astonishment, and only gaze on in expectation of the event.’ This point does not imply that information is only about power, but that element is certainly significant. Yet, power is also diffuse, a matter of the views and interests of the people as well as the state, of consumers as well as capitalists. Moreover, the equations of information look, and are, different depending on the people and state in question, and, also, with regard to the particular conjunctures and interests in question. The economic context of and drive for information is particularly instructive. To adopt a schematic, stadal interpretation, an approach used from the eighteenth century, there was a contrast between the information needs of territorial states where relatively small elites were composed largely of landowners primarily interested in extracting surplus value from land ownership and use, and trading states controlled by more complex commercial elites interested mostly in controlling the flows and nodes of goods and capital. Surplus value and taxable wealth came from tapping into, creating and controlling these flows which depended heavily on information. Thus, there was a divergence between West and non-West as well as within both. Information technologies were open to all Westerners but were only slowly or poorly adopted by non-Westerners.

This emphasis remains the same today, with the added element that companies possess a large amount of information about people. Commercial interests and technologies proved particularly significant for the development of enhanced military capability in the nineteenth century, and this element remains important today. Thus, GIS surveillance depends heavily on commercial technologies.

The consequences of information also look very different depending on the state in question and, indeed, the perspective adopted. If the key to successful electioneering in England from the 1680s rested on good information, the appearance of manuscript and printed poll books both aided attempts at political control and could be seen as a form of political deterrence making the costs of further party warfare prohibitive. Information today is linked to both consumerism and democratisation, but they have different meanings and implications in particular contexts.

At the global scale, Western strength at the expense of other powers in part relied on access to, and use of, information for military, political and economic reasons. The ability to grasp the world conceptually in a fashion that could be utilised, notably for maritime power-projection and trade, is a theme of this book, and is one that made Western states distinctive from the late fifteenth century. Trade itself, making wealth from exchange, and not from nature either directly (agriculture) or indirectly (by means of water and wind power, and by mining), represents the degree to which human activity relies more on intellect and artifice than that of other species; even more so long-range trade and that via intermediaries. Non-Western maritime trade continued, but not on the long-range scale of Western trans-oceanic commerce, nor with equivalent political and military dimensions. Moreover, information proved a key
constituent of the systems for the production and diffusion of new and useful knowledge that proved crucial to Western economic progress, notably commerce and technology. The precision and inter-operability of measurements became more significant with long-range trade, and the needs of the latter provided a different format for the custodianship of measurements and records from those offered by the fiscal exigencies of states.

The ability to gather, manipulate and deploy information therefore gave the Western nations a distinct and significant strategic advantage. The extent to which this advantage will turn out to be temporary is unclear. The extent to which the situation of relative Western power at the global level has changed, is changing and will change is unclear, and appears less precise than discussion of international trends in terms of weapon systems and financial resources might make it appear. The contentious nature of this topic relates in part to the past – namely, the extent of timing of and reasons for Western hegemony – but also in part to the present and future, notably the relationships between the West and the non-West, in particular, between China and the USA. In 2012, the OECD predicted that by 2060 China and India would have 46 per cent of world GDP, with China’s economy far greater than that of the USA, although its \textit{per capita} GDP was predicted as just 59 per cent of that in the USA.

The information dimension is very important to this and other relationships. As this book has suggested, this dimension relates not only to the uses of information for the pursuit of particular ends, but also to the operation of governmental systems, the ability to integrate and utilise scientific advances, and the creation of an impression of relative success. These factors play a role in differences between countries. Thus, the extent of Japanese sovereignty and the particular course of politics there helped explain an ability to absorb and use Western scientific and technological developments in the nineteenth century that was greater than those of India and China.

The location of modernity and modernisation might be regarded partly as an aspect of the creation of an impression of relative success – in fact, of the propagation of a potent image rather than any underlying reality, for such an image is a significant form of soft power, not least as it suggests not only progress and further capacity, but also particular cultural and social characteristics.

The role of image directs attention to cultural factors and to the participation of part or much of the population in a willingness to absorb such images, and thus to understand modernity. This is an aspect of the more general significance of the public. As Marshall Poe pointed out: 'we are active participants in the creation and maintenance of the permanent record machine.' That, however, does not mean that people necessarily like the terms on offer, or the speed with which impressions alter, or the possibilities of the future that are apparently imminent.

The pace of technological change at present is fostering an ease in the dissemination of opinion that not so much collapses hierarchies but rather challenges any pattern of control. In part, this situation may reflect the degree to which the late 2000s and early 2010s were years of widespread crisis in the world economy, notably the Western economy, with particular pressure on living standards and on assumptions about improvements for the bulk of the population. As a result, much of the opinion expressed about change was critical.

Nevertheless, modern technology has led to bold claims about new forms of politics and democracy. The scale of change is certainly striking. Ofcom's \textit{Communications Market Report}, published in July 2012, revealed that the number of texts sent overtook the number of phone conversations for the first time in Britain in 2011, while the number of mobile phone calls also outstripped those made via a traditional fixed-line phone for the first time. In 2011, 92 per cent of the United Kingdom population owned a mobile phone, while 80 per cent of United Kingdom homes had Internet access and 60 per cent could plug into superfast broadband. The average number of monthly texts per person had risen from seventy in 2006 to two hundred in 2011, so that 150 billion texts were sent in 2011. Age trends indicated an accelerating trend particularly prone to use text. Email use in the UK in 2010–11 increased by 17 per cent, while use of the post fell by 30 per cent and of landlines by 4 per cent.

The capacity of new technology for facilitating disorder was certainly shown in the London riots of 2011, with rioters coordinated by mobile phone and BlackBerry use, and their communications encrypted, which handicapped the police response. Moreover, employing the new systems of information diffusion to spread falsehoods has captured a more general problem posed by new means of almost instantaneous spreading of information. On an election day, for instance, these new systems might be used to inform most of the electorate (falsely) that a particular candidate is a paedophile. Such gossip has always been around; in theory and practice, new communications systems, if used effectively, make it easier to dispel such rumours, of course. But it might take longer than the opening hours of polling booths. In August 2012, the Indian government expressed concern when social-media sources spread rumours that Assam migrants in southern cities such as Bangalore would be attacked by Muslims in a reprisal for intercommunal violence in Assam against Muslim immigrants from Bangladesh, rumours that led to many of these migrants fleeing home. More generally, the collection of ever-greater quantities of data does not automatically spread enlightenment, but enables those who wish to sustain a particular belief or set of opinions to seek out data that support their opinions and to ignore data that suggest a contrary position.

Indeed, the end of established hierarchies in the dissemination of information is a cause of inherent uncertainty. Whether that situation is modern, or a
consequence of modernity, or can be readily linked to the issue of modernity, is unclear, but the suggestion here is that this uncertainty is an aspect of the experience of modernity. Debate over such a linkage is scarcely new, and previous developments, such as printing and mass literacy, were also seen as subversive. That such concern recurs, however, does not mean that it is without cause. In particular, successive developments have provided individuals and groups with new ways to explain their identity, and thus to suggest that they are not all the same.

Outside the nature of modern society and the format of democratic politics, information technology has empowered insurgents in irregular warfare by opening a broader range of militant and political action, enhancing such warfare as a continuation of political discourse. Thus, information contributes not only to the texture of modern government, but also to a serious crisis of ungovernability. The interaction of the two can be paralleled in the economic, social and cultural sphere. This interaction offers an important qualification to the tendency to adopt a technology-linked determinism in which modernisation and modernity are allocated to stages in this development. Focusing instead on contrary pressures towards governability and ungovernability permits an analysis of the situation in terms of social characteristics for which technology acts as an enabler.

If that approach is adopted, there was a major change with mass literacy and urbanisation, a change prefigured by the importance and consequences of printing in the early-modern West because printing was linked to confessional change, politisisation and the large-scale dissemination of scientific and intellectual advances and speculation.

For these reasons, modernisation can be seen as a process beginning in the early-modern West, developing greatly in the nineteenth century, notably as industrial development led to large-scale urbanisation, and affecting most of the world's population by the close of the twentieth. Indeed, in East and, far more, South Asia and sub-Saharan Africa, it is very much a work-in-progress. The change in the human environment created, and creates, new opportunities and pressures, and information is a part of this world. It is an important aspect of modernisation. If neither defines the other, the history of recent centuries requires an understanding of their relationship.

Notes

Chapter I  Introduction

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