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A Most Excellent Antidote: Thomas Willis, the *Diatribae duae* and the Physician's Duty

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "A Most Excellent Antidote: Thomas Willis, the *Diatribae duae* and the Physician's Duty" submitted by Michael James Hawkins in partial fulfillment of the requirements for the degree of Master of Arts in History.

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Abstract

For the devout anglican and royalist physician Thomas Willis (F.R.S., F.R.C.P., 1621–75), the events of the Civil Wars and the Interregnum signaled the triumph of chaos over the true religion and government of England. He presented a solution to these problems in the *Diatribae duae Medico-philosophica*. For Willis, a learned physician had many duties; he was to heal his patients' bodies, their souls *and* the body politic. Medical reform, therefore, was a potentially dangerous endeavour especially when undertaken by unlearned quacks and empirics who had little regard for tradition and order. Willis provided an alternative to their radical reforms by integrating present experiences with traditional beliefs and practices. Willis' restoration of learned medicine entailed the reconciliation of chemical philosophy with traditional and proven galenic cures and practices. He hoped his physic could heal both his patients and the body politic.

Acknowledgments

It seems fitting to start my acknowledgments by thanking those who 'kindled' my interest in history. I would like to thank my mathematics professors at the University of Alberta (whose names I regrettably forget) by making me painfully aware that I was not suited to be a mathematician. Had they not failed me, I likely never would have turned (in desperation) to the study of history.

Thanks go to the Hannah Institute for the History of Medicine for granting me their M.A. scholarship. Without their assistance, this thesis would not have been possible. Special thanks go to my supervisor, Dr. Julian Martin for his encouragement, advice and support. I have benefited greatly from both his help and friendship. I especially thank him for his patience during my many discussions of Thomas Willis and the finer points of fermentation, fevers and the urine. I also thank Dr. Lesley Cormack upon whom I sounded out many of my early arguments on the historiography of the period. I also thank Andrew Drummond for his friendship and for our numerous discussions of Stuart historiography over the years. Jim Bohun and Dan Brown at the University of Cambridge deserve special consideration for their help in acquiring vital research materials.

It would be impossible for me to name everyone to whom I owe thanks; instead I would to thank all my friends and colleagues in the Department (especially those in room 2–8) for their support and for providing an environment that countered the stresses associated with taking a degree. Hopefully I'll be able to remind them that my conversational repertoire does not *solely* revolve around mid-seventeenth century natural philosophy.

Most importantly, I would like to thank my parents and family for their love and support.

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A note on the text

My research required the compilation of biographical information on many individuals. The standard biographical dictionaries and source books (*e.g.* the *Dictionary of National Biography*, the *Dictionary of Scientific Biography*, *Biographia Britannica* and *Alumni Oxonienses*) were examined in the preparation of this work, yet wherever possible the primary sources have been consulted. I have attempted to reproduce the quoted material as faithfully as possible. Spelling, italicization and capitalization have not been normalized although minor orthographic changes have been applied (*e.g.* substituting 'j' for 'i' and 'v' for 'u'). All translations from the Latin were done by me and later verified against Samuel Pordage's late seventeenth century translation of the *Diatribae duae* included within *Dr. Willis's Practice of Physick* (London: 1681).

For brevity a number of abbreviations have been used for certain sources cited in the footnotes throughout the thesis.

Acts ..... *Acts and ordinances of the Interregnum, 1642–1660*. ed. C.H. Firth and R.S. Rait. 3 vols. London: H.M. Stationary Office, 1911

Casebook ..... *Willis' Oxford Casebook (1650–52)*. ed. Kenneth Dewhurst. Oxford: Sandford Publications, 1981

CCSP ..... *Calendar of the Clarendon State Papers preserved in the Bodleian Library*. various editors. 5 vols. Oxford: Clarendon Press, 1872–1970

CJ ..... *Journals of the House of Commons*. Vol. V. London: n.p., 1803

de Febribus ..... Thomas Willis. "*de Febribus*", in his *Diatribae duae Medico–philosophicae*. London: Jo. Martin, Ja. Allestry & Tho. Dicas, 1659, sigs. H_2*–Z

de Fermentatione .... Thomas Willis. "*de Fermentatione*", in his *Diatribae duae Medico–philosophicae*. London: Jo. Martin, Ja. Allestry & Tho. Dicas, 1659, sigs. A_3–H

de Urinis ..... Thomas Willis. "*de Urinis*", in his *Diatribae duae Medico-philosophicae*. London: Jo. Martin, Ja. Allestry & Tho. Dicas, 1659, sigs. Z_2–Cc_5v

Lectures ..... *Thomas Willis' Oxford Lectures*. ed. Kenneth Dewhurst. Oxford: Sandford Publications, 1980

LJ ..... *Journals of the House of Lords*. Vol. IX. n.l.: n.p., n.d.

Visitors ..... *The Register of the Visitors of The University of Oxford, from A.D. 1647 to A.D. 1658*. ed. Montagu Burrows. [London: Camden Society, 1881] New York: Johnson Reprint Corp., 1965

Introduction

Give place to the Physician, for the Lord hath created him.

Ecclesiasticus 38.12

Historians of seventeenth-century English science and medicine have long focused their attentions on Interregnum and Restoration England. These historians have provided compelling accounts of how natural philosophers in Oxford and London contributed to the development of the Royal Society.[1] An individual who appears, in passing, in almost every modern account is the young physician, Thomas Willis (1621–75). Willis was a constant feature of the intellectual, religious and social life of Oxford from the mid 1640s until 1666, yet little is known about either him or his work. An examination of his motivations and agendas is desperately needed. Not only did he participate in many of the natural philosophical investigations undertaken in Oxford throughout the Interregnum, he also became the preeminent physician of the Restoration era. Willis wrote more than a dozen medical and natural philosophical works that were read and reprinted throughout the latter half of the seventeenth century both in England and on the continent. His theories and works were widely advocated by many members of the Oxford community and later by prominent members of the Royal Society, the Royal College of Physicians and the Society of Chemical Physicians.[2] An examination of Willis' early life in Oxford provides invaluable insight into his later medical and natural philosophical researches *and* the reasons for their popularity in Restoration England. It has the added benefit of providing a lens through which we can explain the activities of his friends and colleagues, many of whom later became prominent members of Restoration society, such as Gilbert Sheldon (the Archbishop of Canterbury), John

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1 The most commonly accepted accounts are provided in Michael Hunter, *Science and Society in Restoration England* (Cambridge: 1981), Robert Frank Jr., *Harvey and the Oxford Physiologists* (Berkeley: 1980) and Charles Webster, *The Great Instauration* (London: 1975).

2 For example by Henry Oldenburg, Robert Boyle, Nathaniel Hodges, Charles Goodall and Marchamont Nedham.

Dolben (the Bishop of Rochester and then Archbishop of York), John Fell (Dean of Christ Church and later the Bishop of Oxford) and Richard Allestree (the Provost of Eton and Chaplain to King Charles II). His colleagues as a natural philosopher and physician were no less impressive; they included William Petty, Robert Boyle, Ralph Bathurst and Christopher Wren. Thomas Willis was the point of contact between groups of individuals within the Oxford community who held competing religious, political and natural philosophical interests. A thorough examination of Willis, therefore, enables a better understanding not only of his own concerns and motivations, but also the concerns and interests of many of those around him.

In his funerary tribute to Willis, his brother-in-law and long-time friend, John Fell said: "To finish all which is according to his merit, is not the work of one hour or paragraph."[3] Against his advice, I find it is necessary to do this by way of an introduction. While Willis rose to prominence in Restoration society as a wealthy and learned physician, he had humble origins. The eldest of three sons, he was born in the village of Great Bedwyn, Wiltshire in 1621. His family moved to North Hinksey, Berkshire (just outside the city of Oxford) shortly after he was born. Admitted to Christ Church College as a servitor in 1637, he was educated in Oxford during the height of Archbishop William Laud's power as Chancellor. There Willis established lasting relationships with prominent members of Caroline civil society, such as Dr. Samuel Fell, Dr. Gilbert Sheldon and Dr. Henry Hammond. The Civil War and the Interregnum had a profound influence upon his life. His experiences during these turbulent times only served to strengthen his anglican and royalist convictions. These beliefs, however, marginalized him from the institutional life of the university. Although an active chemist, natural philosopher and physician throughout the Interregnum, Willis lacked the social relations needed to advance his career significantly. He did manage, nonetheless, to forge new relations that allowed him to improve his condition; by the late 1650s,

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3 John Fell, "Postscript", in Thomas Willis, *Pharmaceutice Rationalis, pars secunda* (Oxford: 1675), sig. C_2.

he was known as a respected and trusted chemist. Yet with the Restoration his fortune and fame as a physician, philosopher *and* member of the political nation improved significantly. He was appointed Sedleian professor of Natural Philosophy and awarded his doctorate in medicine at the instigation of his old friend and patron, Gilbert Sheldon (then the Bishop of London and Warden of All Souls College). Willis was a key figure in the intellectual life of Oxford. He attracted and taught many young students who later rose to prominence, like John Locke and Christopher Wren. His works enjoyed a remarkable popularity within the university and the newly formed Royal Society. Individuals, such as Henry Oldenburg and John Finch, encouraged their study and sent copies abroad. Willis' reputation as a physician similarly improved. In 1666, he moved to London where he acted as physician to the highest ranks of the political nation. Among others, he attended Archbishop Sheldon, Lady Anne (Viscount) Conway and James Butler, Duke of Ormond. Willis had become one of the richest and most influential physicians in London. He died in 1675 and was buried in Westminster Abbey.

While little is known about the motivations and concerns behind Willis' research, there has been a consensus amongst modern scholars on his significance for the history of science. He has been considered to be part of an intellectual tradition spanning almost half a century. As an active member of the Oxford clubs, Willis is assumed to have been one of the many supporters of the new natural philosophy, as advocated by Robert Boyle and others. According to these accounts, the primary motivation for Willis' research was the desire to answer certain problems arising from Harveian physiology. His natural philosophy, like that of his Oxford colleagues, has been categorized as a compromise between chemistry and atomism. Because of this, Willis is generally considered to be a staunch opponent of traditional scholastic philosophies. Such impressions of Willis' natural philosophy and of his motivations, however, are based neither on an understanding of his own motivations and concerns *nor* on a careful and complete reading of his works; they are based almost solely on the identification and interpretation of

certain 'key' passages scattered throughout his writings. When Willis appears in the scholarship on this period, it is not because historians wish to explain and understand *his* motives and the concerns inherent in *his* natural philosophical research; on the contrary, Willis is used by historians to buttress their own contentions about the agendas of other natural philosophers. Willis, himself, has seldom been a research topic in his own right.[4]

It is hardly surprising that few historians have attempted to explain Thomas Willis and his research: it is not an easy task to undertake. Willis was very successful when it came to hiding his own interests and agendas. Even his contemporaries could reach little consensus on his beliefs and motivations. His work and his authority were frequently used by individuals, such as Nathaniel Hodges and Marchamont Nedham, to support directly conflicting beliefs about the roles, purposes and usefulness of the Royal College of Physicians and the Society of Chemical Physicians.[5] While many aspects of his life and work are of potential interest to modern historians, it is a patent impossibility to explain more than a small fraction of them in this thesis. Following the old adage, I decided to start my story at the beginning. I focus, therefore, on Willis' life and research through the publication of his first work in 1659, the *Diatribae duae Medico-philosophicae, quarum prior agit DE FERMENTATIONE SIVE De motu intestino particularum in quovis corpore. ALTERA DE FEBRIBUS, SIVE De motu earundem in sanguine Animalium His accessit Dissertatio Epistolica DE URINIS.* My decision to limit myself to Willis' life from 1621-59 was not arbitrary. These were the crucial

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4 The most notable full length studies of Willis' life and works are J. T. Hughes, *Thomas Willis, 1621-75: his Life and Work* (London: 1991) and Hansruedi Isler, *Thomas Willis, 1621-75, Doctor and Scientist* (London: 1968). Both authors are more concerned with understanding the founder of neurophysiology and the discoverer of *diabetes milletis* than with understanding Willis on his own terms. While not as comprehensive, Kenneth Dewhurst's works are more useful. Significantly expanded versions of his earlier work, *Thomas Willis as physician* (Los Angeles: 1964) were included as prefatory matter to Willis' *Casebook* and his *Lectures*.

5 For example, they were used to prove: 1) the usefulness of Helmontian chemical medicine; 2) the usefulness of non-Helmontian chemical medicine; and 3) the modernity of the Royal College of Physicians and usefulness of galenic medicine. See Donald Bates, "Thomas Willis and the Fevers Literature of the Seventeenth Century", *Medical History Supplement #1* (1981), pp. 60-3.

decades in which his religious, political, natural philosophical and medical beliefs and concerns were established. This was also the period in which Willis forged lasting relationships based on common concerns and interests with individuals that later helped to advance his career and his standing within Restoration civil society.

In Chapter 1, I argue that Willis' anglican and royalist convictions stem directly from his early life in Oxford. He was raised and educated within an environment that stressed Archbishop Laud's conceptions of order, discipline and piety. For Willis, these beliefs served as the model for his conceptions of the traditional structures of English society and of the English church. Additionally, his beliefs about the importance of maintaining tradition were bolstered by his relations with prominent members of Caroline civil society, such as Dean Samuel Fell, Warden Sheldon and Dr. Henry Hammond. The events of the Civil War only strengthened his convictions because he witnessed — firsthand — how personal and divisional factionalism and a disregard for tradition had brought about the execution of an Archbishop and the King as well as the destruction of the established church of England.

In Chapter 2, I explore how Willis' experiences during the Interregnum influenced his religious, political and philosophical beliefs. He found it difficult to advance his career as a physician and natural philosopher because his religious and political convictions excluded him from the institutional life of the university. He also lacked the social relations needed for advancement; his old patrons and friends were of little assistance because they were in a similar position. Willis' response to his changing situation was largely to retreat from the political and social life of the university. He consciously attempted to make himself invisible. He maintained a modest career as an itinerant physician in the villages around Oxford. There, he continued to associate with similarly disaffected anglicans and royalists. Within the university, however, he struggled to forge the social relations needed to sustain a career as a natural philosopher. He walked a tightrope as he attempted to balance his hope to be invisible with his desire for professional and social advancement.

Willis found a solution in chemistry; his skills as a chemical assistant brought him to the attention of powerful and influential members of the university, like William Petty and John Wilkins. As an assistant, Willis' prominence within the academic community was not great. He was largely able, therefore, to shield himself from changing political fortunes. Willis carefully maintained his invisibility and eventually gained a reputation as a disinterested chemist and philosopher. More importantly, he learned how to express *and* promote his beliefs and concerns in such a way as to avoid controversy and disputes.

In Chapter 3, I argue that Willis' natural philosophy — as outlined in the *Diatribae duae* — must be examined in the context of his experiences and concerns. Whenever historians consider the three treatises published as the *Diatribae duae*, they invariably focus their attentions on the first treatise, *de Fermentatione* because of all of Willis' works, *de Fermentatione*, contains the most chemical and seemingly atomistic explanations for natural and artificial change. Historians have hastily assumed, however, that because it *appears* to be a chemical treatise to them, that this was how Willis intended it to be read. This was not the case. To properly understand *de Fermentatione*, one *must* consider the other two treatises included within the *Diatribae duae*, namely *de Febribus* and *de Urinis*. These treatises form a sustained argument for Willis' medical beliefs. In *de Fermentatione*, Willis provided a medical philosophy that allowed him to explain both physiological processes and therapeutic practices and cures. He outlined chemical concepts and explanatory categories essential for understanding the nutritive process and its chief disorder, fevers. The *Diatribae duae*, instead of being viewed as one chemical and two medical treatises, *should* be read as a medical work from start to finish.

In Chapter 4, I show how Willis' experiences as a practicing physician and as a chemist merged within the *Diatribae duae*. As a chemist, he knew that the traditional explanations of matter and change based on the four elements and humours were unable to explain nature sufficiently. As a practicing physician,

however, he *knew* that the traditional galenic cures and therapies were often the most reliable. Willis reconciled these competing beliefs in *de Fermentatione*; he provided a medical philosophy that allowed him to understand and explain a wide range of phenomena including galenic therapies. Willis' intent was to provide a philosophical framework through which the changes inherent in illness (in general) and fevers (in particular) could be explained and understood. For Willis, therefore, the study of fermentation was not an abstract philosophical inquiry; he intended his philosophy to be *used* by physicians to understand, explain and treat fevers.

In Chapter 5, I explore Willis' medical and physiological theories in detail. He believed that a new medical philosophy needed to explain both recent research and traditional galenic therapies. Additionally, he believed that a learned physician needed to understand the causes of illnesses *and* the operations of medicines. The chemical physicians he encountered in the markets did not have this knowledge; they typically rejected galenic practices and therapies in favour of their own often unsuccessful chemical cures. Willis' philosophy enabled him to understand and explain the causes of illness and the operations of traditional and contemporary therapeutic practices. He was able, therefore, to integrate aspects of traditional and contemporary medical practices within a learned framework. Despite his use of chemical explanations, however, Willis' conceptions of the nutritive system and his classification and treatment of fevers remained largely traditional. Broadly speaking, he only superimposed a chemical framework on galenic medicine.

I conclude by showing that Willis believed learned medicine was facing a distinct challenge from unlearned practitioners and physicians. Although chemical philosophy allowed him to avoid certain philosophical difficulties, it introduced new problems. Chemical medicine was strongly associated with radical and — as his experiences during the Civil Wars and Interregnum proved — dangerous religious beliefs. The cures advocated by these physicians threatened not only their patients' bodies, but also their souls. Willis was not alone in such beliefs. In 1665, Nathaniel Hodges (a graduate of Christ Church) drew a parallel between the

experiences of the clergy and physicians during the Civil Wars and Interregnum:

> and thence it was, that when the REVEREND CLERGY (during the late Rebellion) suffered according to their sworn Enemies implacable Fury, the Professor of PHYSICK also by the prevailing Invasion of Empericks shared in the common Calamity.[6]

The similarities between medical and religious radicalism were no mere analogy to individuals like Hodges and Willis. There was an evident correlation between the two. Hodges hoped that "the CHURCH may never fall again into the hands of Empirical Divines who as rudely treated peoples Souls, as the present Quacks in Physick do their Bodies."[7]

When the *Diatribae duae* is examined in this light, a different picture of Thomas Willis the physician and natural philosopher emerges. No longer is Willis simply one of the many natural philosophers involved in the clubs at Oxford; his medical and natural philosophical goals were much more ambitious. As a devout anglican and royalist, he believed that the events of the Civil Wars and the Interregnum signified the triumph of chaos over the church and government of England. The return of peace and the establishment of the true church and government of England were a great concern for him. Willis made his beliefs known and he advocated his solutions in his medical literature. He wanted to heal both his patients and English society by limiting the popularity that radical chemical physicians enjoyed in the marketplaces. His solution was not to dismiss their cures and practices and to take refuge in the galenic practices of the past; it was to acknowledge and learn from the experiences of the present and to integrate them with the past. Willis' restoration of learned medicine was not a straightforward pursuit; he did not advocate the new philosophy over the old or *vice versa*. It was not a vain attempt to return to the past or to prevent future change; it was a dynamic process through which Willis redefined the past to suit — and shape — the present.

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6 Nathaniel Hodges, *Vindiciae Medicinae & Medicorum* (London: 1665), sig. A3v.

7 *Ibid.*

Chapter 1:
Ancient Manners and Traditions

> *[A Fever] can be described in this manner, that it is an inordinate motion of the blood and an excessive raging of it with heat and thirst in addition to other symptoms by which the natural oeconomy is variously disturbed.*
>
> *de Febribus*, p. 25.

To understand Thomas Willis' later activities, beliefs and motivations, it is essential first to explain his early life and experiences in Oxford. While there is little specific information about Willis' life and activities before 1646, it is possible to explain how the environment in which he was raised formed his later religious and political beliefs.[1] Willis spent most of his life in or around Oxford. He lived and was educated within an environment that emphasized order, discipline and conformity of worship. During the 1630s and especially during the 1640s, Oxford had a strong connection to the politics and patronage of both the royal court and Lambeth palace. The Chancellor of the university was William Laud (the Archbishop of Canterbury) and many prominent members of the political nation were active participants in the Oxford community, like William Chillingworth, William Juxon, Gilbert Sheldon, Henry Hammond, and Edward Hyde.[2] From an early age, therefore, Willis was exposed to many prominent and powerful members of the political nation. He established lasting relationships with the sons and relatives of many of the leading figures in local and national politics, including John Finch (son of Sir Heneage Finch, the former Speaker of the House of Commons, and 'cousin' to Sir John Finch, soon to be Lord Keeper), John Fell (son

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1 The primary sources of information we have on his life and activities are: Fell, "Postscript", sigs. B_2v-C_2; John Aubrey, *Brief Lives*, ed. A. Clark (Oxford: 1898), vol. II, pp. 302-4; and Anthony à Wood, *Athenae oxonienses ... to which are added the Fasti*, ed. P. Bliss (New York, 1967), vol. III, pp. 1048-53.

2 *See* H. R. Trevor-Roper, "The Great Tew Circle", in his *Catholics, Anglicans and Puritans* (London: 1987), pp. 166-230, esp. pp. 215-227.

of Dean Samuel Fell of Christ Church) and John Dolben ('nephew' to the Lord Keeper and Archbishop of York, John Williams). Willis' later beliefs and convictions are hardly surprising; he was educated and lived in an environment that was, and remained, a royalist stronghold for much of the century.[3]

Like everyone in England, Willis could not help but be affected by the Civil Wars. For half a decade, the counties — and even families — were torn apart by divisive political and religious factionalism. The events of the Civil War occupied the attention of many in Oxford. After the short parliamentary occupation of 1642, the university served as the royalist headquarters housing both the courts of Whitehall and Lambeth. By the end of the 1640s, the country had witnessed the execution of both an Archbishop and the King as well as the destruction of the established church of England. Regardless of one's political and religious sympathies, these events were bound to have an influence. For Willis, they instilled a deep-rooted awareness of the dangers inherent in factionalism and arguments of all kinds. Yet, they also reinforced his religious and political beliefs and contributed to his unwavering loyalty to both the established church of England and the crown. As we shall see later, these two interests merged in his first published work, the *Diatribae duae Medico-philosophicae.*

The political and administrative landscape of Oxford before the Civil War

Willis' education coincided with the peak of Laud's power and influence within the university both as the Chancellor of Oxford and the Archbishop of Canterbury. During his chancellorship, William Laud enacted many reforms within the university that he hoped would help promote order, discipline and piety.[4] To Laud, these reforms were vital for the university and England. The universities were the

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3 See E. G. W. Bill, *Education in Christ Church Oxford, 1660-1800* (Oxford: 1988) for a discussion of the connections between Oxford, Christ Church and the court.

4 While Laud attempted to enact the same reforms in Cambridge, his attempts were largely unsuccessful. No doubt his authority as Chancellor enabled him to exert a much more immediate influence upon affairs within Oxford. See H. R. Trevor-Roper, "Laudianism and Political Power" in his *Catholics, Anglicans and Puritans* (London: 1987), p. 79-89.

primary source of future leaders for both the state and church, yet, Laud contended, they could no longer create suitable clergymen and civil servants because they had "sunk from all discipline and fallen into all licentiousness."[5] He believed the situation within the universities was grave, as he later recounted: "if a remedy were not applied in time there would scarce any face be left of a university."[6] According to contemporary accounts, students were more interested in gaming, drinking and cavorting than their studies.[7] Such an "extreme liberty [had been] given and taken by young noblemen and gentlemen of the better sort" that youths and even men did not behave according to their station.[8] Laud's remedy was to enact a broad series of reforms aimed at the administration and substance of university life: the university statutes were codified; steps were taken to ensure uniformity of worship; and the powers of the central administration (namely, the Chancellor and Vice-Chancellor) were enhanced at the expense of those of the Heads of the colleges. Although Laud's reforms caused much disruption within the university, by the time Willis was admitted in 1636, the most serious conflicts had been resolved; the statutes had been tested and enacted by royal proclamation and many of Laud's most persistent opponents within the university had died or been removed from office.[9] The structure of the intellectual, political and religious life of Oxford during Willis' early education reflected Laud's concerns and interests.

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5 William Laud, *The Works of the Most Reverend Father in God, William Laud, D.D.*, ed. J. H. Parker (New York: 1975), vol. V, p. 13.

6 Laud, *Works*, V, p. 13.

7 Mark Curtis, *Oxford and Cambridge in Transition, 1558-1642* (Oxford: 1959), p. 83.

8 Quoted, but not acknowledged in Charles E. Mallet, *A History of the University of Oxford* (London: 1968), vol. II, p. 313.

9 Laud established his authority early in his chancellorship. Three members of the university (Thomas Ford, Giles Thorne and William Hodges) were charged in 1631 with preaching a series of sermons on topics forbidden by the Declaration against Controversy. They were tried in the Chancellor's Court, found guilty and expelled. They refused to acknowledge Laud's ruling because they believed he did not have the right to censor their sermons and impart justice on members of the university. The matter was eventually brought before the King who confirmed both the sentence and the Chancellor's powers. H. R. Trevor-Roper, *Archbishop Laud, 1573-1645*, 2nd ed. (Hamden, Conn.: 1962), pp. 116-7; Mallet, II, p. 305.

During this time, order, discipline and ceremony were the hallmarks of Oxford life. Laud believed that part of the problem with the maintenance of order and good governance was the increasingly unmanageable body of university statutes which had "lain in a confused heap for some ages."[10] The congregation often found it easier to create new statutes than to sort through and examine the confusing and often contradictory mass of statutes.[11] Through Laud's instigation, a committee comprised of the Heads of the colleges was able to greatly simplify the existing statutes.[12] The Caroline Code, as it was called, contained few innovations; the statutes largely confirmed the traditional rights, customs and privileges of the university and its colleges.[13] The Code was an integral aspect of Laud's reforms within the university because it clearly established — in print — the traditional rules and regulations governing virtually every aspect of university life; it outlined the administrative form and function of its government as well as the specified responsibilities, duties and standards of behaviour required of its students and their masters.

Laud expected the statutes to be obeyed. The behaviour of both the students and fellows was closely examined and proper conduct was enforced. Proctors were encouraged to seek out and punish offenders through a complex series of bonuses and deterrents; they were rewarded for every fine they levied and fined for each they did not. When Willis was a student, therefore, the rules and regulations covering university life were strict. For example, students were compelled to wear hats and gowns on Sundays and to show respect by removing their hats when

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10 Laud, *Works*, V, pp. 13-14.

11 Laud, *Works*, IV, p. 187.

12 Under Laud's instigation, the committee was created in 1629 by the then Chancellor, William Herbert, the Earl of Pembroke. Its members included William Juxon, John Bancroft, Brian Duppa, Richard Zouche, John Prideaux, Robert Pinke, Thomas James, Peter Turner and Brian Twyne. Mallet, II, pp. 314-5.

13 In a letter to the committee, Laud urged them to keep "as neare to the ancient statutes of our university as possibly they can, so as they also meet withall the present inconveniences." See Malcom Underwood, "The Structure and operation of the Oxford Chancellor's Court, from the sixteenth to the early eighteenth century chancery court", *Journal of the Society of Archivists* 6 (1978), p. 23.

greeting a master.[14] In 1639, one student, Edward Moore of Christ Church, was whipped and expelled from the university for both failing to remove his hat *and* ignoring the warnings of the senior proctor.[15] These manners and ceremonies were important, according to Laud, because they not only instilled a sense of order and discipline in the students and masters, but they helped to improve people's reverence for the institution. Order and discipline, he argued, could not be created solely by good governance and deterrents: "no laws can be binding if there be no conscience to obey them: penalty alone could never, never do it."[16] To motivate people to obey his laws, Laud believed that it was necessary to improve the outward face of the university.[17]

Willis was admitted to Christ Church as a servitor six years after Laud's installation. By this time, there was little vocal or sustained opposition to Laud and his reforms; his power and authority were securely established and he would tolerate few challenges.[18] The style and forcefulness of Laud's administration, however, often caused tensions between the Heads of houses and the Chancellor. The primary responsibility of the Chancellor had traditionally been to represent the university's interests in court and parliament; he did not generally govern the university. Much of the day-to-day administration of the university was undertaken by the Vice-Chancellor and the Heads of the richest and most powerful colleges resulting in "obstructive personal interests."[19] The poorer colleges had little say in official decisions. Laud, however, took a much more direct and active approach to his duties than his predecessors. Not surprisingly, his actions often interfered with the interests of the Heads and senior members of many colleges. Although there were few changes in the administrative structure of the university,

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14 Charles Carlton, *Archbishop William Laud* (London: 1987), p. 133.

15 Laud, *Works*, V, pp. 231-2.

16 Conrad Russell, *The Causes of the English Civil War* (Oxford: 1991), p. 65.

17 Laud, *Works*, V, p. 101.

18 Even Rector John Prideaux of Exeter College — a staunch opponent of Laud's — expressed his views carefully. Mallet, II, pp. 304-6.

19 Trevor-Roper, *Archbishop Laud*, p. 280.

many Heads felt their traditional rights were being limited.[20] They were right. The chief governing body was still the Hebdomadal Council (consisting of the Chancellor, Vice-Chancellor, the Heads of the Colleges and Halls and the proctors), but it was no longer an elected body; the Heads of every college and hall were expected to sit on the council and take an active part in the governance of the university.[21] Each College, regardless of power, wealth and status, now was given equal representation in the Council.[22] Under the Council were the larger administrative bodies of the Congregation of Regent Masters and the Convocation. They had little to do with the day-to-day administration of the university. They could only consider matters given to them by the Council, which retained an absolute veto over their decisions.[23] Despite the powers given the Hebdomadal Council, the political power was centred upon the offices of the Chancellor and Vice-Chancellor. While this centralization was by no means innovative, the enthusiasm and frequency with which Laud exercised his powers certainly were. Tensions between Laud and the Heads and senior members of the colleges were commonplace. At some time or another, Dean Fell, Warden Sheldon and Drs. Hammond and George Morley (both Canons of Christ Church) all managed to earn Laud's displeasure.[24]

Although the political, religious and intellectual environment of Oxford generally informed Willis' later beliefs and concerns, the more lasting and important influences came from the individuals he associated with in Christ

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20 Nine of the twenty-one sections within the code are devoted to defining the duties and powers of various officials and administrative bodies. See *Tituli* IX-XIII, in [University of Oxford], *Corpus statutorum universitatis oxon.* (Oxford: 1634), sigs. Q-Ff_2. Neither the commonly used nineteenth-century translation nor the 1636 edition of the statutes were available during my research. This does not present a problem because my analysis does not differ from those who were able to consult the more definitive editions.

21 *Corpus statutorum*, sig. Ff_2.

22 Hugh Kearney rightly suggests that this reform was likely inspired by Laud's experiences as the President of St. John's College, one of the poorest in the university. *See* H. Kearney, *Scholars and Gentlemen* (London: 1970), p. 92.

23 Mallet, II, p. 332; Curtis, p. 44.

24 Bill, p. 28.

Church, such as Dean Fell, Canon Thomas Iles and his fellow students John Fell, Richard Allestree and John Dolben. It was, seemingly, through his relationships with these men that Willis became known to his future patron, Gilbert Sheldon, the Warden of All Souls. It is impossible to make any definite statements about their relationships in this period of Willis' life, yet given the closeness of their associations from the parliamentary Visitation onwards, he must have known these men earlier in the 1640s. Before their later relations can be discussed, we should consider Christ Church's status within the Oxford community and the power and influence of its Dean.

Christ Church was granted its charter in 1546 by King Henry VIII. It embodied the traditional role and function of the universities to provide a learned clergy. It was founded through the combination of the properties and holdings of Cardinal College and of the diocese of Oxford. Christ Church, therefore, had two institutional roles; it was both a college and a cathedral. Just like a diocesan cathedral, it was governed by an elected body of clerics who administered its vast holdings. Christ Church had several special responsibilities towards both the university and the diocese: first, it provided for the services and the maintenance of the cathedral; and second, it maintained three regius professorships (Divinity, Greek and Hebrew).[25] Christ Church, not surprisingly, had a strong institutional relationship with the diocese of Oxford as well as patronage connections to the royal court. Since it received its mandate from the crown and not the church, the only legal Visitor was the monarch. During its first century, the college was visited three times: by Queen Elizabeth in 1566 and 1592 and by King Charles in 1636.[26] Christ Church was a rich and powerful college; its Dean had much influence in university and county politics.

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25 James McConica, "The Rise of the Undergraduate College", in *The History of the University Of Oxford, Vol. III: The Collegiate University*, ed. J. McConica (Oxford: 1986), pp. 32-4; *Victoria History of the County of Oxford, Vol. III*, eds. H. E. Salter & M. D. Lobel (London: 1954), p. 235; *Victoria History of the County of Oxford, Vol. IV*, ed. A. Crossley (London: 1979), p. 369.

26 *Victoria History of the County of Oxford*, III, p. 235.

Dean Fell helped maintain Christ Church's position in the political and social landscape of Oxford during the late 1630s and early 1640s. He staunchly defended the rights and privileges of his college. This, not surprisingly, often brought him into opposition with Laud because they had differing conceptions of their rights and powers within the university.[27] Relations between the two were often strained even before Fell's election to the deanery. In 1636, Laud called Fell to Lambeth House and asked him to resign from the Lady Margaret Professorship of Divinity. There is no evidence why Laud wanted him removed from office, but it is evident that Fell retained bitter feelings about his removal.[28] Their relationship came under increasing strain after his election to the deanery in 1638 by the Canons of the college. As Dean of Christ Church, Fell believed his authority over college matters was absolute and final; he alone was responsible for college business and the punishment and control of its members. His active role in the supervision of the college and its students often came at the expense of the university statutes and tradition. The most dramatic example of the tension between Fell and Laud occurred in 1639 and stemmed from an incident between two members of Christ Church: Edward Moore and Edward Fulham (the senior proctor). Upon encountering Moore in the city, Fulham demanded that he remove his hat, as the statutes stipulated. Moore refused and was quickly boxed on the ear by the proctor. Fell was furious over the proctor's behaviour; he had the junior proctor, a Mr. Hide of Christ Church, bring both Fulham and Moore before him. Once there, he proceeded to berate Fulham in the presence of Moore and Hide. Fell concluded by saying that Fulham "had done more than he could justify ... [and that he] should have nothing to do in the college; and that if he meddle[d] thus in the house, he [Fell] would meddle with him: that he [Fulham] was not the Dean of

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27 Their differences did not preclude common concerns and interests. For example, they worked together to limit the number of ale houses in Oxford in late 1639. See Laud, *Works*, V, pp. 245-7.

28 Perhaps Fell was removed because he failed to deliver lectures as Laud stipulated in his letter of 15 July 1636. See Laud, *Works*, V, p. 146. N. Tyacke notes that Fell (a "calvinist") was replaced by Thomas Laurence (an "arminian"). See Nicholas Tyacke, *Anti-Calvinists: The Rise of English Arminianism, c. 1590-1640* (Oxford: 1990), pp. 77, 85.

Christ Church, nor should be."[29] The Vice-Chancellor, Dr. Frewen, was furious and ordered Fell to explain himself. Fell refused. Since all those involved were his students, Fell believed that their disagreement was a college matter. For him, the issue at stake was his power over his students: as Dean, he believed that he, and not the university, was responsible for their behaviour and punishment. For Laud and Frewen, the issue was their power over the university and its members. Fulham punished Moore in his capacity as proctor and not as a fellow student. Fell's actions, therefore, violated both the statutes and also the limits of good manners.[30] Laud quickly intervened in the case; he removed Hide from his office for his part in the affair, and ordered Moore to be whipped and expelled from the university. Laud harshly reprimanded Fell in private letter:

> for government sake ... I shall be unwilling to put any sourness upon you in public; yet must I tell you have carried this business like a sudden, hasty, and weak man, and most unlike a man that understands government. And should you go on with other things according to this, I shall have cause to repent somewhat. And assure yourself, if I hear any more like this I shall easily know what I have to do.[31]

Fell also took an active role in the education of his students, who, for example, were only granted their degrees after they had passed examinations set by Fell and the other masters of Christ Church.[32] Colleges were the fundamental basis of university life: students ate, slept, studied and lived in them.[33] Fell and the Canons, therefore, likely had a great influence upon Willis' later beliefs and concerns. It is not unreasonable to contend that many of his students, like Willis, Dolben, Allestree and John Fell, were strongly influenced and shaped by his concerns and

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29 Early June 1639, Laud, *Works*, V, p. 222.

30 For more on conversational manners, see Steven Shapin, *A Social History of Truth, Civility and Science in Seventeenth-Century England* (Chicago: 1994), pp. 114-9.

31 22 June 1639, Laud, *Works*, V, p. 224.

32 30 May 1639, Laud, *Works*, V, p. 220.

33 Kevin Sharpe, "Archbishop William Laud and the University of Oxford", in his *Politics and Ideas in Early Stuart England* (London: 1989), p. 131.

beliefs as well as those of the Canons.[34]

During the first Civil War, Christ Church's prominence within Oxford increased greatly and, consequently, so did Fell's influence and power over university affairs. After the brief parliamentary occupation of 1642, Oxford became the royalist headquarters. University activity declined significantly as attentions turned from academic to political and military matters. College buildings and residences were devoted to housing royalist supporters and various courts. For example, Merton housed the Queen and her household and the Court of Requests held sessions in the Natural Philosophy school. Affairs of state so occupied the university, that proclamations were issued giving magistrates the right to dismiss students from the grounds because of the lack of space.[35] University officials were actively involved in the preparations; they helped raise funds, secure the fortification of the town and raise troops. For example, Dr. Thomas Clayton Sr., the regius professor of physic, recruited students into the royal army.[36] Christ Church remained the principal feature of the political landscape of Oxford during this time. It housed the King and his court and the Oxford parliaments were held in its Hall.[37] The members of Christ Church were especially active supporters of the royalist cause during this time. The Bishop of Salisbury (and Fell's predecessor as Dean), Brian Duppa, was the "official" prayer writer; Dr. Hammond (the sub-Dean) wrote pertinent theological, moral and political tracts; and William Pennyman, a graduate of Christ Church, was governor of Oxford until his death in 1643.[38] Fell remained the Dean and, after 1645, he was Vice-Chancellor of the

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34 That Heads of houses often exerted a strong influence over their students is incontestable. Under Henry Hammond (acting Dean of Christ Church while Fell was in London during late 1647), the students and Canons of the college "appeared his private family, he scarce leaving any single person without some mark or other of both his charity and care." John Fell, *The Life of the Most Learned, Reverend and Pious Dr. H. Hammond* (Oxford: 1806), pp. 187-8.

35 F. J. Varley, *The Siege of Oxford* (London: 1932), pp. 26, 29.

36 *CCSP*, I, p. 255.

37 Mallet, II, p. 365.

38 Mallet, II, p. 360; Fell, *Life of Hammond*, pp. 184-5; F. J. Varley, "Oxford Army List for 1642-6", *Oxoniensia* 2 (1937), p. 145.

university. Christ Church had a strong relationship with the Civil War government; while Oxford was the royalist headquarters, Christ Church was both the royal court and parliament. As Dean, therefore, Fell was one of the more influential members of the political community.

Many students, like Dolben, Fell and Allestree, quickly enrolled in the royalist army.[39] Willis, however, did not immediately enlist. During the parliamentary occupation of 1642, he retired to his family holdings in North Hinksey shortly after receiving his M.A. degree. He remained there until the fall of Abingdon two years later. Although not in the university, Willis' life was affected by the events of the war. His home lay in a strategic position along both the river and roadways between Oxford and the garrison town of Abingdon (see map 1). Moreover, on a more personal level, both Willis' parents were killed by the epidemic fever that later troubled the royalist and parliamentary forces in 1643.[40] As the eldest son, Willis was responsible for his family properties and his younger siblings.[41] He remained in Hinksey managing his holdings until the fall of Abingdon in 1644. While the royalist forces in Oxford were closer than the parliamentary forces in Abingdon, their movement was severely hindered by the Thames. The parliamentary forces, on the other hand, were able to move quickly and easily throughout the area. According to John Fell, Willis returned to the university and enrolled in the royalist army after suffering from frequent parliamentary raids.[42] He served until the surrender of Oxford in 1646. There is no specific information about his service; Willis was just one of the many Oxford students that enlisted in the royalist army during this period.[43] His support of the

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39 Mallet, II, p. 358.

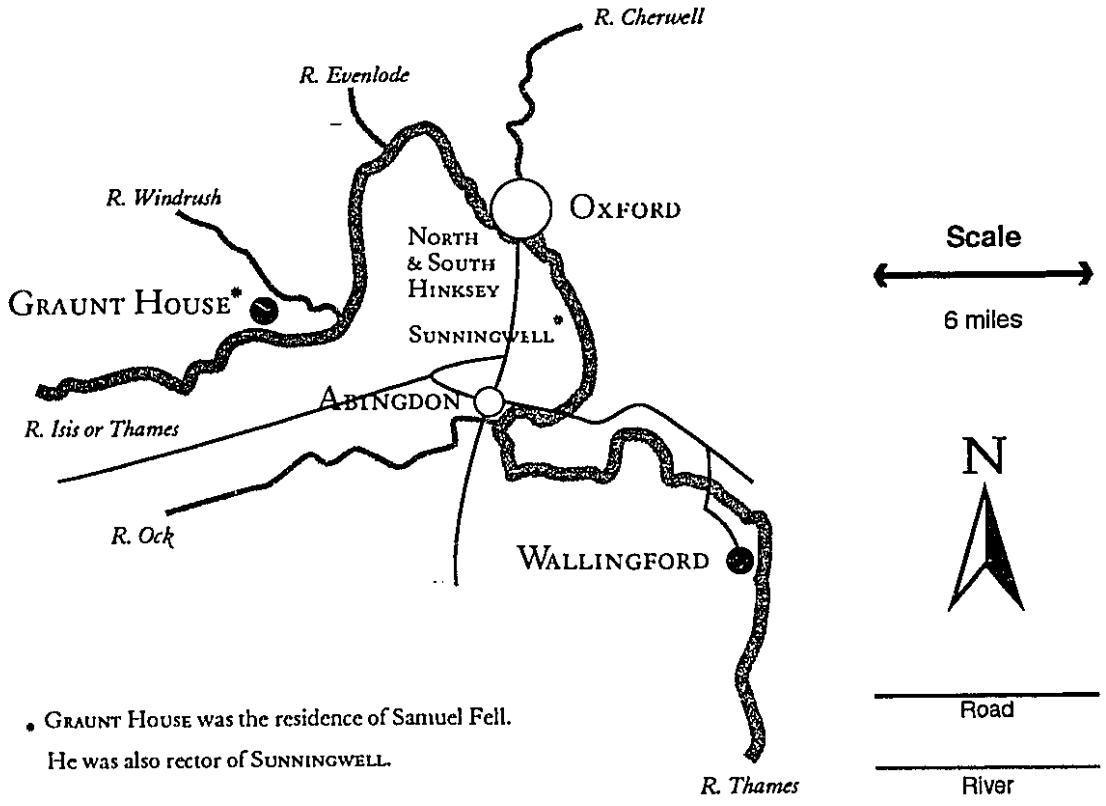
40 Willis recounted the epidemic in *de Febribus*, pp. 171-6.

41 There is little precise information on most of Willis' siblings; he had at least five brothers and three sisters from his father's two marriages. A younger brother, William (1631-62), was a natural philosopher and fellow of Trinity College Oxford. See J. T. Hughes, p. 93; and also Robert Frank Jr., "John Aubrey, F.R.S., John Lydall, and Science at Commonwealth Oxford", *Notes and Records of the Royal Society* 27 (1973), pp. 193-217.

42 Fell, "Postscript", sig. A3v.

43 Kenneth Dewhurst suggests that Willis — along with many other university students — served

royalist and anglican cause, however, did not stop with the surrender of Oxford; on the contrary, it was only beginning.



Map 1: The immediate area around Oxford

Religion, Resistance and the first parliamentary Visitation

Before turning to a discussion of Willis' activities and the religious climate of Oxford during the late 1640s, it is useful to provide a brief reminder of the religious life of Oxford during the previous decade. Laud's firm control over the university allowed him to ensure that his religious reforms were carried out. He chiefly focused his attentions on controlling the visible aspects of the church, such as the position of the altar and the state of the buildings. He believed that outward

in the earl of Dover's regiment. See Dewhurst, "His Life and Works", in *Lectures*, p. 3.

beauty was an indication of inner holiness. By improving the beauty of both the church and church service, he hoped to improve people's piety. He also hoped that conformity of worship would lessen religious and political factionalism. Although Laud tried to enact his 'thorough' throughout England, his reforms in Oxford were amongst the most successful. By the late 1630s, he had achieved a remarkable degree of conformity in public worship.[44] This conformity decreased after his imprisonment in 1641, yet the religious landscape of Oxford remained markedly stable throughout the 1640s. Oxford became a leading centre for churchmen throughout the Civil Wars; Sheldon and Hammond (the King's chaplains) and Juxon, Skinner and Duppa (the bishops of London, Oxford and Salisbury respectively) were in the university throughout this period. During the 1640s, Oxford, more than London, was the centre of the English church.

Oxford surrendered to the parliamentary forces led by Sir Thomas Fairfax on 24 June 1646, yet the Visitors appointed by parliament to examine and reform the university did little until the spring of 1647/8. The political manoeuvering of factions in parliament and the army largely undermined the Visitors' authority. Parliament was more concerned with establishing and maintaining their own authority and power than they were with defining the Visitors' power and legal status. As a legal corporation, the university was subject to rules and guidelines set out by the Crown and parliament. The Visitors were reluctant to exercise their power until their legal status within the university had been determined. Such a determination was not quick in coming. It took almost a year for the parliamentary committees to name all the Visitors and establish their objectives.[45] It took another year for the Commons to determine their authority and powers.[46] It was mid-1648 before the Visitors had full parliamentary support. Royalist and anglican resistance, therefore, continued unchecked for almost two years.

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44 H. R. Trevor-Roper, *Archbishop Laud*, p. 271.

45 For example, see the debates on 13 Jan. 1646/7, *CJ*, p. 51; 10 Feb. 1646/7, *CJ*, p. 83. The appointment of the Visitors was confirmed on 1 May 1647. See *LJ*, p. 165.

46 27 May 1648, *CJ*, p. 574.

The terms of the surrender of Oxford largely contributed to the flourishing of royalist support within the university. General Fairfax guaranteed many of the traditional rights and privileges of the colleges and the university. Additionally, the treaty stipulated that few measures would be taken against royalist supporters. For example, Article 12 of the treaty established:

> That no Lords, Gentlemen, Clergy-men, Scholars, Officers, Souldiers, Citizens, nor any other persons included in this Capitulation ... shall be molested or questioned for any thing said or done, in, or concerning this War, or relating to the unhappy differences between His Majesty and the Parliament.[47]

The only limitations placed on their activities were outlined in the following article. Oxford royalists had to promise not to bear arms against parliamentary forces nor "do any Act prejudicial to their Affairs, so long as they remain in their Quarters."[48] In return for these assurances, Fairfax agreed that no other oaths be forced upon them. The terms of the treaty combined with the Visitors' insecurity concerning their powers allowed a wide range of protest and dissent aimed at both the Visitors and parliament.

Resistance to the Visitors was common throughout the late 1640s. Royalists and anglicans frequently gathered to discuss their situation. Meetings were held in colleges, like All Souls and Christ Church, and in private residences, like Willis' home at Beam Hall and the "Scruple Shop" by the Sarasen's Head Inn.[49] The most active meetings were those held at All Souls and Christ Church; the Heads of these colleges (Sheldon and Fell) still had significant power and influence in Oxford and London.[50] There were frequent meetings of the Heads throughout this period as they worked out strategies of resistance.[51] People seldom disguised their sentiments

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47 Varley, *Siege of Oxford*, p. 161. The entire treaty is reprinted on pages 154-66.

48 Varley, *Siege of Oxford*, p. 161.

49 Mallet, II, pp. 370, 372, 385.

50 Sheldon and Hammond were the King's Chaplain; they were granted passage by parliament to attend the King during his imprisonment at the Isle of Wight. *CCSP*, I, p. 403. Samuel Fell was supported in parliament by John Selden. Mallet, II, p. 375; *Visitors*, p. lxxi.

51 Mallet, II, p. 372.

because there was little need; they had little reason to fear reprisals from Visitors insecure of their own legal status. Even within official bodies, opposition to the Visitors was common. For example, a delegation, which included Sheldon, George Morley, Hammond, Richard Zouche and Robert Sanderson, was created in Convocation on 1 June 1647 by Vice-Chancellor Fell to determine and declare the university's position on recent changes in the political nation; shortly thereafter, the delegation presented its findings and declared in favour of "the true church and religion."[52]

One of the first actions taken by the Visitors was an attempt to expel prominent royalists from office, such as Fell, Hammond and Sheldon. The Visitors first focused their attentions on the removal of Fell. His election as Vice-Chancellor, they claimed, was not lawfully established because he was appointed not by the current Chancellor installed by parliament (Philip Herbert, the Earl of Pembroke) but rather by his royalist predecessor (the Marquis of Hereford).[53] Although he was ordered to resign, no one took notice of the proclamation.[54] Fell's refusal to appear before the Visitors only exacerbated the situation; he was later found guilty of breaking the terms of the treaty signed at the surrender of Oxford.[55] Although Fell's staunch defiance was unique, resistance was common. Officials were slow to respond to the Visitors' summons and requests. For example, the Registrar, John French, refused to submit the university register for their scrutiny; it had to be taken by force.[56] During autumn 1647, the situation was so bad that many Heads were called to London to answer complaints before the parliamentary committee.[57]

Throughout the first Visitation, Willis neither hid his sympathies nor

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52 *Visitors*, p. lxiii; Mallet, II, pp. 372-3.
53 Wood, *Fasti*, IV, p. 101.
54 8 Oct. 1647, *Visitors*, p. 7.
55 31 May 1649, *Visitors*, p. 236.
56 9 Oct. 1647, *Visitors*, p. 8.
57 *Visitors*, p. lxx.

disguised his activities; his actions and beliefs were known throughout the university to both royalist and parliamentary supporters.[58] He was a member of a group (later called the "Loyal Assembly") that held conformist ceremonies in defiance of the parliament and the Visitors.[59] Willis was a significant member of this group; the assembly, which included John Fell, Dolben and Allestree, frequently held their meetings in his rooms at Beam Hall. Willis opposed the Visitors in other ways and he openly supported many of those harassed by them. For example, he housed both Fell and Dolben when they were expelled from their college residences. This was no small gesture. Although young, both were prominent and vocal supporters of the King and the church. Fell, like his father, was an ardent royalist who openly and loudly resisted the Visitors.[60] He frequently led the services held in Beam Hall. Dolben was a noted war veteran; while in his early twenties, he was promoted from ensign to major because of bravery during the siege of York. No direct evidence exists about the content of the services held in Beam Hall.[61] A possible indication of the kinds of prayers and services held is to be found in *The Whole Duty of Man* (London: 1659).[62] Among the many prayers included were a selection for those "who Mourn in secret for the PUBLICK CALAMITIES" and for the "Peace of the Church."[63] The content of the services,

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58 Thomas Warton, *The Life of Ralph Bathurst*, in *The Life and Literary Remains of Ralph Bathurst M.D.* (London: 1761), p. 205.

59 See Leonline Jenkins, *Life of Dr. Mansel, D.D.* (London: 1854) cited in *Visitors*, p. xlii.

60 Fell is presumed to be the author of a letter published in defiance of the Visitors. The author concluded "that the right of Visiting the University of *Oxford* is onely in the Kings Majesty: and that is exempt from all other jurisdiction." [John Fell?], *The Privileges of the University of Oxford, In point of Visitation, &c.* (Oxford: 1647), sig. A_2v.

61 According to Willis' grandson, Browne Willis, the book *Prayers or Intercessions for their Use, who mourn in secret for the publique Calamities of this Nation* (London: 1650) contained the prayers said by Fell during this time. See Wood, *Athenae oxonienses*, p. 1050n4. I have been unable to locate this work.

62 Richard Allestree is generally acknowledged to be the author. See P. Elmen, "Richard Allestree and *The Whole Duty of Man*", *The Library*, 5th ser., 5 (1951), pp. 19-27. Hammond found "great cause to bless God" for the text. See [Richard Allestree], *Whole Duty of Man* (London: 1659), sig. A_3. On *The Whole Duty of Man* and the Restoration church, see John Spurr, *The Restoration Church of England* (New Haven: 1991), pp. 279-330, esp. pp. 281-96.

63 [Richard Allestree], "Private Devotions" in *The Whole Duty of Man*, pp. 79-90.

however, is less important than their existence and the activities of those who participated in them.

By mid-1648, the Visitors had largely succeeded in establishing their power and authority within the university. Although many members of the university community had earlier been called before the Visitors to swear to the Solemn Oath and League of the Covenant, non-submitters were not vigorously punished.[64] Some, such as Fell and Allestree, pled ignorance during their summons:

> [D]oe you submitt to the authority of Parliament in this Visitation?
> ... Mr. Fell, his Answere: I understand not what is meant by the term Submitt, and therefore cannot Answere....
> ... Mr. Allestrie, his Answere: I am not satisfied in the meaninge of the Question.[65]

Others, such as Drs. Fell, Sheldon and Hammond were more direct; they either refused to appear or they openly rejected the Visitors' authority.[66] By early summer 1648, however, such protestations and evasions proved unsuccessful. On 27 May, the Parliament granted the Visitors the power to expel anyone who resisted them.[67] In quick succession, Samuel Fell, Sheldon, Hammond, John Fell, Allestree and Dolben were expelled.[68] Some, like Willis' future wife Sarah and his mother-in-law Margaret Fell, had to be physically removed from their residences by parliamentary soldiers.[69]

Although the members of most colleges eventually submitted to the oath, in some colleges few submitted. Christ Church members, for example, were prominent hold-outs. Not all royalists and anglicans were called before the Visitors. Due either to their age or to their relatively low status and profile within

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64 The Oath was passed on 20 Sept. 1643, see *Acts*, I, p. 298 and *Visitors*, p. lvii.

65 *Visitors*, p. 32. This evasion was later made impossible by the parliamentary committee. By late May, evasions were considered "non submissions" by the Visitors. *Visitors*, pp. lxxxv-lxxxvi.

66 *Visitors*, p. 14(n)a.

67 27 May 1648, *CJ*, p. 574.

68 Fell, Allestree and Dolben were expelled on 15 May 1648; Hammond on 6 Aug. 1648; Dr. Fell and Sheldon on 14 Sept. 1648. Additionally, Sheldon was ordered to advise the Visitors "where hee desires to reside." *Visitors*, pp. 92, 180-1, 185, 187-8.

69 Mallet, II, p. 376.

the university, many were not deemed important enough to be of concern. Willis was one of these individuals; there is no record of him being called before the Visitors.[70] Some colleges yielded few submissions at first, but this changed over time as new students were intruded by the Visitors. Eventually, the number of intruders rendered loyalist opposition irrelevant. Disaffected men like Willis were no longer a threat because they lacked the power to cause any serious problems.

After the expulsions were over, anglican opposition was more muted. Some, like Hammond, came to believe that their resistance would not defeat the parliamentary Visitors. According to John Fell, Hammond believed his goal was "to prepare his charge[s] for the reception of the impending persecution; that they might adorn their profession, and not at the same time suffer for a cause of righteousness, and as evil-doers."[71] Throughout the Civil War, Oxford residents had rallied under the leadership of men like Fell, Sheldon and Hammond. Their efforts were not wasted; they provided an example of resistance and piety that survived through the following decade. The remaining royalists lacked the direct leadership and support of men like Drs. Fell, Sheldon and Hammond, yet they still were able to continue their devotions, mourn for the loss of the church and (as we shall see) maintain the traditional social and patronage relations of Caroline civil society in and around Oxford.

Thomas Willis' support of both the King and the established church of England during the Civil Wars and beyond is hardly surprising. He was raised and educated within an environment strongly connected to the royal court and the church. Oxford throughout the 1630s and 1640s was frequently home to many prominent members of the political nation. Moreover, as a student in Christ Church, Willis formed relationships with the leaders of the current generation within Oxford. He also maintained friendships with many who would become

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70 Although there is an entry for a "Thomas Willis" in the statistical summary of the Visitors' Registers, the errata for the volume remove it. *Visitors*, pp. 493, 592.

71 Fell, *Life of Hammond*, p. 188.

architects of the Restoration church, like Gilbert Sheldon, John Dolben, Richard Allestree and John Fell. Willis' royalist and anglican sentiments are not a trivial matter to be dismissed as we attempt to understand Thomas Willis the physician and his natural philosophical works; on the contrary, to understand his later natural philosophical activities, it is crucial to explain his royalist and anglican sentiments. It is no coincidence that there are strong religious, political and social resonances to the natural philosophical and medical concerns he presented in the *Diatribae duae*. Willis was writing among and for those who shared his religious and political convictions.

Chapter 2:
Practicing a Fugitive Religion

> *[W]ith an imperfect crisis, the case remains in doubt and as yet under judgment; then the physician's duty becomes most difficult: the motions and forces of nature are to be carefully considered, does it begin to prevail on the illness or yield to it?*
>
> *de Febribus*, p. 114.

By 1650, the social and political landscape of England had changed significantly; those loyal to the King and to the English church had largely been excluded from participation in the political nation. Men who refused to swear an oath of allegiance to the Commonwealth were typically removed from their offices and made subject to exorbitant taxation. Individuals who once had political and social prominence within England, like Edward Hyde and William Juxon, now found themselves with little or no power or influence. The situation was not much different within Oxford. Devout anglicans and royalists had been ejected from their offices and expelled from the university. Most attempts to purge the political nation focused on the higher ranks in English society, but many of the middling sort, like Thomas Willis, found themselves affected by their social isolation; they typically lacked the patrons and the social connections needed to sustain let alone advance their careers. Former patrons and friends no longer were in a position to help for they themselves were similarly displaced. Ralph Bathurst, a friend of Willis', summed the situation many royalists faced:"[I] scarce knew, or was knowne to, any of the other party."[1]

Throughout the decade, anglicans and royalists faced the challenge of trying to re-create ties necessary for their professional and social advancement. Some, like Thomas Barlow, were able to adjust to the new political situation quickly.[2] Others,

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1 Warton, *Life*, p. 205.

2 Barlow maintained relations with John Selden (a member of the parliamentary committee concerned with the reform of Oxford) and his former pupil, Dr. John Owen (Cromwell's chaplain and soon to be Dean of Christ Church and Vice-Chancellor of Oxford).

like Willis and Bathurst, found it difficult to establish patronage relationships in a government and administration they believed had no claims to legitimacy. In Oxford, those who refused to pledge allegiance to the Commonwealth were officially barred from holding any office in the university or even from graduating; they were marginalized within the university community.[3] Despite this, Willis was able to improve his situation by attracting the interests of those who were in a position to help him. He used his chemical, medical and natural philosophical skills and knowledge to make himself indispensable to prominent natural philosophers active in the university. More importantly, Willis made himself invisible; although his religious and political views were widely known throughout Oxford, he created and maintained an image of himself as a disinterested natural philosopher.

Oxford during the Interregnum

> [B]efore the surrender, there was no place in England more loyal to their prince, orthodox, and observant of the ceremonies of the church of England, than the scholars, and the generality of the inhabitants of Oxon were; so after the entry of the said parliamenteers, there appeared nothing but confusion, darkness, &c. Hell was broke loose upon the poor remnant.[4]

Anthony Wood's description of Interregnum Oxford may seem overly despondent, yet it does illustrate how deeply some residents loathed the events of the decade. By 1650, Oxford was barely recognizable to Willis.[5] The notable individuals active in university affairs for the last twenty years had all but vanished. Samuel Fell and Thomas Clayton Sr. were dead. Gilbert Sheldon, Henry Hammond and William Juxon had fled the university.[6] Similarly, many of Willis' friends and colleagues

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3 Many different acts, such as the Solemn League and Covenant (1643) and the Engagement (1649/50), were passed to promote (or enforce) loyalty to the state. J. P. Kenyon, *Stuart Constitution* (Cambridge: 1986), pp. 239-42; *Acts*, I, p. 298; *Acts*, II, pp. 325-9.

4 Wood, *Fasti*, IV, pp. 100–1.

5 By 1650, Willis had lived in or around Oxford for almost two decades.

6 Sheldon and Hammond were sheltered by the royalist conspirator, Robert Shirley. See David Underdown, *Royalist Conspiracy in England, 1649-60* (New Haven: 1960), p. 184.

had left the university. In their places were new masters and students. While some of the newcomers were intruded by the parliamentary Visitors, many young men came to the university for the same reasons as their fathers and grandfathers: education and advancement. In short, a new university government and a new academic generation had come to the university.[7] Devout royalists and long time residents of Oxford found themselves isolated from the newcomers for a variety of social, religious and political reasons; by 1650, they must have felt like strangers in their own homes.

During the first few years of the Visitation, there was a marked tension between the Visitors and the London Committee. Many of the original Visitors, like Edward Reynolds and John Wilkins, were moderates, generally favouring reconciliation with Oxford royalists and anglicans. They advocated, for example, softening the wording of the Engagement and similar oaths. Parliament, to say the least, did not approve of their actions; it wanted the university government to support the newly established Commonwealth. To this end, new Visitors were intruded into the university during the early 1650s, and the remaining anglicans and many moderates were purged.[8] By 1653, Oxford had a strong relationship with the new Commonwealth governments and with Oliver Cromwell himself. Not only was he Chancellor of the university (1651–7) but he appointed close friends to key positions within the university government. His chaplain, John Owen, was made Dean of Christ Church (1651–9) and Vice-Chancellor (1652-7); his personal physician, Thomas Goddard, became the Warden of Merton (1651–60); and his brother-in-law, Peter French, was appointed a Canon of Christ Church. These men, plus John Wilkins and Thomas Goodwin, were appointed by Cromwell to a special delegation in 1652 to govern the university in his absence.[9] They had,

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7 The academic affairs of the university came to a virtual standstill from 1642 until 1646. Many of Willis' generation had their education stopped for almost four years.

8 Only three heads retained their position: Adam Airay (St. Edmund Hall), Paul Hood (Lincoln College), Gerard Langbaine (Queen's College).

9 16 Oct. 1652, John Owen, *The Correspondence of John Owen*, ed. P. Toon (Cambridge: 1970), pp. 53-4. Goodwin superseded Owen as Oliver's favorite is 1653-4. *Visitors*, p. lxxix.

therefore, a significant and direct influence over the governance and administration of the university as well as its social and political life.

Given the close relations between these men and the government and administration of the Commonwealth and Protectorate, it is hardly surprising that many royalists were excluded from university affairs. By parliamentary order, everyone who wished to hold any position in the university was required to take the Engagement.[10] When enforced, the Engagement effectively excluded royalists — and even some moderates like Reynolds — from participation in the political nation. The language of the oath was harsh and uncompromising:

> [E]very person and persons that now hath, or hereafter shall have, hold or enjoy any Place or Office of Trust or Profit, or any Place or Imployment of publique Trust whatsoever, within the said Commonwealth ... [and] every person or persons that expects benefit from the Courts of Justice of this Commonwealth ... shall take and subscribe, and are hereby required to take and subscribe the aforesaid Engagement.[11]

It is not hard to understand why some royalists took the Engagement; if they were in a region that enforced it, they were entirely excluded from public life. They could neither hold office nor have any recourse to the courts; in effect, they could not advance or protect their own interests.[12]

Oxford royalists dealt with Engagement in many different ways. Some, like Bathurst, perjured themselves by taking the oath. For many people, swearing a false oath did not present them with much of a dilemma; King Charles himself asserted that his subjects take "what liberty their consciences shall give them."[13]

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10 The Visitors received the order concerning the enforcement of the Engagement on 18 Oct. 1649. See *Visitors*, p. 268.

11 *Acts*, II, pp. 325-6.

12 On the importance of law for gentlemen in sixteenth and seventeenth-century England, see Julian Martin, *Francis Bacon, the State and the Reform of Natural Philosophy* (Cambridge: 1992), p. 72 *et passim.*

13 Underdown, *Conspiracy*, p. 8. King Charles I wrote to Bishop Juxon of London asking him to consult Drs. Sheldon and Hammond for advice on the lawful limits of the liberty of conscience in 1646. *CCSP*, I, p. 335.

Others, like Allestree, avoided the Engagement by leaving the university.[14] For Willis, neither perjury nor flight were valid options. First, he had nowhere to go; his holdings were just outside the city. Secondly, perjury was not an option because to some "Taking unlawful OATHS" — for whatever reason — was a breach of one's duty to God.[15] The only action possible for Willis was to avoid situations in which he would be called to take the Engagement. He, therefore, withdrew from the 'official' life of the university and occupied himself with his medical practice and his chemical investigations.[16]

By 1650, non-submitters had little or no hope of advancement within the political nation. The execution of Charles I and the establishment of the Commonwealth appeared to mark the beginning of a new era in England in which supporters of the crown and of the established church of England had little place. Because of his refusal to take the Engagement, Willis was prevented from holding any post in the university beyond that of student nor could he take any degree.[17] There was also little reason for Willis to obtain a doctorate in medicine; he had no desire to practice medicine in London nor could he teach within the university. He chose to practice medicine locally and to study natural philosophy informally. These pursuits not only offered him a means of economic and social survival, they also provided a way in which he could advance his religious and political beliefs. Willis was able to safely watch and gauge the success of the events of the Interregnum as he quietly worked as a physician and natural philosopher.

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14 Throughout the late 1650s, Allestree was a courier between the Holland and Paris factions of the exiled royal court and royalists in England. For example see *CCSP*, IV, pp. 110, 124, 134, 135, 141, 147, 168, 200, 203, 207.

15 [Richard Allestree], *Private Devotions* in *Whole Duty of Man*, p. 38. For more on the relationship between *lawful* dissent and the liberty of conscience see H. Hammond, *Of Resisting the Lawful Magistrate upon Colour of Religion* (London: 1643).

16 Before he submitted, Bathurst reconciled himself to "sit still, and rest content with whatever befell under a prevailing party." Warton, *Life*, p. 205.

17 Willis either refused to take the Engagement *or* he refused to be put in a position in which he would have to make a stand on this issue. In either instance, the result was that he did not take part in the 'official' academic life of the university.

Willis as a practicing physician

Compared with Thomas Willis' later prominence within the medical community, the beginnings of his medical career were much less prestigious. During the 1650s, Willis did not have the patronage connections needed to further his medical career within the university. He practiced medicine instead in the villages and markets around Oxford. There he faced stiff competition for patients because, as he later commented, "a noxious cure is often held in great value with the vulgar."[18] Patients could choose from a wide range of therapies and practitioners. One could find anything from learned doctors to old women practicing medicine. In Oxford during the 1650s, quacks and other empirical practitioners were common: Adams, a locksmith, also earned a living as a surgeon; a Dr. Pundeen consulted his patients in Bendicot's Tavern and James Themut sold his divine cures in the markets.[19] To compete with the other practitioners, Willis offered his patients something they could not easily find: an inexpensive university-trained anglican physician.

Our understanding of Willis' early medical practice is based almost solely on a casebook containing fifty case histories from the early 1650s. While this casebook does not provide a comprehensive account of his medical practice, it does provide valuable insight into many aspects of Willis' early medical practice, such as who his patients were and the kinds of therapies and treatments he favoured. Before examining Willis' casebook, a brief historiographical discussion is in order. A feature of most modern accounts of Willis is the reliance on classification as a means of explanation. Many historians feel that they have sufficiently explained Willis simply by classifying him according to the purported type of medicine or natural philosophy he advocated. Based on an examination of Willis' later works, he is generally assumed to be either a 'chemico-humoural' or a 'chemico-atomistic' philosopher.[20] This categorization, however, is often retrospectively applied to

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18 This section was not included in the 1659 edition. See Willis, *Diatribae duae Medico-philosophicae ... Editio tertia* (London: 1662), p. 182.

19 Dewhurst, "Early Medical Practice", in *Casebook*, p. 42.

20 Dewhurst, "Summary and Conclusions", in *Casebook*, p. 159; Robert Frank Jr., "Thomas

explain Willis' early philosophical research and medical practice. Many scholars *assume* an ideological continuity between the medical and natural philosophical beliefs in the casebook and the concerns evident in his later medical writings.[21] As a result, they place undue emphasis on the few scattered passages that *seem* to indicate Willis' chemical approach to medicine. However, there is a fundamental difference between Willis' work during the early 1650s and his later activities. The histories documented in the casebook were not the product of an accomplished or experienced physician; they were the work of a tentative young physician with little practical experience. He received his Bachelor of Medicine barely three years earlier and had been practicing medicine for only two years.[22] Willis was still attempting to understand and explain illness. His later works were the product of a learned and experienced physician who *knew* both how to explain and cure illness. Modern commentators have not fully acknowledged this. They have used the few 'chemical passages' in the casebook to help bolster their assertions about Willis' later reliance on chemistry and chemical explanations in his published medical works. They have assumed that these passages, combined with the rest which are based on galenic physiology, show Willis' 'chemico-humoural' approach to medicine. There is a much more plausible explanation: Willis was unsure of how to explain physiological processes and their disruptions inherent in illnesses. Although he lacked practical experience, he was familiar with many medical works both ancient and modern. His occasional use of chemical terminology to describe blatantly galenic processes was the result of his attempts to integrate and reconcile his studies of both modern and classical sources with his practical experience. Far from showing Willis' 'chemico-humoural' medicine, the case histories highlight the problems and difficulties a young and inexperienced physician encountered as he

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Willis and his Circle", in *The Languages of Psyche: Mind and Body in Enlightenment Thought*, ed. G. S. Rousseau (Los Angeles: 1990), pp. 115-118.

21 This is an example of what Quentin Skinner calls a "mythology of coherence." *See* Quentin Skinner, "Meaning & Understanding in the History of Ideas", *History & Theory*, 8 (1969), p. 21.

22 He started practicing medicine in 1647 shortly after receiving his B.M. (3 Dec. 1646). See Aubrey, *Brief Lives*, II, p. 303.

tried to learn and practice medicine at the same time.

When his casebook is examined without any preconceptions, a different picture of Thomas Willis the physician emerges. No longer does he seem to be a 'chemico-humoural' physician, rather he was a physician who favoured galenical explanations and therapies as well as chemical medicines.[23] Consider the case of Robert Wylde of Worcester, who suffered from a number of conditions such as dyspepsia and colic pain.[24] His ailments, Willis concluded, were caused by the excessively cold and moist temperament in his stomach. This prevented the full sanguification of the chyle; the blood, therefore, contained too many impurities. Consequently, the blood and other humours frequently collected in certain parts of the body, further exasperating the patient's condition.[25] The therapies Willis instituted were as galenic as his explanations of the problems:

> The curative intentions will be: 1st, gently to purge the body, so that the humours which continuously flow through the affected parts are excreted; 2nd, to cleanse the kidneys and bladder to remove the viscous matter and also the sand and pebbles with drying and diuretic drugs.[26]

These treatments were based on galenic physiology. To restore the natural balance of the humours, their excesses first had to be removed. Once this was accomplished, Willis turned his attentions towards their cause: namely, the patient's cold and humid temperament. Following Galen's advice about opposites curing opposites, Willis proposed a therapy emphasizing *dry* or *drying* medicines to rid the stomach of its excess humidity. He even proposed a cure based largely on the unfashionable galenic practice of relating cures and therapies with other

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23 There is a distinct difference between the explanations offered by Willis in his casebook and those he offered in the *Diatribae duae*: the casebook explanations were solidly galenic; the ones in the *Diatribae duae*, although still essentially based on galenic physiology, were explained using chemical and not peripatetic philosophy.

24 *Casebook*, pp. 67–74.

25 See Galen, "*de purgantium medicamentorum facultate*", in C. G. Kühn (ed.), *Claudii Galeni Opera Omnia* (Hildesheim: 1964-5), vol. XI, pp. 325-6.

26 *Casebook*, p. 72.

terrestrial and celestial events. He suggested that Wylde "Take powder of medlar-stones soaked in boiling water and dried; of this take 1/2 oz, divide into seven parts in the month of May when the moon is waxing."[27] Willis' actions in Wylde's case were galenic from start to finish.

Willis' galenic explanations and therapies in Robert Wylde's case were by no means unique. Traditional galenic classifications, explanations and therapies were common throughout the casebook. To cure one patient's catarrh, Willis suggested changing the patient's regimen and applying remedies to counter the cold and humid temper of his head.[28] When treating an elderly woman with *dyspnoea* or breathlessness, Willis classified the illness according to Galen's scheme. He even drew up a detailed table outlining the types of *dyspnoea* based on Galen's "*de difficultate respiratione.*"[29]

Why is Willis assumed to be a 'chemico-humoural' physician? Simply put, scholars have had a great difficulty distinguishing between galenic explanations and therapies and chemical cures. They assume that since Willis used chemical medicines, he must have been a chemical physician. They bolster this contention by citing the rare cases in which Willis seems to use chemical concepts. Willis rarely used chemical terminology or concepts within his casebook. The chief example of Willis' 'chemical language' is the phrase "bad chemistry."[30] Although historians, like Kenneth Dewhurst, have argued that this phrase shows Willis' nascent 'chemico-humoural' medical philosophy, the phrase, in itself, is meaningless. When these passages are examined in context, the explanations, therapies and cures are all galenic. Bad chemistry, for Willis, meant nothing more than an unfavourable mixture of the humours in the body that needed to be purged. In the case of a "P[illegible]. N." Willis stated that there were two principal aims for purging her bad chemistry: "first that the hot and bilious humours may be prepared and turned away ... and

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27 *Ibid.*, p. 73.
28 *Ibid.*, pp. 82–3.
29 *Ibid.*, pp. 115–7. See also Galen, "*de difficultate respiratione*", in Kühn, VII, pp. 796-818.
30 *Casebook*, pp. 68, 82, 83.

secondly that the parts unnaturally affected may be restored to their original constitution and strengthened."[31] When Willis said his aim was to restore his patient's bad chemistry, he was only indicating that his primary therapeutic aim was to restore the balance of the humours.

There are only two cases in which Willis explicitly rejects galenic explanations and therapies. Instead, he adopted the explanations used by the "hermetics."[32] Many historians assume that Willis was referring to such noted chemical physicians as Paracelsus, Gassendi and J. B. van Helmont, but this may not be the case. Willis rarely named the authorities he relied upon; any claims about his 'Helmontian' and 'Paracelsian' approach to medicine based on such a broad term as hermetic must be treated with skepticism. Such claims seem unlikely considering Willis himself never mentioned these persons. To understand these instances, the details and context of each case must be examined. In the first example, he considered both the possible galenic and chemical causes for the illness. Willis did not present an argument rejecting one for the other; he was attempting to understand the cause of the illness so he could undertake a cure:

> It will not be an easy business to name the proper causes of this state, which is not to be sought in the treasury of ancient medicine. For besides the commonly assigned humours and their motions we must also, with the hermetics, suppose that there is a dissolution of the humours and vapours arising from the blood and the filthy excrements.[33]

Willis did not choose to use a chemical rather than galenic therapeutic strategy to cure his patient. On the contrary, he found the case so difficult that he was unable to prescribe any remedies; his acceptance of a chemical approach to medicine in this case only emphasized his desire to come to terms with a puzzling case by whatever means possible. In the other instance, Willis rejected a galenic explanation for the illness in favour of a chemical one:

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31 *Ibid.*, p. 82.
32 *Ibid.*, pp. 108-9.
33 *Ibid.*, p. 98.

> [I]t does not seem probable that any of the presumed humours could, separately from the blood, be stirred up into such a rapid motion that would swiftly penetrate into diverse parts of the body. Nor if the humour mixed in the blood did more, would it cause such commotion.[34]

The patient's "night-pains," he concluded, were caused either by "winds" exciting the "malignant humours" or by the abundance of a gastric juice (a salty humour) in the body.[35] While the explanations for the possible causes of the illness were chemically-based, his therapy remained galenic. He was to "purge the primary routes and the whole, both by medicines and by phlebotomy and then by sweating; and afterwards to correct the bad diathesis of the humours by appropriate medicaments and a good mode of living."[36]

Apart from these two instances, Willis did not rely on hermetic or mechanistic explanations within his casebook.[37] That is not to say that he was unfamiliar with chemical medicine; on the contrary, he favoured the use of chemical medicines in his cures. He was familiar with many chemical and *materia medica* texts. This is not surprising since he had more practical experience as a chemist then he did as a learned physician.[38] Of all the authorities Willis cited, only a handful were used to bolster his explanations of the illness. Even in those specific cases, his conceptualization of the illness remained essentially galenic.[39] Willis relied primarily on chemical physicians' remedies rather than their

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34 *Ibid.*, p. 109.

35 *Ibid.*, pp. 109–10.

36 *Ibid.*, p. 110.

37 Dewhurst argued that Willis' use of the term "insensible transpiration" indicates the chemical and mechanistic basis of his philosophy, but this is not the case. First, Willis' descriptions of the illnesses and of the process of transpiration were solidly galenic. Second, "transpiration" was frequently used by Galen to explain the abundance of humours in the body. See *Casebook*, pp. 82–3, 100-1 and Galen, "*Galeni adversus Lycum libellus*", in Kühn, XVIII, pt. 1, pp. 205-6; "*methodi medendi, lib. XI*", in Kühn, X, pp. 753-5.

38 Willis helped prepare chemical remedies when servitor to Canon Thomas Isles in 1636 and he worked as a chemist for philosophers, such as Bathurst and John Lydall, during the late 1640s. See Aubrey, *Brief Lives*, II, pp. 303-4; Frank Jr., "Science at Commonwealth Oxford", pp. 197-8.

39 *Casebook*, pp. 70, 110, 141.

explanations of illnesses and physiological processes. Apart from Hippocrates and Galen (which we would expect *any* learned physician to know and cite), he also mentioned cures prescribed by Daniel Sennert, Ortolf, Le Palmier, Lazare de Rivière, Jean Fernel, Abraham Zacutus and Horatio Augenius. While the medicines Willis prescribed were markedly similar to those advocated by chemical physicians, he used them to treat and remedy disorders explained using galenic physiology and natural philosophy.[40] He rejected the mysticism and religious radicalism of chemical medicine while incorporating chemical cures into galenic medicine. Willis' explanations for illnesses and their treatment were markedly tentative, cautious and largely traditional. While he often used chemical cures, he understood and explained their actions according to traditional galenic concepts and explanations.

Willis may have used many of the same cures as the empirics, yet he was able to offer his patients something few empirics could: he could explain how and why the cures worked. The empirics Willis competed with in the markets had little or no knowledge of learned medicine, physiology or natural philosophy; they only knew how to make their cures. His conceptions of the empirics and their cures were not based solely on his experiences competing with them for patients; Willis had an immediate and personal knowledge of the failure of their treatments. He was frequently called to help patients after empirics had failed, to cure the patient.[41] Sometimes, as Willis described in the case of Mrs. J. Sterne, their cures made the situation much worse: "on incautiously taking many remedies from empirics to quieten the flux of her bowels she fell into a fever, with a thirst, burning, dejected appetite, and her mouth and throat were gripped by a fierceness."[42] The chief problem with empirics, according to Willis, was that they used their cures "like a sword used in the hand of a blind man, without discrimination and exact method of healing, more often bestows hurt than benefit

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40 For example, see *Ibid.*, pp. 65, 73, 88, 139, 149.

41 For example, see *Ibid.*, pp. 92, 103, 112, 124 *bis*, 127, 130, 135, 138, 143 and 147.

42 *Ibid.*, p. 130.

to the sick."[43] Empirics, however, generally focused on the apparent signs of an illness rather than on their more hidden causes. One of Willis' patients sought the cures offered by a certain empiric because of her success in curing angina.[44] For Willis, "an exact method of healing" involved understanding the hidden causes of illness (both internal and external). The learned physician did not specifically attempt to heal the outward signs of the illness; he focused his attentions on remedying the underlying physiological imbalances and disruptions.[45]

An important aspect of Willis' early medical practice was the predominance of royalists both as his colleagues and as his patients.[46] Throughout the Interregnum, Willis continued to associate with people who shared his religious and political convictions. He was a member of a close-knit circle of anglican physicians active in the region throughout the 1650s. The circle consisted of Ralph Bathurst, Richard Lydall and Peter Eliot. These men worked together as both practicing physicians and natural philosophers. Although he took the Engagement, Bathurst later stated:

> Had my principles, or conversation, been otherwise than became me, I could not have expected those invitations and encouragements, which I found from my lords of Canterbury, Winton, lord chancellor Clarendon, and other chiefe favourites, at the king's first return. Nor would Dr. Fell, Dr. Dolben, Dr. Allestree, Dr. Willis, Mr. Ma Wren and other, have been my constant friends, and intimate acquaintance all along, through the worst of times.[47]

Bathurst's convictions and loyalty, while not as well known as Willis', are evident in his actions: throughout the Interregnum, he helped Bishop Skinner of Oxford (1641-63) secretly ordain anglican ministers. Richard Lydall similarly submitted to

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43 *de Febribus*, p. 111.

44 *Casebook*, p. 124.

45 For more on Willis and empirics, see chapter 6 below.

46 Kenneth Dewhurst performed detailed biographical investigations of all Willis' patients in the casebook. Of the patients whose allegiances are discernible, only one (Edward Dew) was *not* a royalist. His wife, however, was the niece of a prominent Hinksey royalist, Edward Perrot. See Dewhurst, "Summary and Conclusions", in *Casebook*, p. 158

47 Warton, *Life*, pp. 205-6.

the Visitors while retaining his anglican and royalist beliefs; he was expelled from the commons at Merton for proclaiming his loyalties in 1649 and he married the daughter of Charles Perrot, a noted Oxford royalist.[48] Eliot, a former chaplain at Corpus Christi, left his College shortly before the Visitation.[49] The circle formed the basis of a small community of royalists and anglicans bound together by common concerns and interests. They evidently preferred to keep business with fellow anglicans. When Lydall's sister-in-law Anne Perrot became ill, Willis was called to treat her.[50] Willis frequently consulted the apothecary John Crosse, a friend of John Fell.[51] Similarly, he and Eliot knew and probably worked with William Day, an Oxford surgeon.[52] Willis and his associates lived and worked around a small section of High Street near All Souls College known for its strong royalist and anglican bias; in addition to Day, Eliot and Crosse, this section of High Street was home to George Bates — future chief physician to Charles II — and the Principal of St. Alban's Hall, Richard Zouche — a "malignant" who openly "talked against Oliver" — (see map 2).[53]

The circle had contacts that extended beyond the medical and natural philosophical communities. They provided devout anglicans with a 'respectable' form of medicine and practitioner. Rather than consulting an empiric who might support questionable religious views (*e.g.* a Paracelsian chemical physician), they could consult an anglican physician. For example, Willis treated Margaret Fell's brother, Robert Wylde, a noted Worcester royalist, who served in the royalist army during the wars and was the County Commissioner for Worcestershire.[54] He also treated his future brother-in-law Walter Jones, who succeeded Samuel Fell as the

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48 *Visitors*, p. 262; *Casebook*, pp. 150-1n2.

49 Eliot was never examined by the Visitors.

50 *Casebook*, pp. 149-51.

51 Dewhurst, "Early Medical Practice", in *Casebook*, p. 56.

52 Day kept his consulting rooms in "The Angel" on High Street (an area remarkable for royalist and anglican dissenters). After the Restoration, Willis, Day and Eliot formed a partnership and expanded their medical business leasing most of the entire block.

53 Aubrey, *Brief Lives*, II, p. 81.

54 *Casebook*, p. 74.

rector of Sunningwell, Berkshire. Willis was called to treat members of the Perrot and Finmore family, both prominent landholders in North Hinksey.[55] The Perrots were noted Oxford royalists; Edward Perrot served in the royalist army during the Civil War and his wife, Elizabeth, was the daughter Sir William Stonehouse, a staunch royalist.[56] Willis and his circle fulfilled a valuable social role for anglican families around Oxford; they were part of a small community of disaffected anglicans that tried to maintain — in a limited fashion — the traditional structures, relations and values of Caroline civil society.

① Beam Hall (Willis' residence)
② 82 High St. (W. Day's Consulting Rooms)
③ 85, 86-7, and 88 High St. (Sarasen's Head Inn, & the residences of G. Bates and R. Zouche)
④ Deep Hall (R. Boyle's residence rented from the apothecary, J. Crosse)
⑤ 106-7 High Street (Buckley Hall), William Petty's residence
⑥ Christ Church
⑦ All Souls College

Map 2: High Street, Oxford circa 1655[57]

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55 For example, see *Ibid.*, pp. 64-5, 82-3, 83-4, 149-50.

56 *Ibid.*, p. 150n2.

57 Information compiled from H. E. Salter's *Survey of Oxford*, ed. W. A. Pantin, 2 vols. (Oxford:

Willis the natural philosopher

Sustaining a career within the university was not as easy because "his principles were knowne well enough."[58] Willis' natural philosophical skills, however, provided him with a potential means through which he could establish new patronage relations. Despite his reputation as a devout anglican and royalist, Willis created and maintained an image of himself as a disinterested chemical assistant. When working with other philosophers, Willis avoided controversies, arguments and personal disputes of all kinds. Instead, he focused on his natural philosophical investigations and the preparation of chemical recipes; the invisibility of being a technician gave Willis social, political and professional security.[59]

During the late 1640s, he participated in the researches conducted by a group of anglican natural philosophers from Trinity college, including his younger step-brother William Willis (1631-62), Ralph Bathurst, Richard Highmore (the brother of Nathaniel Highmore M. D.) and John Lydall (the brother of Willis' medical partner, Richard Lydall). Willis maintained strong and lasting friendships with this group throughout the Interregnum and Restoration.[60] Little is known of their investigations except what was outlined in a series of letters between John Aubrey and John Lydall.[61] While this group discussed and performed many kinds of research, Willis' involvement appears limited to assisting in their chemical

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1969) and superimposed on David Loggan's "Map of the City of Oxford" (1675) as reproduced in Anthony à Wood, *The Life and Times of Anthony à Wood*, ed. Llewelyn Powys (London: 1932).

58 Warton, *Life*, p. 205.

59 On the roles of invisible technicians, see Shapin, *A Social History of Truth*, pp. 355-407. Some, like Robert Hooke, resented their invisibility, yet for Willis it provided a means of survival through the Interregnum. On Hooke, see Stephen Pumfrey, "Ideas above his Station: A Social Study of Hooke's Curatorship of Experiments", *History of Science* 20 (1991), pp. 1-44.

60 Bathurst refused a request from John Aubrey to travel with him in 1653 because he could not leave Willis, who likely would not join in the endeavour. Warton, *Life*, pp. 41-2.

61 Extracts from the correspondence in MS. Bodleian Library, Aubrey 12, fos. 292r-319v were reprinted in Frank Jr., "Science at Commonwealth Oxford", pp. 213-7. In the mid-1650s, Bathurst, like Willis, was primarily interested in medical matters, such as respiration, the nutritive function of maternal blood, and the concoction of food). See Warton, *The Literary Remains*, in *The Life and Literary Remains of Ralph Bathurst M.D.*, pp. 127-238.

investigations.[62] "[O]ur Chymist," as Lydall described him, helped prepare chemical compounds and mixtures, such as *aurum fulminans*, a highly volatile preparation made from the mixture of gold and *sal armoniac*.[63] *Aurum fulminans* was examined by philosophers throughout the latter half of the century because it allowed them to study, describe and explain all kinds phenomena associated with heat and combustion.[64] For Willis, *aurum fulminans* was an important natural philosophical compound "inasmuch as many other natural operations are performed by the motion of these kind of sulphurous particles."[65] Willis, for example, later used *aurum fulminans* to explain by analogy the heating of the blood. Willis' involvement with the natural philosophical investigations undertaken by the "Trinity group" allowed him to further his career in numerous ways. For example, it provided him with an informal framework through which he could improve his skills as a chemist and a physician. More importantly, his friendship with Lydall and Bathurst provided him with a way to create social connections to further his career.

Willis lacked the social connections he needed, but his friends were not as isolated. Both Bathurst and John Lydall were involved with the 'official' academic life of the university: Bathurst was studying for his doctorate in medicine and Lydall moderated the "Phylosophy Lecture" held in Trinity in 1649.[66] Willis likely became known to many of the newer members of the university, like Petty and Wilkins, through his friends. William Petty attracted the attentions of many scholars and students, like Wilkins, Seth Ward and John Wallis.[67] Petty had numerous natural philosophical interests including medicine and anatomy. During

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62 The extracts reprinted by Frank especially highlight their interest in astronomy, anatomy and navigation. Frank Jr., "Science at Commonwealth Oxford", p. 213.

63 MS.Bodl. Aubrey 12, fo. 294r cited in Frank Jr., "Science at Commonwealth Oxford", p. 213.

64 Frank Jr., "Science at Commonwealth Oxford", p. 197.

65 *de Fermentatione*, p. 75.

66 Bathurst submitted to the Visitors on 1 June 1648. Although Lydall refused to submit, he was given special dispensation to "moderate" the philosophical meetings in Trinity in 1649. *Visitors*, pp. 89, 121, 269.

67 Frank, *Oxford Physiologists*, p. 54.

his brief stay in Oxford, he helped further interest in natural philosophical investigations within the university. In addition to his duties as the Tomlins Reader in anatomy, he also hosted meetings and gatherings of philosophers in his rooms at Buckley Hall. Petty also had relationships with prominent members of the university community and the Commonwealth government, including Francis Rouse, Samuel Hartlib, John Graunt, Colonel Kelsey (Governor of Oxford, 1646-51) and Henry Cromwell.[68] For young physicians and natural philosophers, Petty was an important man to know; he had knowledge, ability and social connections.

The most famous incident concerning Petty and his associates was the resurrection of Anne Green in 1650. These events brought the physicians involved (Petty, Bathurst and Willis) into the public eye both in Oxford and beyond. The story of Anne Green, as told by Richard Watkins in *Newes from the Dead* (1651), is a morality tale. During the late 1640s, a young woman named Anne Green was a servant to Sir Thomas Read, a local JP. While in his house, Green had an affair with Sir Thomas' grandson, by whom she secretly had a child. In 1650, the body of an infant was found in her room. Although Green and her gossips claimed the child had been still-born, she was brought to trial by Sir Thomas. She was quickly tried, found guilty of murder and hanged. After the sheriff declared her dead, her body was taken away to be dissected by four local physicians: William Petty, Thomas Willis, Ralph Bathurst and a Mr. Clerke. Upon beginning their examinations, they discovered that Green was not dead and they then set about to revive her.[69] They succeeded. As news spread of her "resurrection," many became convinced of her innocence; not only had God spared her life, but Thomas Read,

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68 During Petty's brief stay in London, he attracted the attention of Samuel Hartlib and other parliamentarians. John Graunt helped secure his appointment as Gresham Professor of music (1651) and his fellowship at Brasenose College was fa[illegible]ated by Hartlib, John Dury, Col. Thomas Kelsey and Francis Rouse. Petty was later personal secretary to Henry Cromwell. See Webster, *Great Instauration*, pp. 81-2, 155.

69 The first reaction of their assistant (a "lusty fellow") was to carry out the death sentence; he promptly "stamped" her chest several times. When the learned physicians arrived, they stopped the man "for humanity as their Professionsake, [and] fell presently to act in order to her recovery." [Richard Watkins], *Newes from the Dead* (Oxford: 1651), p. 2.

her "grand prosecutor," died just as her recovery seemed assured.[70] She was quickly pronounced innocent and, as in many morality tales, she later went on to live a most virtuous life.[71]

The case of Anne Green captured the attention of many Oxford residents, and propelled the physicians involved into the public eye. Laudatory and often jocular poems were written by Oxford students proclaiming the skills of their physicians. As Peter Killigrew wrote "Death, spare your threats, we scorne now to obey; If Women conquer thee, surely Men may."[72] Joseph Williamson, a future Secretary of State, wrote:

> *Cà Catholique, que dis-tu maintenant?*
> *Le miracles se font-ils pas? pendant*
> *Qu' entre nous l'aveugle gaigne la veüe*
> *Le boiteux marche, le mort se voit en rüe.*
> *Voy-cy la fille qui tantost estoit morte,*
> *Elle vit à cett' heure, & tres-gaillarde se porte.*[73]

In a lengthy tribute to the incident, Anthony Wood praised the physicians' skills:

> Had sage *Hippocrates* this seene,
> His leading *Theme* had alter'd beene;
> For such the wonder is, that you
> *Have made Art long, and Life so too.*[74]

While Petty received most of the credit, the others benefited from the exposure the incident gave them, if not as physicians, then certainly as witnesses to — and participants in — a miracle.

After Petty departed for Ireland in 1651, many of the philosophers involved in the Buckley Hall meetings began to gather in Wadham College. Amongst the participants were Robert Wood, John Wallis, Robert Boyle and Matthew, Thomas

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70 Watkins left it to the reader to decide whether the cause of Read's death was old age, a guilty conscience or Divine judgment. *Ibid.*, p. 7.

71 Robert Plot, *Natural History of Oxfordshire* (Oxford: 1677), p. 199.

72 Watkins, p. 10 (sig. C3v). The pagination of the latter half of the book is inconsistent. All references to that section will be both to page and signature.

73 *Ibid.*, p. 6 (sig. C1v).

74 *Ibid.*, p. 21 (sig. E).

and Jonathan Goddard.[75] A number of anglicans, including Willis, Bathurst, Seth Ward, Christopher and Matthew Wren also took part. The leader of this group, a participant in the Buckley Hall meetings, was the Warden of Wadham, John Wilkins. Wilkins had a considerable reputation as a natural philosopher before he came to Oxford; he wrote numerous tracts and had been an active participant in the "Invisible College" in London. Wilkins was also one of the first parliamentary Visitors. He arrived in Oxford shortly after the surrender and was named Warden of Wadham in 1648.[76] By 1652, he was a prominent and powerful member of the university community; not only was he Warden of Wadham, but he also served on the committee established by Cromwell to run the university in his absence.[77] More importantly, as far many anglican philosophers were concerned, Wilkins held moderate political and religious views.[78] In the preface of *Monarchy asserted, or, The state of monarchicall & popular government* (London: 1657) Matthew Wren praised his character: "in an Age overrun with passion and sourness: It is not enough with you, for the ruining of a man, to be told that he is of such a party or persuasion."[79] During his tenure as Warden, many anglicans enjoyed both his patronage and — as Wren described it — the "generous freedom" he allowed them. For example, Seth Ward was appointed Savilian professor of astronomy through Wilkins' insistence even though he never took the Engagement; and John Fell was allowed to remain in Oxford because of Wilkins' support, despite the protestations of John Owen, the Vice-Chancellor of Oxford.[80]

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75 Boyle's participation started shortly after his arrival in Oxford in 1655. Frank Jr., *Oxford Physiologists*, p. 64.

76 His patrons, lord Berkeley and lord Saye and Sele, both served on the Commons committee concerned with the reform of Oxford. See 10 Feb. 1646/7, *CJ*, p. 83.

77 Owen and Wilkins were schoolmates at Edward Sylvester's school in All Saints parish, Oxford. They, along with other graduates of his school, held annual reunion dinners. Perhaps at one of these dinners, Owen or Wilkins met Thomas Willis. *Fasti*, IV, p. 34-5.

78 He and the then Dean of Christ Church, Edward Reynolds, supported softening the wording of the Engagement. Barbara Shapiro, *John Wilkins, 1614-72, An Intellectual Biography* (Los Angeles: 1969), p. 84.

79 Cited in Shapiro, p. 119.

80 *Ibid.*, p. 120.

The individuals who participated in the Wadham meetings had diverse natural philosophical interests and concerns, including astronomy, anatomy, geometry, medicine and chemistry. Willis' participation appears limited to chemical and medical investigations. In his casebook, he recorded a long list of expenses "Laid out at Wadham Coll."[81] This list highlights a fundamental feature of Willis' interest in chemistry: he was primarily concerned with chemical investigations related to the study and practice of medicine. The ingredients Willis listed, such as rhubarb, oil of amber, honey and *mercurius dulcis*, were ingredients in many of his cures; *mercurius dulcis*, for example, was used as a purgative; honey was a chief ingredient in such preparation as oxymel, hydomel and Fernel's Water.[82]

In 1656, Wilkins married the Lord Protectors' sister, enhancing his power and significance within Oxford, but also inspiring his political ambitions.[83] The activities of the Wadham group became increasingly sporadic as Wilkins' political aspirations increasingly took him from the university. In 1659, Wilkins left Oxford to become Master of Trinity College, Cambridge. Private researches no doubt continued, but the Wadham group appears to have disbanded. Towards the end of the decade, a small group of philosophers informally met with Robert Boyle in his rooms at Deep Hall.[84] Boyle, while young, had prominence within the political nation; his father was the earl of Cork and his brother, Lord Broghill, was an influential member of the Protectorate government. Although Willis had communicated many chemical experiments to Boyle's assistant (presumably Hooke) earlier in the decade, the extent of his participation in these gatherings is not known.[85] His reputation as a chemist and natural philosopher by the time of these meetings, however, was well established. He had written a short tract on

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81 *Casebook*, p. 153.

82 *Ibid.*, pp. 73, 76, 80, 154.

83 Sheldon later accused Wilkins of marrying "too near unto you know who." Shapiro, p. 112.

84 Boyle leased his rooms in Deep Hall from the apothecary John Crosse, an anglican and friend of John Fell's.

85 Frank Jr., "Circle", p. 115. Willis recommended Hooke to Boyle as an assistant in 1654. Shapin, *Social History of Truth*, p. 401.

fermentation that was distributed amongst Oxford natural philosophers and which was highly recommended.[86] News of his abilities and skills had spread beyond Oxford; Samuel Hartlib called him "a very experimenting ingenious gentleman" and a "leading and prime man in the Philosophical Club at Oxford."[87]

Willis' reputation as a chemist and natural philosopher improved greatly during the Interregnum. Although still not part of the 'official' academic and social life of the university, he did significantly advance his situation and standing within the community. He used his chemical and natural philosophical skills and abilities to cement the social relations necessary for his advancement within the university. They brought him to the attention of influential new members of the Oxford community, such as William Petty, John Wilkins and Robert Boyle. Chemistry, while becoming a popular pursuit in Oxford, remained a highly *skilled* endeavour. Preparing and mixing recipes, like the explosive *aurum fulminans*, required considerable practical experience. Willis' abilities here made him useful, perhaps even indispensable, to many local philosophers. His career as a physician, on the other hand, provided an outlet for his anglican and royalist sentiments. It allowed him to support himself financially and to contribute to the maintenance of a small pocket of Caroline civil society that still existed in Oxford. Although Willis' abilities had managed to earn him a significant reputation by the close of the decade, he was better known as a chemist and natural philosopher than as a physician. For Willis, the invisibility of being an assistant gave him the social and political security he desired during the Interregnum. It allowed him to improve his standing without having to compromise his anglican beliefs or sentiments. Invisibility provided security, but it needed to be carefully cultivated and maintained. As we shall see in the *Diatribae duae*, a chief component in being invisible was learning how to promote your own beliefs while simultaneously avoiding controversies and disputes.

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86 Frank, "Circle", p. 116n33.

87 Hartlib, "Ephemerides", 1654, ff. WW-WW 7-8. Cited in Frank Jr., "Circle", p. 115.

Chapter 3
Wandering in Solitary Places

> *[F]or a long time, observing the events and courses of fevers, I had been engrossed with discovering the methods of the principles for healing them, finally a new pathology of this disease was conceived in my mind.*
>
> *de Febribus*, H5*.

By the close of the 1650s, Thomas Willis had enhanced his standing within the Oxford community. A decade earlier, he had been a struggling young physician and natural philosopher trying to advance his career but lacking the social connections needed to do so. He succeeded because he was able to recreate the needed social relations through his involvement with influential and prominent Oxford natural philosophers, such as William Petty and John Wilkins. By 1658, he had gained a reputation as a learned and skilled chemist and natural philosopher. While not as noticeable, Willis' career as a physician had similarly changed for the better. As the case histories in the *Diatribae duae* show, both his abilities and his confidence had greatly improved. It hardly surprising that the announcement in late 1658 of the publication of his first work met with a favourable response. The *Diatribae duae Medico-philosophicae, quarum prior agit DE FERMENTATIONE SIVE De motu intestino particularum in quovis corpore. ALTERA DE FEBRIBUS, SIVE De motu earundem in sanguine Animalium His accessit Dissertatio Epistolica DE URINIS* was praised in the correspondence of Robert Wood and Robert Boyle.[1] Before proceeding to a detailed discussion of the *Diatribae duae*, some questions need to be answered: for example, what was a *diatriba* and why did Willis believe it was necessary to write one?

Understanding the rhetorical status of a *diatriba* within learned seventeenth-

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1 Wood, Willis' neighbor and a participant in the natural philosophical investigations in Buckley Hall and Wadham, recommended the work to Samuel Hartlib. Similarly Boyle sent copies to both Hartlib and John Beale. Frank Jr., "Circle", pp. 116n33, 116n35.

century discourse is vital for a full appreciation of Willis' work. However, few dictionaries — either modern or early modern — provide a definition beyond "diatribe" or "discourse." Such definitions disguise the subtleties in the meaning of *diatriba* because the definition of "diatribe" is almost as superficial. Only one of the definitions in the Oxford English Dictionary is from the early modern period: a diatribe, is a "discourse" or "disquisition."[2] A *diatriba*, however, was very specialized form of discourse; it referred to a disquisition that occurred outside an auditorium or lecture hall.[3] A *diatriba*, therefore, was a learned disputation delivered by someone outside the formal institutional structures of academic life.

Willis believed that the traditional structures of society were important (be they academic, political, social or religious). When his first work was published, he believed it necessary to indicate that the work was the product of a learned gentleman (an Oxford physician) with no official standing within the university. All of this information was related on the title page of the *Diatribae duae*. Willis re-emphasized these points in the prefaces to both *de Fermentatione* and *de Febribus*. He stated: "I would not have any one reckon this is brought forth by me as if lecturing from the chair."[4] Unlike someone studying within the 'official' university environment, Willis had "to wander without a leader or companion in many out of the way places, and trample as it were in a solitude trodden by no footsteps."[5] For someone like Willis, who was raised in an environment that stressed order and hierarchy, it made sense for him to portray both his work and himself in such a manner. While he had managed to gain the attentions of natural philosophers within the university, he was still outside the formalities of university life. His refusal to acknowledge the authority of the parliamentary Visitors and his

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2 Willis' "diatribe" does not suit the more modern connotations of a personal and vehement discourse because he consciously avoided disputes and arguments throughout the text.

3 Robert Estienne, *Thesaurus Linguae Latinae* (Brussels: 1964), II, p. 83.

4 *de Febribus*, sig. H5*. The doctor lecturing from his seat is a very traditional image. See "A Medical Master and His Students", in Glasgow, MS Hunter 9, fo. 39 reprinted in *Osiris* 2nd ser., vol. 6 (1990), p. 6.

5 *de Fermentatione*, sig. A4.

subsequent withdrawal from the official university life were not without their consequences. Without a change in either the political climate or in his conscience, Willis could not take part in official academic matters; he would remain wandering in out of the way places.

For over a decade, Willis was a practicing physician, natural philosopher and chemist. His experiences in these professions shaped his later conceptions about physiological change and related phenomena. These professions were fundamentally concerned with understanding, explaining and controlling change. To cure his patients, a physician needed an understanding of the natural philosophical causes of their illness in order to undertake a suitable remedy. As a learned physician, Willis believed that the traditional galenic cures and therapies were often the most reliable. Yet as a natural philosopher and chemist, he believed that the traditional peripatetic principles were unable to significantly unfold the "secret recesses" of nature. Thus, although Willis was convinced galenic practices were often the best, he was unable to accept their underlying peripatetic explanations and justifications. Willis reconciled his competing medical and natural philosophical experiences and beliefs in the *Diatribae duae*, providing a medical philosophy that explained the operations of traditional galenic therapies using a chemical rather than a peripatetic framework.

Before proceeding to a detailed analysis of the work, a brief bibliographical introduction is needed. The *Diatribae duae* was registered at the Stationer's Company on 26 Nov. 1658 by the London printing house of John Martin and James Allestree, a kinsman of Willis' friend Richard Allestree.[6] The volume consisted of three separate tracts (continuously foliated, but paginated separately). The first two tracts (*de Fermentatione* and *de Febribus*) formed the *Diatribae duae* proper; the third (*de Urinis*) was an epistolic discourse to Willis' friend and colleague, Ralph Bathurst. When examining this volume, historians generally

6 *A Transcript of the Registers of the Worshipful Company of Stationers from 1640 to 1708 A.D.*, ed. G. E. Briscoe Eyre (London: 1913), vol. II, p. 207.

assume that there is little rhetorical and philosophical continuity between the three tracts. They wrongly consider the *Diatribae duae* to be primarily a chemical work to which two medical treatises were later "appended."[7] The *Diatribae duae* must first and foremost be examined as one rhetorical unit. Willis believed all the tracts were thematically related and cross-references were commonplace.[8] In the first tract (*de Fermentatione*), Willis introduced the concepts necessary for a full appreciation of his medical philosophy. He outlined how the "Chemists' principles" could be used to explain natural, artificial and physiological phenomena. He then proved his philosophy in *de Febribus* by using his chemical principles to explain fevers, an important medical topic in seventeenth-century medicine. In the final treatise (*de Urinis*), he emphasized the points and concerns raised in the earlier works by chemically explaining the diagnostic importance of examining the urine in cases of fever. In the *Diatribae duae*, Willis presented a sustained argument proving the usefulness of a chemical medical philosophy for understanding and explaining physiological processes and remedying their unnatural disruptions and disorders. It was not a chemical treatise that dealt in passing with medical matters, it was first and foremost intended to be read as a medical work.

Willis' fermentative theories enabled him to explain the structures and actions of many natural, artificial and physiological processes without recourse to peripatetic philosophical principles. Willis did not attempt to provide a comprehensive account of all physiological phenomena in the *Diatribae duae*; his chief interest was in providing a natural philosophy that explained the nutritive system and the motion of the alible juice in the human body.[9] Using fermentation, Willis broadly explained the functioning of the human body and the operations and actions of medicines and other therapeutic practices. Not surprisingly, given

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7 Frank Jr., "Circle", p. 116.

8 For example, see *de Fermentatione*, pp. 26, 97, *de Febribus*, p. 103; *de Urinis*, p. 29.

9 For example, he avoided discussion of sensation and motivation.

his attention to the nutritive system, Willis explained the study and cure of fevers, the primary nutritive disorder. Fevers literature had an important rhetorical function for early modern physicians. Fevers were an important and common illness; medical philosophies, therefore, were often judged as to how well they enabled a physician to understand, explain and remedy fevers. These practical concerns motivated Willis to develop his medical philosophy. Although he advocated a chemical medicine, his conceptualization, classification and treatment of fevers remained solidly galenic. His primary intention was to provide a philosophy that allowed him to reconcile contemporary chemical medicines and cures with traditional galenic therapeutic practices.

Chapter 4
Understanding the Natural Oeconomy

> *[T]he Spirits being regularly disturbed in their motion become enraged, they shake the blood and force it to grow monstrously hot, until what is extraneous and not mixable, is either conquered and diminished or cast out of doors.... [F]rom a lack of spirits also from their motion being perverted or impeded, arise great vices of the natural oeconomy.*
>
> *de Febribus*, p. 6.

Thomas Willis outlined a comprehensive medical natural philosophy in *de Fermentatione*. In under 100 pages, he described the categories and styles of explanation for many kinds of natural, physiological and artificial phenomena. It is not hard to understand why historians of science long focused their attentions on this text given all of Willis' works: his chemical explanations of phenomena seem to reflect many of the contemporary natural philosophies popular in England and on the Continent, such as those advocated by Robert Boyle, Pierre Gassendi and J. B. van Helmont. *De Fermentatione* is considered, therefore, to be one of many works written during the latter half of the seventeenth century signaling the downfall of the scholastic philosophies and the rise of mechanical and chemical philosophies often associated with the Royal Society.[1] Such conceptions of this work are fundamentally misleading because they are based more on historians' conceptions of *de Fermentati* n on an appreciation of Thomas Willis' own concerns and motivations. V e *de Fermentatione* to explain change without recourse to the four elements, yet it would be an oversimplification to *assume* he was motivated by a desire to reject the learned philosophies taught in the university. His experiences as a chemist taught him that peripatetic principles did not sufficiently explain phenomena yet, as a physician, he knew that galenic

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1 Frank Jr., *Oxford Physiologists*, pp. 163-9 *et passim*; Theodore Brown, *The Mechanical Philosophy and the 'Animal Oeconomy'* (New York: 1981), pp. 155-9; Audrey Davis, *Circulation, Physiology and Medical Chemistry in England, 1650-80* (Lawrence, Kansas: 1973), pp. 154-63.

cures and therapies based on these principles worked. He presented his solution to this apparent dilemma in *de Fermentatione*. He provided a medical natural philosophy that explained and preserved the traditional galenic therapies by using a chemical rather than humoural framework.[2] Far from trying to discredit traditional practices, Willis wanted to bolster them.

A New Physica

Aristotle noted the similarities between the study of natural philosophy and medicine. He concluded that learned physicians "begin their investigations into medicine with an inquiry into nature."[3] When discussing the natural philosophical beliefs outlined in *de Fermentatione*, modern scholars seldom consider the other two works included in the *Diatribae duae*, namely *de Febribus* and *de Urinis*. *De Fermentatione* is assumed to be a chemical work and, consequently, the physiological examples and the following medical works are dismissed as an afterthought.[4] Willis, however, did not conceive of his work in this manner. He limited his inquiry to specific aspects of fermentation because "the more full handling of them pertains to a chemical work."[5] In *de Fermentatione*, Willis presented his readers with the chemical principles necessary for understanding his physiological theories. He described a medical natural philosophy that explained natural phenomena, physiological processes *and* the operations of medicines.[6] *De*

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2 There is a marked division in the scholarship on Willis written by historians of science and historians of medicine. Historians of science (who typically examine *de Fermentatione*) classify Willis' *philosophy* as a compromise between chemical and atomistic philosophies. He is, therefore, considered to advocate the new philosophy. See the authors cited in note 1. Those who examine Willis' medical *practice* describe him as a conservative who favoured chemical categories within a galenic therapeutic framework. See Dewhurst, "Early Medical Practice", in *Casebook*, p. 49 and Harold Cook, *Decline of the Old Medical Regime* (Ithaca: 1986), pp. 184–5. These competing images of Willis are addressed in Chapter 5 below.

3 Aristotle, "On Sense and Sensible Objects", Ch. I, 436b1-436b2 in *On the Soul, Parva Naturalia, on Breath*, trans. W. S. Hett (Cambridge, Mass: 1935), p. 211.

4 Frank Jr., "Circle", p. 116; Frank Jr., *Oxford Physiologists*, p. 167.

5 *de Fermentatione*, p. 87. Also see pp. 32, 48, 72.

6 Willis commented that the operations of medicine *could* be included within the text, but, as he said "this subject deserves a singular consideration." See *de Fermentatione*, p. 48.

Fermentatione was not a chemical text with scattered medical references to which he appended several medical tracts; Willis asserted it was a medical text that used natural philosophical examples:

> So far as those [examples] used, whenever chosen out of natural Philosophy, [they] were fit to wait upon the *medical dissertation* [*de Febribus*] following next, that we may more happily know the origin, progress and state as well as the remedies and cure[s] of the tumults which are continually created in the human body from the irritated blood and the other humours.[7]

The rhetorical structure of *de Fermentatione* further emphasizes its pedagogic nature (see table 1). Willis provided a comprehensive account of *physica* — the nature and causes of change in natural, artificial and physiological bodies. His theories explained the generation, growth and corruption of matter as well as the interactions between various objects. He explained how and why natural processes occur and, more importantly, why they often went wrong. Willis also provided the framework through which these processes could be altered and even controlled through the application of external bodies, like medicines, food and chemical distillations. In short, Willis provided a natural philosophy that specifically explained physic.

7 *Ibid.*, p. 97.

Chapter 1	An introduction to the composition of bodies
Chapter 2	An introduction to the "properties" & "affections" of chemical particles
Chapter 3	A discussion about the mixtures of principles in minerals
Chapter 4	A discussion about the mixtures of principles in vegetables
Chapter 5	A discussion about the fermentative processes in animals
Chapter 6	An introduction to the many kinds of fermentation possible in artificial things
Chapter 7	An explanation of the internal fermentations that tend towards exaltation and perfection
Chapter 8	An explanation of the fermentations that cause corruption
Chapter 9	A discussion of the mixtures of fermentative bodies that tend towards dissolution, or the breaking apart of bodies
Chapter 10	An account of the greatest dissolvent in nature: fire
Chapter 11	A fermentative explanation of the mixture of liquids that result in the precipitation of principles
Chapter 12	An explanation of how particles, through all the tumults of fermentation, come together and form new "friendships"

Table 1: The Structure of de Fermentatione

The Principles of the Chemists

Early in *de Fermentatione* Willis explained why he chose to explain natural phenomena using a chemical framework: the philosophies of the peripatetics and the atomists only superficially described phenomena. Peripatetic philosophy "saves the appearances of things, that it is almost the same thing to say a house is composed of wood and stone, as a body of four elements."[8] Likewise the atomistic philosophy "induces notions extremely subtle and remote from the sense[s] and which, when it descends to particulars, does not sufficiently quadrate with the phenomena of nature."[9] Chemical explanations avoided these deficiencies, yet they introduced a new and potentially much more important problem: chemical philosophies were frequently associated with religious radicalism. Willis, like many learned Englishmen, believed that chemical physicians, especially those who practiced Paracelsian and Helmontian medicine, advocated unhealthy medical,

8 *Ibid.*, p. 3.
9 *Ibid.*, p. 4.

religious and political beliefs.[10] Willis believed that it was necessary to apologize for advocating a chemical philosophy:

> If anyone objects that I prostitute unusual notions, almost only heard in the offices of chemists, I say ... [it is] more easy to represent them to the vulgar capacity and to lay them not only before their eyes, but even into their hands. Of the kind of substances which I call particles, rude and impertinent men may certainly see them to be in things with the help of their senses: besides the names of sulphur, salt, spirit and the rest are more commonly known than matter and form or the four principles of the Peripatetics.[11]

Chemical natural philosophy was not useful because of its 'truth', but because it allowed Willis to describe phenomena in a way that was useful for learned practitioners while still remaining accessible and familiar to the meanest of men, the rude and impertinent. Chemical philosophy, therefore, gave Willis an advantage over other physicians when he practiced medicine in the markets around Oxford; he was able to demonstrate his knowledge of causes in ways readily understandable by his potential customers.

Natural and artificial phenomena, according to Willis, could be understood and explained by fermentation, or the "internal motion of particles or principles of any body."[12] These principles "meet each other in various ways, they associate and again scatter themselves; they enter into different marriages and endure divorces in [their] continual interactions, on which the origins, destructions and transmutations of things depend."[13] All fermentations followed the same pattern: they carried an object from imperfection towards perfection and then to

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10 On religious aspects of chemical medicine, see Owen Hannaway, *The Chemists and the Word* (Baltimore: 1975), esp. pp. 1-21, 75-91; Walter Pagel, *The Smiling Spleen* (London: 1984); P. M. Rattansi, "Paracelsus and the Puritan Revolution", *Ambix* 11 (1963), pp. 23-32; Charles Webster, *Great Instauration*, pp. 273-88; Webster, "Paracelsus: medicine as popular protest", in *Medicine and the Reformation*, eds. O. P. Grell and A. Cunningham (New York: 1993), pp. 57-77. On the responses to chemical philosophies and medicine, see Cook and Brown (cited in footnotes 1 & 2).

11 *de Fermentatione*, sig. A3v–A4.

12 *Ibid.*, p. 17.

13 *Ibid.*, p. 32.

corruption.[14] More than simply the internal motion of principles, fermentation was a directed process with set bounds and limits.[15] Willis was more interested in understanding and explaining the process of fermentation than in explaining the reasons for the affections and motions of the particles (as we shall see). There were five principles or particles that were present in bodies to varying degrees: spirit, sulphur, salt, water and earth. Willis did not assert that these principles were the basic bodies from which all matter was made; on the contrary, they were a heuristic aid with which natural phenomena could be understood, explained and manipulated:

> I mean by the name of *principles*, not the most simple and completely uncompounded entities, but such kind of substances into which natural things are resolved as though [into] parts lastly sensible.... In the meantime, what small pieces are gathered together in subjects or depart from them appear under the form of *spirit*, *sulphur*, *salt* or *one* of the others.[16]

Of the five principles, spirit, sulphur and salt were the most active. The interactions and affections of the spirituous, sulphurous and saline principles caused all change. Water and earth were only the media through which these principles associated: water generally facilitated their interactions while earth hindered them. Willis assigned a number of properties to each principle (see table 2). For example, spirituous particles are highly active and constantly attempting to burst forth in all directions. While not as delicate as spirituous particles, sulphurous particles give objects their temperament (heat, consistency and "pleasant frame").[17] When vigorously agitated, however, sulphur produces a burning heat that can consume the entire body. Saline particles promote the coagulation of the other active principles. The many mixtures and combinations of these active and passive principles explained all natural and man-made objects.

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14 *Ibid.*, p. 36.
15 *Ibid.*, p. 49.
16 *Ibid.*, p. 4.
17 *Ibid.*, p. 6.

Kind of Particle	Natural Characteristics	Normal Fermentative Actions	Physiological Properties
Spirit	Perfection and State	Promotes perfection by "bridling" the irregularities of salt and sulphur	Animation and Sensation
Sulphur	Temperament as to heat, consistency and "pleasant frame."	Promotes maturation or natural growth by gently loosening the bonds binding the particles	Growth and Temperament
Salt	Compaction	Impedes corruption by promoting the coagulation of the particles	Generation and Reproduction
Water	Liquidity	Assists in the association of spirituous and sulphurous particles	A medium that facilitates the physiological processes and fermentative actions
Earth	Solidity	Hinders excessive fermentations by restraining volatile actions	A medium that prevents undue imbalances by hindering volatile motions

Table 2: The Characteristics of the Particles

Before discussing the various changes and alterations that natural and artificial bodies (*res physica*) underwent, Willis explained the characteristics of the threefold family of minerals, vegetables and animals using his chemical principles. The explanations of the natural bodies became increasingly detailed as their mixtures and inherent fermentations became more complex and interdependent. Minerals, being the simplest natural bodies, were easy to describe (see figure 1). They were resistant to change because of the lack of spirit and the abundance of earth and salt, the bonds of which are exceptionally hard to break. The different kinds of minerals and metals were the result of differing amounts of sulphur or spirit. Vegetables were harder to explain because of the more complex mixtures of the active elements possible. It was possible for any of the active principles to be exalted within vegetables (see figure 2). For example, plants suitable for human use, like fruit trees and medicinal herbs, exalted spirits. Hardy and long-lived plants, like oak trees, had an abundance of saline principles. Aromatic plants, such as evergreens, were sulphurous. For minerals and vegetables, Willis provided a framework that allowed the natural philosopher to understand and explain

instances according to the mixture and exaltation of certain principles.[18] Such categorizations were not possible for more complex objects like animals and works of artifice.

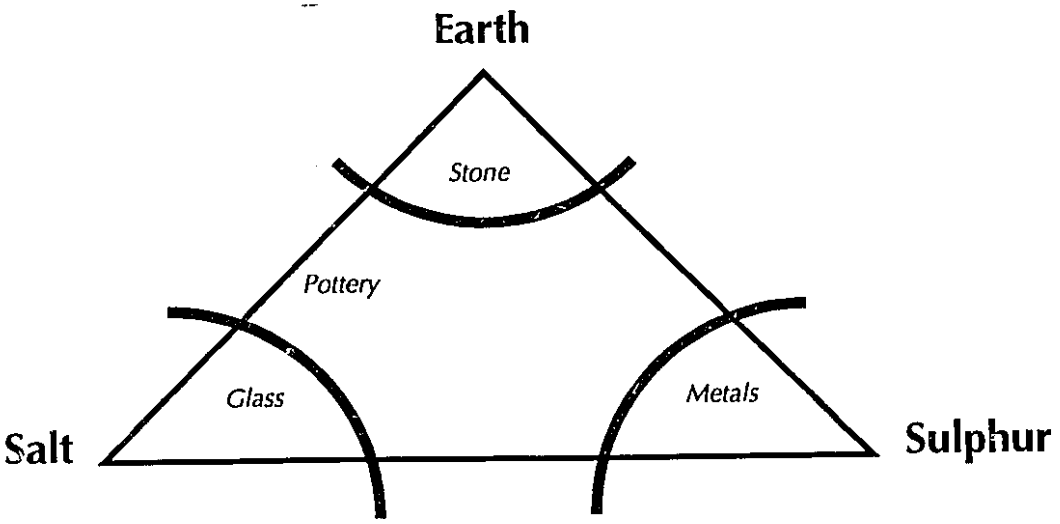

Figure 1: The Principles in Minerals

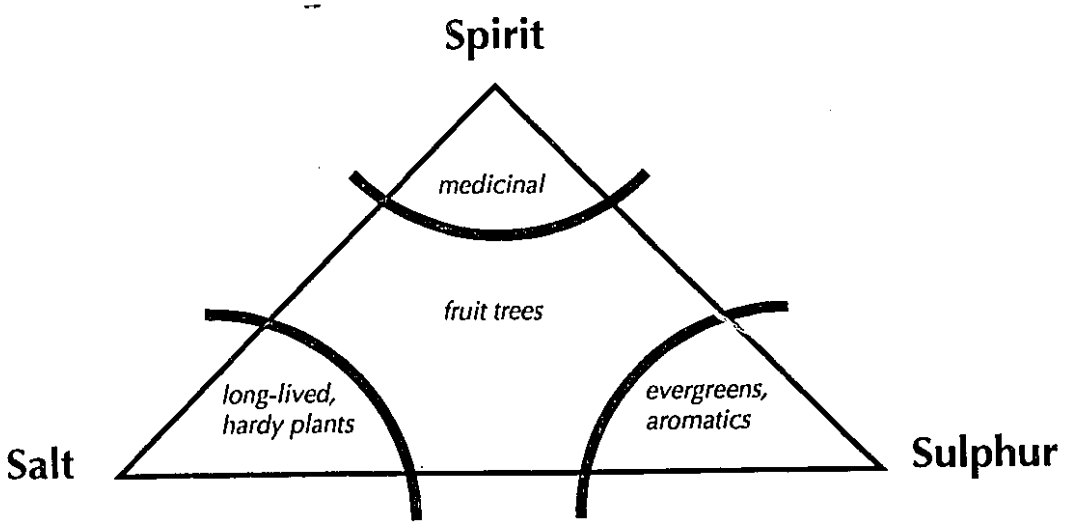

Figure 2: The Principles in Vegetables

18 Later in the century, Robert Plot directly based his explanations of the "waters" and "stones" of Oxfordshire on the style of explanations outlined in *de Fermentatione*. See Plot, *Natural History of Oxfordshire*, pp. 18–50, 69–79, *esp.* pp. 27–8, 71.

Willis did not describe animals according to the mixture of their inherent principles. He focused, instead, on providing fermentative explanations for key physiological processes, like generation, digestion and nutrition. Animals were composed of a complex system of processes in which each of the active principles played their own unique part. To this end, Willis gave spirit, sulphur and salt certain physiological properties in addition to their fermentative characteristics (see table 2, column 4). Spirit, because of its delicate frame and divine origin, was crucial for sensation and animation. Salt aided generation because it bound the other principles together. Sulphur was present in almost every physiological fermentation because it was often bound to other principles. Its gentle motions caused a warming heat and it loosened the bonds holding the other principles together, thereby facilitating the normal fermentative processes essential for life.

The most complex objects to explain were works of art, or objects made by human skill. Willis devoted the last seven chapters of *de Fermentatione* to their consideration. The number of combinations and mixtures possible in these objects made their study difficult because it was "impossible to enumerate the particular species; or to reduce the diverse instances of this to certain classes or heads of distribution."[19] Willis chose, instead, to describe and explain them according to their general fermentative characteristics. For example, he described the changes and ends inherent in all fermentations. He outlined what general characteristics were needed for an object to ferment. He also explained how fermentations might be controlled and manipulated.

Willis divided all fermentations into four phases or stages of change: *crudity*, *maturation*, *perfection* and *corruption*. Knowledge of each of these stages was essential if he was to provide a medical natural philosophy that allowed physicians to control, manipulate and direct the fermentations inherent in physiological processes. During the first stage (crudity) the motions of the active principles were hindered but not usually stopped by the abundance of crudities, like earthy and

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19 *de Fermentatione*, p. 33.

aqueous particles and fixed salts. During maturation, the active principles increased their motions. As a result, the more delicate spirituous and sulphurous particles were exalted causing a gentle heat that further excited the active principles. Eventually, they freed themselves from their bonds. This evaporation helped to "digest" the larger impurities, like the thicker sulphurous, saline and earthy particles. This, in turn, caused more fermentation, more evaporation and more digestion. Eventually, the object reached the height of its fermentative process (perfection) from which it was unable to digest any more crudities. The mixture of the remaining active principles determined its usefulness and purpose. For example, the exaltation of spirit and sulphur rendered many objects suitable for human use, such as cooked food, wine and medicine.[20] Perfected bodies seldom remained in the same state. The exaltation of certain active principles made objects very unstable because there is little to hinder their fermentative motions. Corruption, therefore, was natural and inevitable. As certain principles fermented and evaporated from the perfected body, the remaining principles were exalted in the mixture: sulphurous particles remained in rotting food, hence its rank smell; and wine turned into vinegar because the evaporation of spirit and sulphur resulted in the exaltation of salt.[21] Willis provided many examples of this process, but the clearest was his discussion of the fermentation of wine (see table 3):[22]

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20 *Ibid.*, p. 37.

21 *Ibid.*, p. 54.

22 Galen described the concoction of black and yellow bile using the fermentation of wine as an analogy. Willis' parallel would have been apparent to any learned physician. See Galen, *On the Natural Faculties*, trans. A. J. Brock (Cambridge, Mass.: 1963), p. 209 [Kühn, II, p. 135]; Galen, *On the Usefulness of the Parts*, trans. M. T. May (Ithaca: 1968), pp. 205–6 [Kühn, III, p. 270]. For further examples of the process of fermentation, such as bread-making, zymurgy and the seasonal growth of plants, see *de Fermentatione*, pp. 22-4, 37-40, 40-3.

Stage	Example	Fermentative Description
Crudity	[T]he juice pressed out of grapes ... boils remarkably of it own accord. [44]	Fermentation begins in the must ... [because the juice] swells plentifully with active principles. [44]
Maturation	[W]hile wines become hot, gradually being separated, either congealing together, they fasten to the sides of the of the vessel in the form of tartar, or they sink to the bottom as dregs. Meanwhile the liquor floating on top turns clear and highly spirituous. [44]	[T]he spirituous and delicate particles excite the more thick dregs, and scatter [them] from themselves in every direction, that the mass of the vinous liquor, being made free from the mixture of the dregs, is rendered clear and without dregs. [44]
Perfection	The active particles in our food, are placed in vigour and exalt themselves for pleasure and good health; thus they greatly please the palate and go in food for a more easy digestion. [48]	[P]articles of sulphur begin to spring forth together with spirit .... And by its motion ... [they bring] an active quality, vegetative power and maturation ... [as] may be observed in wine and Liquors fermented for a long time. [6-7]
Corruption	[I]f kept too long or not closely shut up in a cask ... both beer and wine turn into vinegar. [41-2]	Wines are depauperated when from a long effervescency, the spirit and more pure sulphur being evaporated, the particles of salt begin to be exalted. [47]

Table 3: The Fermentation of Wine[23]

As Willis' discussion of wine-making demonstrated, there were many factors that could hinder fermentation, such as the frame of the body and the heterogeneity of its particles. There were two fundamental preconditions for any fermentative process: an "amiable frame" and heterogeneity of principles. Bodies needed a certain looseness ('amiableness') in their structure to facilitate the interactions of the five principles necessary for fermentation. If there were too many earthy particles, for example, the lighter particles would be scarcely able to move. On the other hand, if aqueous particles were abundant, the frame would be too loose; the active principles would be so dissociated that they could not bind with each other. The object, therefore, would quickly become corrupt. Second, fermentation required a heterogeneity of particles within the body because it was

23 All references are to *de Fermentatione*.

essential that "some particles oppose others and incite them into motion."[24] An excessive homogeneity of principles, as found in minerals for example, prevented fermentation because the few contrary particles present were quickly bridled by the overwhelming majority.[25]

Active intervention was often needed to promote and facilitate fermentation. For example, yeast was needed to start the fermentations necessary for making bread.[26] Wine, on the other hand, required constant attention because it so easily fermented. Vintners needed to ensure that "the impurities of wines are purged forth, their heats tempered, or also their defect or sickness may be healed."[27] A vintner, therefore, needed to know the causes of the fermentative imbalance and, more importantly, how it could be remedied through the application of external ferments. Not surprisingly, Willis concluded that "the duty of a physician and a vintner is almost the same."[28] Just as the vintner intervened to heal the ferments in wine, so did the physician in his patient. To present a usable medical natural philosophy, therefore, he had to explain how fermentations could be helped or hindered through the application of external bodies.

The interactions of bodies could be understood by examining the interactions of their principles. All particles had certain "affections" for the other particles. The most obvious was the tendency of like particles to congeal.[29] In addition to this, Willis outlined a few of the stronger affections: saline particles readily joined with earthy particles: spirit had affections for sulphur and water; and sulphur easily combined with spirit. While other combinations of principles were possible, these were the most likely principles to interact and ferment. Simply describing the

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24 *Ibid.*, p. 34.

25 *Ibid.*, p. 19.

26 *Ibid.*, pp. 38–9.

27 *Ibid.*, pp. 43–4.

28 *Ibid.*, p. 31.

29 Willis' natural philosophy cannot be classified as a truly mechanistic account of the universe because he never explained affection; he only described its effects. Affection remained what John Henry calls an "occult force." See John Henry, "Occult Qualities and the Experimental Philosophy: Active Principles in Pre-Newtonian Matter Theory", *History of Science* 24, (1986), pp. 335-81.

affections of the particles, however, did not enable Willis to explain observed phenomena. The affections of the active principles did not enable him to explain why acids dissolve bodies or why the mixture of salt of tartar and blood produced dregs. More detail was needed on how bodies could be combined and on how their principles fermented if Willis was to explain such phenomena. He divided his discussion of these interactions into three broad categories: *dissolution*, *precipitation* and *congelation*. Dissolution explained the interactions of solids and solvents; precipitation dealt with the interactions of solutions; and congelation described the hardening of matter.

Dissolution was the process through which the principles in an object were driven apart. Willis described two kinds of solvent: aqueous solutions and fire. While both of these solvents operated differently, their effects were the same: they released certain principles within an object thereby exalting the others. Fire, according to Willis, was the visible and physical sign of the evaporation of sulphurous particles from an object.[30] Not surprisingly, he believed that when fire was applied to an object, it exalted the sulphurous principles and helped release them from their bonds. If unchecked, fire eventually drove away all the active principles in a body, leaving behind nothing but ash (earth and fixed salt). If gently used, however, fire rendered many objects suitable for human use. The most common example of this is the preparation of food. Through cooking, the sulphurous and spirituous particles in food were excited and, consequently, made more palatable and easier to digest.[31] It was not easy to exalt certain principles (such as spirit and salt) using fire, because they were released from their bonds along with the sulphurous particles. Aqueous solvents, though, could be used to exalt any of the active principles in an object because they attracted and then restrained the others within their own frame. For example, saline solutions

30 *de Fermentatione*, p. 67.

31 The application of fire exalted the active principles in the food and cooked away many of their impurities. *Ibid.*, p. 71.

attracted salts, thereby exalting spirit and sulphur; spirituous solutions exalted salt by attracting spirits and sulphur; and sulphurous solutions chiefly exalted salt by removing the sulphurous particles.[32] Acids (strong saline solutions) destroyed objects by removing their saline bonds. Once the salt was removed, the other principles were likely to ferment and break the object down into small pieces.[33] Through the careful application of solvents, it was theoretically possible to exalt any of the active principles within a solid body.

Precipitation described the mixture and combination of solutions that resulted in the creation of a third body, either liquid or solid. This process enabled Willis to explain, for example, why a mixture of blood and salt of tartar resulted in earthy dregs. Precipitation, like dissolution, allowed the natural philosopher to exalt certain principles by mixing solutions based on the affections of their principles. The chief difference, however, was that the frame of the solution attracting the particles was unable to contain them so, instead, they were released. Willis postulated two kinds of feces ('released material'): elementary and integral. Elementary feces were composed solely of one of the five principles; integral feces contained a combination of them. Many examples of precipitation were given but the most important, in light of the following tract on fevers, was Willis' discussion of the precipitation of the rudiments of urine from the blood in the kidneys. He compared this precipitation to the creation of whey from milk: an acid (saline) rennet passed through the liquor whereby the thicker parts were cast off in a saline solution.[34] Thus, Willis was able to explain the usefulness of the urine as a general indicator of health; it allowed the physician to gauge the constitution of the blood and the successfulness of the nutritive process. He described the combination of blood and salt of tartar in much the same manner; the only difference was a solid,

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32 Saline solutions (*e.g.* the one that helped concoct food in the stomach) were exceptionally powerful. They released the salts in an object, consequently weakening its frame and breaking the object into small pieces. *Ibid.*, pp. 26–7, 59–61.

33 *Ibid.*, p. 61.

34 *Ibid.*, pp. 83-4.

rather than liquid, saline feces.

Congelation and other types of congealing fermentation were different from precipitation in that the saline particles in an object were purposefully exalted. In precipitation, the congelation of salts into feces was the by-product of the exaltation of the other principles in the mixture. Willis outlined three types of congealing fermentations: *coagulation*, *congelation* and *vitrification*. Coagulation explained the formation of shells and bones. It was the process in which the saline particles in an object combined with each other without the assistance of an external ferment.[35] Congelation explained the stiffening of an object through the addition of an external ferment. It explained, for example, how ice could be made by adding salt and snow to water.[36] The congealing fermentation was vitrification, in which saline particles were fused with earthy particles. Vitrification explained pottery and glass; the controlled application of fire freed the other principles, leaving only earth and salt, fused together by their intense fermentation.[37]

Willis' explanations of dissolution, precipitation and congelation served a threefold purpose. First, they allowed him to explain the creation and destruction of matter. They also demonstrated how objects interacted and affected each other using a fermentative framework. Second (as we shall see), they allowed him to explain several crucial physiological functions, such as the nourishment and purification of the blood (vital considerations for the treatment of fevers). Third, they provided a framework that could be used to facilitate the creation of compounds with specific fermentative temperaments. Thomas Willis' natural philosophy suited his needs as a practicing physician. It allowed him to understand and explain change. More importantly, his explanations of chemical processes allowed him to explain the operations of medicines and food in the human body.[38] These theories could also be used to determine the general course of his treatments

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35 *Ibid.*, p. 91.
36 *Ibid.*
37 *Ibid.*, pp. 94–5.
38 *Ibid.*, p. 32.

and to design specific medications to combat specific problems.

Ferments, Affections and Medicine

Historians of science have had great difficulty understanding Thomas Willis' natural philosophy. While specific details of his philosophy have been well documented in the secondary literature, historians' analyses of his intentions and motivations have varied widely.[39] For some, Willis appears to advocate an atomistic chemical philosophy; others argue for a 'chemico-humoural' philosophy. Categorizing Willis' natural philosophical beliefs in this manner does not help us understand his motivations and concerns; on the contrary, it obscures them. Rather than try to classify the kind of natural philosophy he advocated, we should be asking why he wrote *de Fermentatione.* Willis was not interested in explaining the physical composition of matter or the primary causes for change; he was concerned with providing a framework with which physicians could understand, explain and control change.

Willis believed that chemical principles were useful to this end. They explained observed phenomena in a manner that was more accessible than either mechanical or peripatetic philosophies. They not only allowed Willis to understand natural, artificial and physiological phenomena but also the interactions of externally applied ferments. He could, for example, use his philosophy to explain the operations of medicines in the human body. Although Willis found chemical principles useful, he never asserted that matter was ultimately reducible to the five chemical principles. On the contrary, he asserted that matter could be best *understood* if one explained phenomena *as though* it could be reduced to those principles. The chemical principles were a heuristic aid to understanding phenomena. They were not the basic building-blocks of matter. Willis can be considered a chemist, but certainly not an atomist. For a practicing physician, like Willis, explaining the composition of matter was not as important as

39 See chapter 5, below.

understanding and controlling how and why it changed. Yet even Willis' explanations for change reflected his desire to provide a usable medical philosophy. He did not explain, for example, why the principles moved inside the body or why certain principles had affections for other principles. Knowledge of these kinds of phenomena did not allow a physician to explain, understand or treat illness better. A usable medical philosophy, for Willis, needed only to explain the more proximate causes for physiological processes and illnesses.

Willis never described *de Fermentatione* as a chemical work. Fermentation was a vital consideration for physicians because "Not only are we born and nourished by the reason of Ferments; but we also die: every disease raises its tragedies by the strength of some ferment."[40] In *de Fermentatione*, he introduced the natural philosophical concepts and categories of explanation necessary for a fuller appreciation of his medical philosophy. He often neglected to give full consideration to certain natural and artificial processes and phenomena because, as he put it, "the more full handling of them pertains to a chemical work."[41] Willis provided many physiological and medical examples to bolster his natural philosophy. He outlined basic and fundamental physiological processes, such as generation, nutrition and the purification of the blood. *De Fermentatione* must not be considered a chemical tract with scattered medical references, but a medical work that contained natural philosophical examples. The *Diatribae duae*, consequently, must also be considered a medical work. To understand Willis' natural philosophy, we must understand the context in which it was written. We must, therefore, examine it in the light of his medical beliefs and practices.

40 *de Fermentatione*, p. 31.

41 *Ibid.*, p. 87.

Chapter 5:
Healing the Natural Oeconomy

> *Concerning the cures of very many illnesses, the work is chiefly committed to nature, to whose necessity, learned medicine acts as a midwife; and the office and science of a physician, is chiefly busied in these, that occasions of giving suitable aids are expected for this labour. In fact, the plague has this peculiarity, that its cure is little left to nature, but to everything offered by the remedies gathered from art.*
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> *de Febribus*, p. 155.

Thomas Willis' primary concern was to provide a medical philosophy that enabled a learned physician to explain and understand natural physiological processes and to remedy their unnatural disturbances. For Willis, the maintenance and restoration of health depended on the successfulness of the ferments inherent in all physiological processes. Fermentation was not a single event or a collection of episodes, but a lengthy process with set limits and ends. To cure illnesses, the physician needed to understand not only the specific details of the ferments causing the disorder but also their relationships to the process as a whole. Although Willis outlined many physiological processes in the *Diatribae duae*, he focused his attentions on the nutritive system and on its chief disorder, fevers. His conceptions of the nutritive process and of its relationship to fevers remained largely traditional even though he incorporated aspects of recent natural philosophical and anatomical investigations into his work. While Willis' language and styles of explanation differed from those used by many galenic physicians, his cures and therapies did not: broadly speaking, he had only superimposed a chemical framework on the traditional galenic conceptions of nutritive physiology.

Describing a Discovered Country

Willis began his discussion of fevers with these thoughts:

> To Institute a new doctrine of [illegible] in this age may perhaps seem the

> same as if someone should make a to-do to describe the midst of this country instead of a land previously unknown. For what is related to the diagnosis of this illness already seems to be firmly established.[1]

Why did Willis believe a new medical philosophy was necessary? Historians have provided compelling accounts of the concerns and beliefs of many physicians and philosophers active during the Interregnum, yet few have addressed Thomas Willis in anything but a passing manner. The most commonly accepted account of these individuals is provided by Robert Frank Jr. in *Harvey and the Oxford Physiologists*. He describes how many of the "Oxford Clubbe" were concerned with clarifying certain 'key' Harveian problems on the composition of the blood and air and their relationships to respiration and vital heat. There are, however, some important methodological weaknesses in his approach. When explaining the actions and concerns of individuals traditionally considered 'minor actors' in the events of this period, Frank generally relies on a cursory examination of their work and on an analysis of their activities and relationships with the 'major figures'. When explaining the concerns and interests of Thomas Willis, he describes the beliefs and concerns of various philosophers active within Willis' immediate context, like Robert Boyle, William Petty and John Wilkins. He then discusses the beliefs and concerns of philosophers removed from Willis' immediate context, such as William Harvey. Frank's explanations of Willis' natural philosophical concerns are based more on his examinations of other natural philosophers than on Willis himself. Frank contextualizes his account of these 'concerns' with a few select quotes from Willis' works which appear to support his contentions about how Willis discarded the traditional peripatetic philosophies and practices in favour of the new mechanical and chemical philosophies.[2]

Robert Frank Jr. is not alone in this dubious approach. Audrey Davis,

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1 *de Febribus*, sig. H_2*.

2 The preface to *de Febribus* and the first chapter of *de Fermentatione* are the most commonly cited sections because Willis *appears* to modern historians to reject scholastic philosophies for the new philosophy.

Theodore Brown and Kenneth Dewhurst tell similar stories based on the mechanical application of broad historiographical categories rather than on a direct examination of Willis' physiological and philosophical beliefs and concerns. The consequence is that Willis' philosophy is inextricably interwoven with those of the individuals with whom he is compared. When explaining Willis' conceptions of fevers, for example, Davis uses van Helmont's beliefs to fill the 'gaps' in Willis' account. She gives more consideration to van Helmont's beliefs than she does to Willis' and concludes that despite the differences in their beliefs, Willis was generally a Helmontian physician.[3] Theodore Brown does the same thing using Rene Descartes' philosophy; for him, Willis is a Cartesian. Robert Frank Jr. uses William Harvey and the Oxford "Sparkles" to prove Willis was an Oxford Harveian.[4] Dewhurst provided detailed accounts of Willis' physiological beliefs and theories, yet he relied on a similar approach; he used a variety of mechanical and chemical philosophers, such as Pierre Gassendi, Cornelis van Hogelande and J. B. van Helmont to prove that Willis was a 'chemico-atomist' with galenic tendencies.[5] The current scholarship on Willis and on his natural philosophy, concerns and interests, therefore, has shockingly little to do with an appreciation and understanding of Thomas Willis and his own beliefs.[6]

Willis desired to explain the actions and effects of traditional galenic therapies without recourse to peripatetic principles which, as he argued in *de*

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3 Davis, *Circulation*, pp. 154-70.

4 Brown, *Mechanical Philosophy*, pp. 152-3; Frank Jr., *Oxford Physiologists*, pp. 165-9, 221-3, 248-50, and esp. 287-94; Frank Jr., "Circle", pp. 118-9. A pictorial representation of Frank's argument was presented in Frank Jr., "The Image of Harvey in Commonwealth and Restoration England", in *William Harvey and his Age*, ed. Jerome Bylebyl (Baltimore: 1979), p. 108.

5 Dewhurst, "Early Medical Practice" and "Summary and Conclusions", both in *Casebook*, esp. pp. 49, 161.

6 There is no place for an understanding of Willis' beliefs and concerns within the current historiographical framework for this period, which remains rudimentary, and actually little more than a sophisticated retelling of the ancients vs. moderns thesis popularized in 1936 by F. R. Jones. See F. R. Jones, *Ancients and Moderns*, 2nd ed. (New York: 1982). Individuals, like Willis, who fail to fit easily in either of these categories, are an anomaly; they are either ignored or forcibly made to fit into the prescribed framework.

Fermentatione, only saved the appearances of things. Furthermore, recent natural philosophical and anatomical investigations concerning the motion of the blood and nutritious juice and on the functions and purpose of the liver suggested to him problems in the traditional conceptions of nutrition.[7] How could a nutritive disorder like fevers be understood and cured without first explaining the motions of the blood and nutritious juice? Willis believed traditional explanations of fevers were unsatisfactory because Harvey's arguments concerning the motion of the blood displaced the function and purpose of the vegetative soul seated in the liver. In galenic natural philosophy, the liver had several important functions; it contained the vegetative soul responsible for the body's growth and, more importantly, it created the blood. In Harvey's scheme, however, there was no place, literally, for this soul. He proved that the body did not create and destroy massive amounts of blood for its nourishment. There was now no need for a special organ to make massive amounts of blood because what little was needed could be made from the blood itself. For Willis, these researches suggested that traditional galenic conceptions of the motion of the blood were wrong and, consequently, traditional accounts of the causes of "the heats of fevers and their preternatural motions are entirely hidden and in the dark."[8]

While current accounts of Willis' motivations for writing the *Diatribae duae* do provide some insight into how and why Willis wanted to integrate the circulation of the blood into his medical philosophy, they preclude a detailed understanding of his medical and philosophical beliefs by downplaying his religious, political and social beliefs. They also provide no answer as to why his cures and therapies remained solidly galenic. Willis believed that a new medical philosophy needed to account both for recent research and for the successfulness of traditional galenic practices and therapies. His experiences as a practicing

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7 Chiefly William Harvey, *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (Frankfurt: 1628); Francis Glisson, *Anatomia Hepatis* (London: 1654); and Thomas Wharton, *Adenographia* (London: 1656).

8 *de Febribus*, sigs. H_2*v-H_3*.

physician throughout the decade convinced him that traditional therapies were often the most reliable and successful ones. Additionally, he was convinced of the importance of being able to understand the causes of illnesses *and* the operations of medicines. Empirics seldom had this knowledge and, as Willis frequently witnessed, their cures often caused more harm than good. One of the few substantial distinctions between learned physicians and the many quacks and empirics was the ability of the learned physician to know and explain the causes and manifestations of an illness as well as the actions and effects of his therapies. Most importantly, Willis knew it was important for a physician competing for patients in the markets to present his skills and explanations in an accessible manner. For Willis these were the primary attractions of his chemical philosophy. It enabled him to explain physiological phenomena and traditional galenic practices and therapies in a form that his patients could readily understand. Thus, to offer his services as a learned physician, Willis had to integrate past medical practices and beliefs into a contemporary philosophical framework. As we shall see, his motivations were far more complex and textured than the secondary literature has led us to believe.

Fermenting Humours

Willis incorporated the results of many recent anatomical and philosophical investigations into his work, such as those conducted by Harvey and Francis Glisson, but he did not offer a medical philosophy based on anatomical observations.[9] He chose instead to emphasize the *process* of nutrition rather than the operations and functions of its specific parts. For some philosophers, like Glisson, anatomical observations were an important foundation for natural philosophy: "[t]he end of *artificial* dissection is not to mangle and cut the object it takes in hand rudely into *shreds*, but to gain the *perfect knowledge* of the same and

9 Although Willis later offered arguments based largely on anatomical observations in *De Cerebri anatome* (London: 1664) and *De Anima Brutorum* (Oxford: 1672), we should not *assume* the existence of a near complete continuity of thought and practice in Willis' natural philosophy.

all its parts thereby."[10] A medical philosophy, therefore, had to be based on detailed anatomical investigations into the structures, functions and purposes of specific organs. For Willis, anatomical proofs were less important because he wanted to provide a philosophy that explained the entire process of nutrition *and* the disruptions that could later lead to fevers. Not surprisingly (given his earlier discussion of fermentation), Willis concluded that a learned physician was like a vintner because both are concerned more with the functions of an entire fermentative process rather than the changes inherent during specific episodes.[11] The goal of both was to facilitate natural fermentations and to help remedy unnatural disturbances. To do this effectively, they needed to understand the ferments inherent in that specific instance *and*, more importantly, how they related to the process as a whole. Thus, Willis thought it was more important to explain the process of nutrition than it was to describe the form and function of its various parts. His conception of the nutritive process, however, remained largely unchanged from the traditional galenic accounts: food was made into nourishing juice which was then distributed through the blood vessels. The only significant difference was his use of chemical rather than peripatetic explanations.

According to Galen, after food was swallowed, it was forced down the alible duct towards the stomach by the attractive faculty in that organ. There, it was concocted by the heat of the stomach into a refined material fairly similar to blood, called *chyle*. During the *first elaboration* — as this process was called — food composed of the four elements was broken down and purified. The coarsest wastes were carried to the bowels and expelled from the body. After this elaboration, the chyle traveled through the intestines and the mesenteric vessels into the liver where it underwent a second concoction in which further wastes were removed. Galen compared the *second elaboration* to wine-making.[12] As wine fermented, the

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10 Francis Glisson, *English Manuscripts of Francis Glisson (1)*, trans. Andrew Cunningham (Cambridge: 1993), pp. 17–19.

11 *de Fermentatione*, pp. 43–4.

12 Galen, *On the Usefulness of the Parts*, pp. 205-6 [Kühn, III, p. 270].

heavier dregs sank to the bottom of the vessel, while the frothy wastes rose to the top. A similar process, he argued, occurred in the liver when the blood fermented and wastes were separated.[13] The heavy black bile (which is *cold* and *wet*) sank to the bottom of the liver, while the light yellow bile (*hot* and *dry*) rose to the top of the liver. The black bile traveled to the spleen and was then expelled from the body; the yellow bile collected in the gall bladder before it was expelled. By this time, the remaining chyle had been transformed into blood (*hot* and *wet*). The blood was then distributed throughout the body as nourishment. The various parts of the body attracted and assimilated what they need from the blood, while ignoring the remainder.[14] The nourishment of the lung, however, required an additional concoction because it was composed of a finely textured flesh that required an equally refined blood. Galen demonstrated that some blood was concocted in the left ventricle before traveling to the lung. As the blood flowed out of the liver through the veins to the extremities, all the parts were nourished. By the end of its course, the blood had been entirely consumed.

Willis described this process using chemically based explanations. According to both Galen and Willis, the nutritive juice followed virtually the same physical paths as it was distributed through the body; their chief difference was in how they conceived of the motion of the blood and nutritious juice through the veins (see table 4). Since Galen believed that the nutritious juice (the blood) was *distributed* and not circulated throughout the body, it was easy to conceive of it following a set path with a beginning and an end: in his case, the liver and extremities. It was hard for Willis to conceive of the motion of the nutritive juice in this manner. Once in the vessels, the alible juice became part of a continuous cycle whereby it traveled repeatedly to all the parts of the body. There was no physical start or finish to its circular motion. Also, since the blood was not consumed in massive quantities by

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13 Galen frequently used fermentation to explain physiological phenomena. See chapter 4, note 22. Antonius Musa Brasavolus listed over two dozen references to fermentation in his index. See A.M. Brasavolus, *Index Refertissimus in Omnes Galeni Libros* (Hildesheim: 1975), p. 191.

14 Galen, *On the Natural Faculties*, pp. 33-9 [Kühn, II, pp. 20-24].

the body for its nourishment, there was no need for an organ devoted to sanguification. Willis argued, therefore, that the blood carried the nourishing juice (*chyme*) throughout the body. During the nutritive process, only the chyme — not the blood — was consumed. Furthermore, the chyme was created from the chyle before it was introduced into the blood. Willis believed that food was purified in the stomach because of its mixture with a saline ferment (the acidic remnants of previously digested food). The salts in these bodies entered into a flux which thereby weakened the frame of the food and allowed the other principles to ferment more easily. The product of this dissolution (*chyle*) then traveled to the intestines where it was gently heated further aiding its fermentation. After undergoing this process, the chyle was transformed into a rudimentary chyme containing many impurities and crude particles and then introduced into the veins through the milky vessels in the mesenteric root. The chyme, however, was not immediately assimilated into the body parts for nutrition; it had first to undergo a lengthy maturation as it circulated with the blood.

Galenical Nutrition			Willisian Nutrition		
Stage	**Explanation**	**Site**	**Stage**	**Explanation**	**Site**
First Elaboration	Food is cleansed of coarser impurities as it is broken down into chyle, a blood-like substance	Stomach	Digestion	A Saline ferment causes a fluxion between salts, thereby breaking down the food and helping to purge the coarser crudities.	Stomach
Transportation	The chyle travels to the liver	Intestines and the milky vessels in the mesenteries	Chyme-making	The chyle is fermented into chyme through which further coarse ferments are removed.	Intestines
Second Elaboration	The chyle is cleansed of its impurities, resulting in two waste humours (black and yellow bile), and is transformed into blood	Liver	Transportation	The chyme enters the veins through the milky vessels in the mesenteries	Milky vessels in the mesenteries
Transportation	Blood leaves the liver and is distributed throughout the body through the veins	Veins	Circulation	The blood undergoes an extensive fermentation as impurities are digested	The blood vessels
Final Elaboration	Some blood needs to be refined further so that it can nourish the lung. This elaboration takes place in the left ventricle.	Left ventricle	Purification	Crudities and the old defected portions of the blood are expelled, thereby facilitating the perfection of the maturing chyme.	Liver Spleen Kidneys
Nutrition	The body nourishes itself through the application of the faculties of each of the body parts		Nutrition	The parts are nourished by assimilating the needed principles	

Table 4: The Nutritive Process according to Galen and Willis

Once the chyme entered the vessels and mixed with the blood, Willis' account of the nutritive process became more complex than the traditional galenic account. Willis asserted that the blood was not composed of a mixture of the four humours (blood, phlegm, black and yellow bile); it was an aqueous solution or "singular humour" in which all the active principles were exalted and constantly fermenting.[15] During its circulation, however, the blood took on characteristics Galen ascribed to the other three humours:

> in fact the blood having obtained various qualities, at one time hotter, at another colder, its nature imitates the qualities of such humours [phlegm, choler and melancholy]; or in its circulation it casts down its recrements, which being deposited in little receptacles or containers, are believed to be the morbific and preternatural humours.[16]

The other humours were *recrements* of the blood in which certain principles were exalted. Nervous juice (phlegm) was composed primarily of spirit and water; yellow bile (choler) had salt and sulphur exalted in an aqueous mixture; black bile (melancholy) exalted salt and earth with some water (see table 5).

Humour	Composition (in order of exaltation)	Galenic Site	Willis' Site
Blood	Spirit, Water, Salt, Sulphur, and Earth	Liver	n/a (blood makes blood)
Choler	Salt and Sulphur in a spirituous solution	Gall Bladder	Liver
Melancholy	Fixed Salt, Earth and some sulphur	Spleen	Spleen
Phlegm	Spirit and Water	Brain	Brain

Table 5: A Comparison between Galenic and Willisian physiology.

It was essential to understand the motion and composition of the blood to

15 *de Febribus*, p. 4.

16 *Ibid.*, p. 28.

explain the humours and their influence on physiological processes. Willis drew an analogy between the ferments of the blood and wine to demonstrate his physiological theories better.[17] Both liquors, he argued, were highly volatile and spirituous when perfected. Moreover, they also underwent similar fermentative changes during their crudity, perfection and defection. When the chyme was first introduced to the blood, it contained many impurities that bridled the active spirits. Before it could render suitable nourishment, it first had to be purified. The natural heat and ferments in the blood excited the active principles in the chyme and, consequently, helped it to digest its cruder particles. As the chyme matured, the spirits became increasingly exalted. Once perfected, the chyme was highly volatile with spirits attempting to fly forth at every opportunity. This ebullition of the blood, in turn, helped sustain both the body's innate heat and the fermentation of less perfected chyme. The exalted principles are then assimilated to the body parts as nourishment, thereby rendering the blood lifeless like wine left in an open vessel. Willis noted, however, one key difference between these two liquors:

> [I]n wine there is no destruction of the old and addition of new parts, but that the liquor confined in a bottle remains constantly the same: but not so concerning the blood, in which certain parts are continually destroyed and others are always generated anew in their place. In wine, the times of crudity, maturation and defection are distinct and are successively carried out in the whole. In blood, the same threefold state is celebrated at the same time and in parts.[18]

Within the blood, one could see simultaneously all the stages of the fermentative process from crudity to defection. Crude chyme was added continually to the blood, while perfected chyme was nourishing the body and defected chyme was being expelled. These chymes interacted and influenced each other in their own fermentations; for example, perfected chyme helped both to fuel the perfection of crude chyme and to purge defected chyme. Similarly, the crude and defected

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17 *Ibid.*, pp. 9-13.

18 *Ibid.*, p. 17.

chymes helped bridle the excessive fermentation of the perfected chyme. Nutrition, therefore, was a complex system of interactions on many different levels.

While these fermentations occurred throughout the body, several anatomical locations deserved special consideration. The motions of the heart, for example, were caused by the fermenting blood in the "bosom of the heart" as:

> very many particles of spirit, salt and sulphur endeavour to burst forth from the weakening of its [the blood's] frame: by which it is rarified to full measure, and like water boiling over a fire, the boiling blood put in motion is carried through the veins not without an extraordinary tumult and turgencency.[19]

Without the introduction of crude chyme, this turgency could not last for long because the fermenting principles quickly rendered the blood defected. During its circulation, the principles of the perfected chyme were *assimilated* to the body parts as nourishment.[20] The blood — like uncorked wine — quickly became lifeless as the active principles were removed. The defected chyme was then removed from the blood by purifying organs, like the kidneys, spleen and liver. In the kidneys, the saline and spirituous parts of the blood precipitated into a serum that was excreted; in the spleen, the blood was volatized into a heavy black material composed of fixed salt and earth; and in the liver, the adjust salts and sulphur in the blood fermented into a yellow frothy liquor.

Apart from the differing conceptions of the function and purpose of certain organs and on the motion of the blood, Willis' basic conception of the nutritive process remained essentially galenic: alible juice was made from food and then mixed with the blood and distributed through the vessels and assimilated into the

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19 *de Fermentatione*, p. 26.

20 Although he did not focus his attentions on describing the nourishment of the parts, Willis apparently conceived of it in much the same manner as Galen; nourishment was somehow attracted to the body parts, assimilated and the wastes rejected. See *de Febribus*, p. 15 and Galen, *On the Natural Faculties*, pp. 37-9 [Kühn, II, p. 24]. By not specifically describing the actions at this stage, however, Willis made his work serviceable to philosophers who advocated many different philosophies: Galenic physicians could explain the process according to galenic principles *and* chemical physicians could explain these actions chemically.

parts of the body (by some unexplained mechanism). Instead of emphasizing the differences between his physiological system and the galenic system, Willis chose to emphasize their similarities. For Willis, the similarities were more important than the differences. This conciliatory tone was a constant feature of the *Diatribae duae*. When Willis introduced his views concerning the motion and heat of the blood in the heart, he briefly mentioned the chemical views of Hogelande and the mechanical views of George Ent and Rene Descartes. Hogelande believed that the heat in the heart was caused by a fermentation, while Descartes and Ent described a vital flame.[21] Willis concluded:

> Whether it be said to be done by this or by that way, the matter entirely returns to the same thing: because the alteration which the blood receives in the heart can be equally deduced from a flame, or a nitrous-sulphurous ferment.[22]

He wanted to provide a medical philosophy that allowed him to practice medicine. He chose to use chemical explanations because they allowed him to explain the operations of the body and of medicines using the same language and styles of explanation. It enabled him to understand and explain illnesses and his cures more easily. Engaging in philosophical arguments and debates did not facilitate this.

The Ebullition of the Blood and Galenic Medicine

Nutrition was a complex system of fermentations that acted on many different levels. Not surprisingly, disturbances in this process often had grave and lasting consequences. The chief disorders deriving from the flow of the blood and the alible juice were fevers. As a practicing physician, Willis knew the importance of understanding and curing fevers; in his casebook, he related many accounts of

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21 On Descartes and Hogelande, see Roger French, "Harvey in Holland: circulation and the Calvinists", in *The Medical Revolution of the 17th century*, eds. R. French and A. Wear (Cambridge: 1989), pp. 46-86. On the responses to Harvey's work, see Roger French, *William Harvey's Natural Philosophy* (Cambridge: 1994), pp. 114-309.

22 *de Febribus*, p. 20.

fevers and related illnesses.[23] Fevers were both a common and a deadly disease; a third of all mankind, Willis estimated, fell prey to them.[24] Many early modern physicians shared his conceptions; the study of fevers (puretology) was an important concern for early modern physicians.[25] New medical philosophies were often judged according to how well they enabled a physician to explain, treat and cure fevers. If a medical philosophy could not explain such an important illness, what use was it to a practicing physician? These concerns are evident in the *Diatribae duae*; Willis offered a new framework with which fevers could be understood and explained, but his conceptualization, classification and treatment of them remained largely traditional. In the broadest terms, fevers remained pathological; they were illnesses that brought an immoderate heat to the blood and other humours:

> It is plainly known, even to the senses, that the *blood* in a fever is made to greatly boil and rage; and everyone having a fever (though rude and unskillful) complains of the blood being affected and of the same boiling in the veins as if driven into anger.[26]

Willis contended, like traditional physicians, that the source of the immoderate heat generally could be found in the nutritive system because the alible juice is the only liquor with which the blood is regularly mixed.[27] Disturbances in the nutritive process, therefore, typically caused an unhealthy alteration in fermentative balance in the blood.[28] Willis' chemical explanations for galenic conceptions of both the nutritive system and fevers allowed him to integrate aspects of both modern and traditional medical philosophies. He was able to explain the operations of popular remedies *and* traditional therapeutic practices according to his doctrine of fermentation. More importantly, he was also able to consult and use many of the

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23 For example, see *Casebook*, pp. 89-91, 96-7, 101-2, 103-5, 106, 108, 124-5, 130-3, 140-1.
24 *de Febribus*, sig. H3*.
25 Bates, "Fevers Literature", pp. 45-7.
26 *de Febribus*, p. 2.
27 *Ibid.*, p. 28.
28 *Ibid.*, p. 66.

traditional recipe books and febrile literature written by galenic physicians.

Willis retained the traditional galenic classification of fevers, dividing them into two broad categories or types: intermittent and continual (see table 6).[29] In intermittent fevers, the illness fluctuated in its severity. The symptoms (the heats and shivers) would gain strength and then enter into remission for specific periods of time, usually one to three days. Such fevers were caused by the excessive fermentation of either the spirituous or the sulphurous particles in the blood due to the addition of corrupted chyme.[30] The severity and length of duration of the intervals were determined by the nature of the corruption of the chyme and by the resulting saline and earthy ferments. Continual fevers, on the other hand, were those in which there were no intermissions. Of the fevers Willis discussed, these were the most deadly; they included such illnesses as the plague, small pox and various other pestilential fevers. Unlike intermittent fevers, however, the fermentative imbalances in continual fevers had many different proximate causes including regimen, climate and "envenomed" matter. Ephemera (fevers-for-a-day) were caused by the ebullition of spirits; putrid fevers were caused by the exaltation of the sulphurous parts of the blood; and malignant fevers exalted both spirit and sulphur.

29 For example, he argued in favour of the traditional galenic conceptions of "putrid" fevers. See *Ibid.*, pp. 72-3. See Galen, "*de febrium differentiis lib. II*", in Kühn, VII, pp. 336-374.

30 *de Febribus*, pp. 26-7.

Intermittent		Continual	
Name	Fermentative Description	Name	Fermentative Description
Tertian	The spirits and the sulphur in the blood ferment and consequently the saline and sulphurous parts become exalted.	Ephemera	Spirits are exalted within the blood and cause it to quickly boil and then become defected.
Quotidian	The fermentation of the spirits and the sulphur render the blood depauperated of spirits causing the saline and sulphurous parts to quickly overwhelm the remaining principles and ferment.	Malignant	Spirits and sulphur are exalted and either quickly consume the impurities in the blood and restore health or cause the blood to become corrupted.
Quartian	The spirits in the blood are first exalted rendering it sweet. After they quickly ferment, the saline and earthy parts of the blood enter into a flux and cause the blood to turn sour.	Putrid	Sulphur, fixed earth and salts ferment with great heat, severely affecting the brain and nervous juice.

Table 6: The Types of Fever

Being able to describe and classify fevers, however, did not enable Willis to treat and cure them. Fevers were the visible signs of a deeper disturbance in the normal fermentative processes of the nutritive system. A learned physician needed to explain, treat and cure their underlying causes and not just the visible symptoms. Patients had many choices when they sought medical treatment, ranging from the cures of traditional physicians to those offered by quacks and old women. There were generally few differences between the cures offered by learned and unlearned physicians. Their chief difference — and the most important according to Willis — lay in their understanding of the causes of the illness and their rationale and explanations for their therapies. A learned physician had to know the causes of the fevers *and* be able to explain the actions and effects of his remedies. Unlike empirics, he did not advocate general cures for specific ailments; a learned physician had to consider carefully both his patient's illness and its causes. Knowledge of the specific causes of an illness, therefore, was a significant consideration for Willis:

> [T]here are various prescriptions and forms of medicines, not only among physicians but also among old women and Empirics in use everywhere: from which however, like a sword used in the hand of a blind man, without discrimination and exact method of healing, more often bestows hurt than benefit to the sick.[31]

His experiences as a practicing physician reinforced these beliefs. In his casebook, Willis frequently cited cases in which remedies hastily enacted by empirics were more dangerous to the patient than the illness itself.[32]

Willis outlined two types of cause that had to be considered before advocating any therapies: the *procataric* cause, or the patient's latent disposition; and the *evident* cause, which brought that disposition into act. Willis examined many of the same factors a galenic physician would:

> The *procatarıic causes*, which are assigned to this Disease [putrid fevers], are an hot and humid temperament, an active habit of Body, a youthful age, spring or summer time, a rich and luxurious diet, besides the habitual drinking of rich wines, a sedentary and idle life, a body full of gross humors and with corrupted juices.[33]

Willis and galenic physicians both believed it was necessary to know a patient's regimen (*e.g.* their healthy temperament, diet and environment) before making any pronouncements about the causes and the nature of their illnesses. Since fevers were the result of specific disruptions in a patient's idiosyncratic equipoise (be it chemically or humourally based), it was essential to know both their *healthy* and *unhealthy* regimen. How could a learned physician understand and treat an illness unless he first had an appreciation of the extent of the disruptions that caused it?

Willis believed it was necessary to understand both his patient's latent disposition as well as the evident cause for their illness. Willis provided numerous examples of the evident causes for fevers. While it is impossible to list them, they can be divided into two broad categories: those which prevented the natural

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31 *Ibid.*, p. 111.

32 *Casebook*, pp. 92, 103, 112, 124 *bis*, 127, 130, 135, 138, 143 and 147.

33 *de Febribus*, p. 75.

cooling of the blood, and those which directly heated the blood. Both resulted in the undue ebullition of the blood, yet their ferments varied significantly. Factors preventing the cooling of the blood (*e.g.* "immoderate labour", "sudden passions of the mind" or "constriction of the pores") *facilitated* the fermentative imbalances that caused fevers.[34] Those that heated the blood (*e.g.* diet and faulty digestion) *directly caused* the fever.[35] Willis generally considered the same causes as a galenic physician; the only difference was how he explained their effects on an individual's health. For example, Willis' discussion of the epidemic fever of 1657 is based on the Hippocratic concern for the influence of the "Airs, Waters and Places" on an individual's health. The epidemic was caused by the "intemperance" of the year:

> For when about the calends of July, the air was immoderately hot, with a most intense heat for many days, it easily altered our blood towards an hot and bilous intemperance. Certainly by which ... the sweet spirituous part was much consumed, while the saline and sulphurous [parts] were excessively brought forth.[36]

This alteration in the character of the blood, in turn, prevented the proper fermentation of the alible juice and, consequently, caused the ebullition of the blood. Willis believed that changes in patients' regimen could also cause fevers. For example, a sedentary young man was ill with an ephemera because he "exercised himself beyond means in the summer sun." Another young gentleman had an ephemera because of the "immoderate drinking of strong wine" and a "noble matron" had a putrid fever because she "put on thinner garments than she had preferred."[37] The chief difference lay not in the factors Willis considered but in his explanations for their effects on his patients. The cases of ephemera were caused by the exaltation of the sprits in the blood due to undue exercise or drinking; the

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34 *Ibid.*, p. 69.

35 *Ibid.*, p. 21.

36 *Ibid.*, p. 205. Also see Hippocrates, "Airs, Waters, Places", Ch. X, lines 83-96 in *Hippocrates*, I, pp. 103-5.

37 *de Febribus*, pp. 71-2, 115-7. See also Hippocrates, "Regimen in Health", Ch. I, lines 1-9; Ch. VII, lines 1-4 both in *Hippocrates*, IV, pp. 45, 55.

putrid fever was caused by the exaltation of sulphurous principles because they were unable to evaporate through her pores.

To gauge the fermentative disorder, Willis recommended the physician consider the usual range of signs, such as the patient's pulse and excrement. The pulse was an important indicator of change; it allowed the physician to determine the strength of the spirits in the blood.[38] The physician could use it, therefore, to determine both the constitution of the blood and the likely outcome of the fever:

> So long as the pulse is laudable, the matter is safe and it presents great hope; but from the bad state of this, a more evil omen is presented and a despair of health. Thus a physician cannot make a prognosis in a proper manner nor safely prescribe medicine without a frequent and diligent examination of the pulse.[39]

Willis' discussion of the usefulness of the pulse differs from Galen's account in one detail. Galen believed that the pulse was an indicator of the flow of vital spirits through the arterial system. It, therefore, provided the physician with insight into the successfulness of the respiratory process (not the nutritive process as Willis claimed).[40] Willis' general discussion of the pulse was brief; he provided only a short fermentative description of its usefulness and some very broad rules on how it could be interpreted. He assumed, however, that his readers would be familiar with the intricacies of consulting the pulse. His use of the pulse, as shown in the case histories in *de Febribus*, was much more comprehensive; Willis referred to "equal" and "unequal" pulses and even timed their rhythms.[41] His discussion of urines, on the other hand, was detailed. He devoted an entire treatise in the *Diatribae duae* to its consideration. The urine was an important diagnostic aid because although the physician "cannot search into the innermost parts of a sick body as it were a closed vessel, judgment is sought from the infused liquor,

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38 *de Febribus*, p. 98.

39 *Ibid.*, p. 99.

40 Galen, "*De usu pulsuum*", in Kühn, V, pp. 149-53.

41 *de Febribus*, pp. 98-100, 116.

washing each part and from which taking away many small scraps."[42] Unlike the pulse (which only revealed the strength of the spirits in the blood), the urine allowed the physician to determine the general fermentative character of the blood. The colour and consistency of the urine provided the physician with knowledge of the composition of the ferments in the blood. A red urine indicated the exaltation of sulphurous particles; yellow urine indicated salt and sulphur; pale or clear urine an abundance of spirits; and sediment indicated the amount of earthy principles in the blood.[43] By regularly consulting both the urine and the pulse, Willis was able to determine the ferments in the blood and the progress of the fever. He could, therefore, alter his treatments and remedies to suit his patient's changing fermentative temperament.

In 1653, Willis treated a family that suffered from a pestilential fever.[44] His actions and accounts highlight the importance of both the urine and the pulse. During the winter solstice, Willis was called to treat a seven year old boy. The outward symptoms of his fever were severe; he had trouble swallowing and he was unable to speak or understand his parents. The colour and contents of his urine were highly variable throughout the course of Willis' fourteen day treatment. When his urine was red with sediment, Willis proposed clysters to help the body purge excess sulphurous and saline particles. By the seventh day, the urine was pale without any sediments. Although the fever had abated, the child had great difficulty swallowing and was rendered increasingly insensible by the abundance of spirits in his blood. Despite the severity of the illness, the child's pulse remained equal and strong. The prognosis was favourable and, as Willis noted, the patient recovered his health. His eleven year old brother was not so lucky. Although the fever and the urine were markedly similar to his brother's, he had hotter temperament. The heat of the fever, therefore, was more intense. Although his

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42 *de Urinis*, sig. Z_2.

43 *Ibid.*, pp. 6-40.

44 *de Febribus*, pp. 176-81.

urine indicated — based on Willis' experiences with his brother — a favourable crisis, his pulse was quick and vehement indicating a dangerous abundance of spirits in the blood. Willis did not recommend the same therapies as he had during his brother's illness because they would have done little good. While the younger brother's fever was cured through the purging of sulphurous and saline particles, his elder brother would require more gentle intervention to alleviate the abundance of spirituous principles.[45] Willis applied gentle remedies to lessen the heat of the blood but to no avail; the patient's pulse grew weaker and he died on the thirteenth day.

The cures and therapies Willis advocated were not innovative. Fevers were caused by fermentative imbalances in the blood; the chief means through which the blood could be restored to health was through the application of the so-called "Instruments of Medicine" (regimen, medicine and surgery). Willis prescribed many different particular therapies and it is impossible to discuss even a fraction of them. It is possible, however, to address — in very broad terms — the kinds of cures he preferred. Willis' cures typically followed the traditional precept that opposites cured opposites. For example, when a patient suffered from a fever caused by the abundance of sulphur and spirits in the blood, Willis avoided treatments that might exalt these principles (*e.g.* medicines and food containing spirits and sulphur). Moreover, he prescribed foods that countered the fermentative imbalance (*e.g.* saline foods helped remedy the exaltation of spirits and sulphur). He prescribed therapies that countered their ferments, such as purging drugs (*e.g.* sudorifics, clysters and vomitories) or minor surgery. For example, vomitories purged salts from the body and phlebotomy helped removed spirits from the blood. Willis provided a clear example of the 'instruments' in his discussion of tertian fevers. To alleviate the primary burning he prescribed a "slender" diet low in sulphur and spirit.[46] This would likely temporarily restore the spirituous and

45 Willis did not recommend phlebotomy because the patient was too weak. *Ibid.*, pp. 178-80.
46 *Ibid.*, pp. 49-50.

sulphurous temper of the blood to normal. To alleviate the later fits caused by the "souring" of the blood, Willis proposed the use of vomitories because "they purge the stomach so that the first coction may be better performed and then the nourishing chyme may be more purely supplied."[47] Vomitories rid the stomach of its saline and sulphurous contents, therefore helping to prevent the later abundance of salts in the blood.

The treatments prescribed by Willis were intended to counteract the illness; however, they had to be considered in light of the patient's natural temperament. The cures Willis prescribed for a "melancholic" woman and a "pale" man differed greatly even through they both had putrid fevers. The melancholic woman had a natural and healthy excess of fixed salt and earth in her blood. When she was ill with a putrid fever, these principles and sulphur were exalted. Before Willis prescribed his treatments, he attended his patient for four days to learn both her natural and her unnatural disposition. By the fifth day, he had enough information with which to formulate his therapeutic strategy and to begin treatment. He prescribed a phlebotomy to alleviate the minor heat in her blood by removing sulphur. More importantly, he prescribed numerous clysters to help the body remove the excess saline and earthy particles through the spleen.[48] The young man, however, had a more spirituous temperament; his fever, therefore, was much more vehement than the woman's. Although Willis briefly prescribed a vomitory to lessen the saline and sulphurous parts in the blood, he relied almost exclusively on blood letting. The temper of both his patient and the season (spring) caused the fermentation of the spirituous and sulphurous parts of the blood. Phlebotomy was the quickest and easiest way to remove the principles from his blood.[49] A patient's regimen and temperament were vital considerations in the cure of any illness. Excessive phlebotomy in the woman's case would have exalted the salts in her

47 *Ibid.*, p. 47.
48 *Ibid.*, pp. 122-6.
49 *Ibid.*, pp. 126-8.

blood rendering it more sour; similarly, clysters would have exasperated the spirituous and sulphurous parts of the young man's blood. In both cases, those treatments (according to Willis' doctrine) would have done more harm than good.

Although Willis typically relied on traditional cures and remedies, I have no desire to argue for the creation of yet another category (*e.g.* 'chemical-galenist') with which to classify him. This would only perpetuate the primary problem with the secondary literature on Willis: namely, that categorization of his philosophy and his practices provides no insight into his motivations and concerns. My aim has been to show that Willis was motivated by a desire to preserve the traditional and proven therapies and practices advocated by galenic physicians. As a practicing physician, Willis was aware that it was unwise to take unnecessary risks with his patients' lives. If his cures were unsuccessful, he both damaged his reputation and lost a client. Physic, after all, was a profession. If Willis was unable to maintain his clientele, he would be unable to practice medicine. He had reservations, therefore, about instituting his "new" doctrine of fevers:

> [F]evers have been happily and sufficiently cured by the same remedies and a similar method of healing, from the times of Hippocrates and Galen to this day; and therefore it may seem a rash and not that prudent a work that we should endeavour new things, after having had the experience of so many ages, especially since it makes sport of the human hide. [50]

Willis believed, however, that it was necessary to institute a new doctrine of fevers because the traditional peripatetic principles were unable to sufficiently explain the more hidden causes for natural, artificial and physiological phenomena. He believed, therefore, that therapies and cures based on peripatetic explanations were potentially dangerous because the physician had little knowledge of how these therapies affected his patient's health. Willis' philosophy allowed him to explain the operations of new chemical medicines and cures, such as concoctions of Peruvian bark, yet his general conception of physiology and the treatment of fevers

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50 *Ibid.*, sig. H_3*v.

remained markedly traditional. *De Febribus* emphasizes a widely accepted (if seldom voiced) feature of early modern medicine in general and of the treatment of fevers in particular: little changed in the treatments and therapies used by physicians from the time of the Greeks until the nineteenth century.[51] The changes that did occur were generally not caused by new philosophical systems; they were accomplished through changes in the clinical and social practice of medicine. Thus, classifying Willis as a 'modern' because of his 'chemical' or 'corpuscularian' philosophy reveals very little. Thomas Willis was first and foremost a physician; if we are ever to understand him in that context, we must look not to vague similarities between philosophical systems, we must look directly to his beliefs and actions as a physician.

51 Donald Bates is one of the few historians to state this explicitly. Moreover, he suggests rightly that an examination of Willis' actions as a physician might reveal more about his intentions and concerns than epistemological "mining" of his work. See Bates, "Fevers Literature", pp. 55, 70.

Chapter 6:
Conclusions

> *[W]hile pestilence attacks, fear, sadness and the passions of the soul are like another plague; for by these, the seeds of the poisonous contagion, which placed on the surface of the body, like on the edge of a whirlpool, are snatched inside with a certain force and carried to the heart; for that reason it is a most excellent Antidote to be of a cheerful and confident soul.*
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> *de Febribus*, p. 156.

For many devout anglicans and royalists, the maintenance of the traditional structures of civil society was of the utmost importance. They displayed their interests in many different ways. Some, like Ralph Bathurst and Bishop Skinner, helped preserve the established church by secretly ordaining anglican priests. Others, including Richard Allestree and John Dolben, helped maintain the lines of political intelligence between Edward Hyde and royalists in England. Henry Hammond wrote moral tracts on the "liberty of conscience" and on the duty of lawful magistrates. Willis demonstrated his interests through his work as a physician and natural philosopher. Within Willis' medical philosophy, there are many judgments and values about the roles and duties of the learned physician, how he should conduct himself and, more importantly, how he should practice medicine. These values had implications beyond the practice of medicine. A learned physician, according to Willis, was to care not only for his patients' bodies but for their souls and even for the body politic. He was to restore and promote peace. The practitioners and physicians that Willis encountered in the markets did not fulfill these duties for a number of reasons. Some, as discussed earlier, were unable to explain the actions and operations of their remedies. They were incapable, Willis thought, of curing their patients effectively. He believed these practitioners were dangerous because of their failure to understand physiological processes and the operations of their therapies. Willis attempted to limit their influence by providing a philosophical framework through which their cures could be explained and

reconciled with the existing corpus of galenic therapies and observational accounts. He competed with these practitioners by providing potential patients with an alternative to their unlearned advice; unlike such practitioners, Willis was able to explain physiological functions and the operations of both traditional and modern therapeutic practices. He introduced, however, a potential problem when he advocated chemically-based explanations for phenomena: chemical medicine with its inherent religious overtones emphasized individual passions and the rejection of tradition over the good of the community.[1] To Willis, this radicalism was unacceptable because similar radical and factional beliefs contributed to the execution of the King and Archbishop and resulted in the erosion of traditional beliefs and manners. Willis presented his antidote to these concerns in the *Diatribae duae*; he advocated a chemically-based medical philosophy that was free from religious radicalism. He believed that a learned physician had not only the duty and obligation but, using his medical philosophy, also the means to heal both his patients *and* to contribute to the restoration of peace within civil society.

Vulgar Opinions and the Physician's Duty

Many of the practitioners and physicians Willis encountered in the markets around Oxford failed to fulfill the obligations and duties he believed inherent within the practice of physic. Their cures and remedies were often detrimental to their patients' health. Some practitioners even advocated medical philosophies and religious beliefs that threatened their patients' souls and, Willis believed, threatened society itself. Willis' chief objection to their practice of medicine was that they relied on experience more than reason. "It has not passed unnoticed," he stated, "that naked experience avails little without the assistance of method and reason, indeed frequently [it] causes much injury."[2] The empirics, as he called these practitioners, let nature "remove reason from its place."[3] Yet for Willis, the

1 See the authors cited in note 10, chapter 4.

2 *de Febribus*, sigs. H_4^*-H_4^*v.

3 *Ibid.*, sig. H_4^*v.

solution to the problems raised by the empirics was not to have reason overwhelm nature. This approach was already tried unsuccessfully by medieval physicians who attempted to frame learned medicine "into a general method after the manner of some speculative science" resulting in a "deceptive pile of unstable doctrine."[4] The responsible practice of medicine entailed the marriage of reason and nature:

> In fact, he who has united both that reason does not pervert experience and nature itself and that it not remove reason from its place, seems to have affirmed everything. That although I well know I have not reached it, yet I will freely profess that I have aimed at this target.[5]

Willis aimed at the restoration of learned medicine. This restoration did not entail the wholesale rejection of either traditional or contemporary beliefs and practices. On the contrary, it could only take place through the integration of traditional practices and beliefs with the "new foundation in medicine" created by philosophers and physicians like William Harvey and Francis Glisson. The restoration required the reconciliation of the "experience of so many ages" with the experiences of Willis' own.

Willis frequently discussed empirics and their practice of medicine in the *Diatribae duae.* A common theme was that they were dangerous to their patients. Rather than treating their patient's idiosyncratic equipoise, they merely applied their remedies based on the outward signs or symptoms of their illness. They wielded their cures like a blind man does a sword. To Willis, this practice was unacceptable because similar diseases are not necessarily cured by the same remedies. The learned physician, he argued, ought to consider carefully his patients' equipoise as well as the underlying physiological disturbances that caused their illnesses. While some empirical cures might work, Willis believed they were dangerous unless they could be explained and understood. This was one of his motives for developing his medical philosophy. He wanted to provide a framework

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4 *Ibid.*, sig. H4*.

5 *Ibid.*

through which the operations and actions of empirical cures might be understood and explained in light of traditional medical practices and beliefs.

Willis' complaints about the empirics' practice of medicine were not limited to their inability to explain their cures and treatments; he also believed they had little knowledge of medicine or physiology. This, he argued, is evident in the popular practice of consulting the urine for *every* kind of illness. He argued that practitioners have relied so heavily on the examination of the urine that a patient "rates a physician worthless unless he undertakes to divine from the urinal as from a magic glass."[6] Willis believed that many practitioners used the casting of waters as a parlour trick. He described how the rules and directions for urine divination are so detailed that "medicasters" could tell their patient not only the nature of their illness, but also whether they are "man or woman, addicted to the passions of love or sadness, whether or not a woman is pregnant ... and six hundred others."[7] Their judgments, he continued, were based more on their "cunning craftiness" than on their knowledge of medicine and physiology.

Like a traditional physician, Willis believed that the urine was an important indicator of the health of a patient. It was the only way that a physician could evaluate and judge the success of the nutritive process and prescribe appropriate medicines because "we cannot search into the innermost parts of a sick body as it were a closed vessel, judgment is sought from the infused liquor, washing each part and from which taking away many small scraps."[8] The urine, therefore, was an especially important consideration in the treatment of nutritive disorders like fevers. The blood was continually purified and cleaned as it circulated through the body. In the kidneys, water and saline particles were precipitated from the blood and expelled from the body through the urine. If the constitution of the blood was by some means perverted, as in the case of fevers, the expelled recrements in the

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6 *de Urinis*, sig. Z2v.

7 *Ibid.*, pp. 45-6.

8 *Ibid.*, sig. Z2.

urine would reflect this corruption. By carefully examining the urine, a learned physician could determine the nature of the corruption and perhaps even its cause.

The primary problem with these empirics was that they relied on false conceptions of the importance of the urine. The urine, Willis argued, was a useful indicator only when faced with certain kinds of illness, such as those involving digestion, nutrition and disorders arising from the constitution of the blood. Medicasters relied on the inspection of the urine in too many instances. He especially criticized those practitioners that relied solely on the urine when making their prognostication. Since the urine was only truly useful for certain disorders, it was especially important that the physician carefully examine his patient. The urine of sick people sometimes appears healthy and the urine of healthy people sometimes appears sick. A practitioner who relied only on the urine could often make a false prognostication.

Willis aimed to remedy this situation by providing a philosophical framework through which the usefulness of the urine could be explained and understood. He outlined how the urine reflected the constitution of the blood and how a careful examination might reveal the hidden processes in the human body. Most importantly, he provided guidelines on how the physician was to conduct himself and practice medicine. A learned physician did not concern himself with addressing only the 'surface' of the illness; rather, he was to have an appreciation and understanding of its more hidden causes. This appreciation came from an extensive, long-lasting examination of a patient and his regimen. Willis presented an example of how a physician should conduct himself and his practice when he described the career of Henry Sayer of Magdalen College, Oxford.[9] While still a young man and inexperienced physician, Sayer earned a reputation as a learned and conscientious physician because of his actions during the plague of 1645. He treated his patients — both poor and rich — with little regard to his own safety. As Willis related, while many physicians fled the area and refused to treat patients,

9 *de Febribus*, p. 162.

Sayer "handled their buboes with his own hands" and he frequently visited their "infected houses." His close and constant contact with his patients allowed him to understand the hidden causes and intricacies of their illnesses. His cures and therapies, according to Willis, helped save many. The royalist governor of Wallingford Castle, hearing of Sayer's devotion to his patients, called him to treat a close friend.[10] Sayer remained at his patient's bedside throughout the illness, often lying in the same bed. Sayer's devotion, however, was also the cause of his death; he died of the plague while treating his patient in Wallingford Castle. Sayer was an archetypal medical hero for Willis because he knew the importance of gaining a detailed and personal understanding of his patients and of the hidden causes of their ailments. This information was so important for Sayer that he sought it despite the risks to his own health.

Willis intended his medical philosophy to provide learned physicians with the means to understand and explain the hidden actions and operations of medicines as well as physiological functions. At the same time, he was able to integrate and explain proven galenic therapies and cures as well as the numerous traditional accounts of fevers in his new medical philosophy. While Willis believed the reconciliation of traditional and contemporary medical practices and beliefs would aid in the restoration of learned medicine, it would not — in itself — help sustain the traditional structures of Caroline civil society. That required a different approach.

The learned physician's duties and obligations extended beyond matters of medical philosophy and practice. Inherent within Willis' medical philosophy were beliefs and values about the social, political and religious duties, roles and functions of the learned physician and of his medicine. The prevention of illness was often important for the maintenance of order within society. In *de Febribus* Willis recounted the devastation caused by the "camp fever" epidemic of 1643.

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10 In 1648, the governor of Wallingford refused to take Hammond and Sheldon into his home as prisoners; he would only welcome them as friends. Mallet, II, p. 385.

The deaths caused by this illness in Oxford had a profound impact upon the maintenance of order and tradition:

> I remember in some villages in this year nearly all the old men were snatched away from life so that few remained who were able to defend the manners and privileges of the Parish by the more anciently received traditions.[11]

The practice of medicine, therefore, was of profound importance for civil society. Yet the physician's contributions to the maintenance of order was not limited to preserving the lives of members of the political nation. The learned physician was himself expected to preserve the ancient manners, traditions and structures of society. Empirics and market physicians, Willis argued, did not do this. They either ignored their responsibilities altogether or, as in the case of radical chemical physicians, they advocated unsound religious beliefs that could contribute to its destruction. For Willis, the learned physician had the responsibility to care for — and to remedy — the health of both his patients and the body politic.

The social and political aspects of medicine were explained by Willis in his discussion of the prevention and cure of the plague and other pestilential fevers. He listed two general categories of *preventatives*: private and civil. Private preventatives were discussed in the previous chapter. They included the traditional galenic concepts of regimen, physic and surgery. The civil preventatives highlighted the public aspects of medicine and duties of the physician. Unlike the private preventatives, which were to be enacted by the patient and the physician, the public preventatives were the responsibility of the lawful magistrate. To prevent the plague, magistrates had three primary considerations: first, they were to uphold the traditional rights and manners of divine worship; second, they were to remove "nests of the corruption;" and third, they were to promote wholesome living amongst the citizens in their charge.[12] The importance of prayer and divine worship could not be understated. Willis, like most early modern physicians,

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11 *de Febribus*, p. 172.

12 *Ibid.*, pp. 155-6.

believed that the plague had two causes. The primary cause was God; the plague was for "the castigation of the wickedness of men."[13] The other cause was the natural cause which covered anything that disrupted normal physiological functions. Prayer, therefore, was often just as effective as medicines. When plague struck an area, the magistrate had a duty to see that "suitable physicians and ministers are brought together for the use of the healthy and the necessities of the sick."[14] In addition to providing for the spiritual health of his charges, the magistrate was also to ensure that they had a wholesome and clean means of living. He was to ensure that streets were kept clean and that the people had a wholesome and varied diet. A magistrate's negligence in his duties could easily lead to the spread of the plague and other pestilential fevers. This, Willis argued, was the case during the "camp fever" epidemic. The local magistrates were so concerned with military matters that they forgot their other duties and obligations. Both royalist and parliamentary troops lived in such "hideous filth" that sickness spread easily and quickly from camp to camp and town to town.[15] Willis intimated that the epidemic might even be partly responsible for the royalist defeat in Oxford because in some villages few were left to defend the "more anciently received traditions."[16]

Willis believed if the local magistrate was unable to fulfill his responsibilities to his citizens, then the obligation fell to learned physicians. To many devout anglicans, most magistrates appeared to neglect their duties. As Henry Hammond lamented in *The True Magistrate*, many were more involved with "corrupted interests" than with the preservation of order within their parishes.[17] If magistrates did not promote divine worship or maintain the structures and bonds of civil society, Willis believed it was the physician's responsibility to do so:

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13 *Ibid.*, p. 142.
14 *Ibid.*, p. 156.
15 *Ibid.*, p. 172.
16 *Ibid.*
17 [Henry Hammond], *The True Magistrate* (London: 1659), p. 7.

> while pestilence reigns, there is no less need of care that the contagion can kept off at a distance, than that the impressed pestilence can be cured, therefore, a double task is incumbent on the physician: surely that he looks to the *prevention* of this malignant disease as well as to its *cure*.[18]

Willis believed, therefore, that he had a medical as well as a religious obligation to ensure that the traditional rights and practices of divine worship were observed. These obligations make Willis' Beam Hall ceremonies take on a much different appearance. Rather than simply indicating Willis' loyalty to the established church of England, they can be seen as a medical obligation with profound political and religious overtones. By hosting these ceremonies, Willis was not only declaring his loyalty to the church, he was also challenging the authority and legitimacy of the local magistrates, who — according to Willis — were not fulfilling their lawful and traditional duties.

Willis' actions as an itinerant physician also had similar overtones. He provided a means through which the traditional social and patronage bonds of Caroline civil society could be maintained and perhaps even advanced in Interregnum England. His patronage relationship with the Fell family continued. He treated members of the family and their servants. More importantly, Willis himself strengthened his connection to the family when he married Samuel Fell's daughter, Sarah. He similarly helped maintain other relations within Oxford. He acted as physician for prominent royalist families in North Hinksey, such as the Perrots and the Finmores. As a physician, Willis worked and associated with other anglican physicians and medical men, such as Ralph Bathurst, Richard Lydall, Peter Eliot, William Day and John Crosse. Through their efforts, they were able to maintain aspects of Caroline civil society within a small and fairly self-contained community of anglicans and royalists.

None of these duties or obligations were — in themselves — exceptionally innovative. Physicians throughout the seventeenth century and beyond

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18 *de Febribus*, p. 155.

acknowledged spiritual aspects of the practice of medicine. Illness was often considered an act of divine will. What better way to cure the sick than to have them pray to God? To devout anglicans, many physicians (especially chemical ones) advocated dangerous religious views. Thomas Willis provided an alternative to their cures, providing a physic that combined the best traditional and modern beliefs and practices. Willis was able to achieve this by rendering radical chemical physicians and their philosophers invisible throughout the *Diatribae duae*. Although historians of science have often talked about the influences of various continental philosophers on Willis' beliefs, such arguments are hard to sustain. Willis himself seldom mentioned other philosophers: Gassendi, Hogelande and Descartes were mentioned once in passing; J. B. van Helmont was mentioned twice; and Paracelsus was not mentioned at all.[19] Willis made these philosophers invisible in order to distance himself from the radicalism — both religious and philosophical — of their philosophies. Having essentially stripped chemical medicine out of its religious and philosophical contexts, Willis was able to supply his own. He integrated aspects of chemical medicine and philosophy into a framework that was both medically and religiously traditional.[20]

Willis similarly avoided controversies and disputes involving natural philosophy and the practice of medicine. His experiences during the Civil Wars and Interregnum had taught him that controversies could all too easily tear apart a community. He advocated a philosophy, therefore, that stressed the importance of avoiding conflicts. Whenever Willis encountered natural philosophical beliefs or concerns of which he did not approve, he distanced himself from the controversy. For example, when discussing the reasons for the heating of the blood in the heart, Willis briefly presented the views offered by Descartes and Hogelande. Rather than asserting the truthfulness of one position over the other, Willis concluded:

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19 *de Fermentatione*, pp. 20, 63; *de Febribus*, pp. 20, 156.

20 This is a perfect example of 'distance leading to enchantment' as discussed by H. Collins. See H. M. Collins, *Changing Order: Replication and Induction in Scientific Practice*, 2nd ed. (Chicago: 1992).

"Whether it be said to be done by this or by that way, the matter entirely returns to the same thing."[21] What was important for Willis was that the fermentation or the accession of the blood resulted in the same phenomena, namely, the motion and heats of the blood. In cases in which Willis could not peaceably dismiss the dispute, he "passed over" the controversy altogether. When explaining solutions in *de Fermentatione*, Willis briefly mentioned the universal solvent or "philosophic vinegar" discussed by van Helmont and other chemists. Willis' disapproval for their claims is evident in the passage, yet he did not pass an explicit judgment. He concluded stating "they bring nothing new or wonderful" to his discussion and, consequently, "we will pass them over."[22] Willis, therefore, strove to render invisible both aspects of radical chemical philosophies as well as arguments and controversies. He was largely successful; Willis domesticated chemical medicine into a religiously and philosophically non-controversial framework.

Willis' anglican and royalist sentiments are not to be dismissed by historians of science as they attempt to understand and explain his natural philosophy; they have to be acknowledged and explored. Over the past 25 years, historians have shown that natural philosophy and the practice of medicine often had strong religious and political overtones in seventeenth-century England. The converse is also true; political and religious beliefs and concerns have medical and natural philosophical overtones. This is a subtle distinction, yet it is one which highlights a dominant trend in the history of the sciences. Although much has been written highlighting the social, political and religious agendas and concerns of 'scientists', such discussions help perpetuate a distinction between 'scientific' activity and other forms of human activity. 'Scientists' remain distinct from other individuals within society and their 'scientific' concerns are given special consideration by historians of science. Although 'scientists' may share similar concerns and views with other members of society, they remain first and foremost 'scientists'. Much scholarship

21 *de Febribus*, p. 20.

22 *de Fermentatione*, p. 64.

continues to reify science, not as an acultural activity but still as something uniquely special and different from other forms of human enterprise. If historians approach the history of the science from 'the other side', a different and much more comprehensive picture emerges.[23] Rather than focusing on 'scientists' with 'scientific', political, religious and social interests, historians can examine individuals with many interests and concerns of which scientific interests are only one small part. As this examination of Thomas Willis shows: actors' categories *must* be taken seriously.

The anonymous author of the anglican tract entitled *The Whole Duty of Man* (1659) pleaded for a solution to their political, social and religious troubles:

> And now O God, what Balm is there in *Gilead* that can cure us; who when thou wouldest heal us, will not be healed, we know thou hast pronounced that there is no peace to the wicked, and how shall we pray for peace, that still retain our wickedness? This this, O Lord, is our sorest disease, O Give us Medicines to heal this sickness, heal our souls, and then we know thou canst soon heal our land.[24]

On a metaphoric level at the very least, medicine and religion had many similarities. The minister was to care and tend for the souls of his parishioners; the physician was to care for their bodies. Yet given the common conceptions of the relationships between body and soul, the duties and functions of the two professions often overlapped. The body was ruled by three souls (animal, vegetable and rational) which were influenced by the health of the patient. Radical religious views, therefore, might be seen to have pathological as much as theological roots. The author of *The Whole Duty of Man* may not have been drawing a mere analogy between medicine and religion; his parallel might have been sincere.

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23 Steven Shapin's 'gentlemanly' etiology highlights the potentials of approaching 'science' from 'the other side', yet I have reservations about the sufficiency of 'gentlemanly behaviour' in explaining the creation of facts in seventeenth-century natural philosophy. See Steven Shapin, *A Social History of Truth*. His earlier work presented a much more useful approach on the relations between politics and natural philosophy. See S. Shapin and Simon Schaffer, *Leviathan and the Air-Pump* (Princeton: 1985), esp. pp. 332-45.

24 [Richard Allestree], *Private Devotions* in *The Whole Duty of Man* (London: 1659), p. 81.

Willis intended his medical philosophy to heal the nation. He hoped that his non-controversial chemical philosophy would help lessen the popularity of unlicensed medical practitioners. He believed if he could limit the influence of their radical religious and medical views, it might be possible to promote peace within the political nation. He believed that the English people could use their experiences in the Civil Wars and the Interregnum to build a more lasting and stronger peace. Through his study of fermentation, Willis discovered that all changes have a defined and immutable end. While some changes destroy bodies, others, like those caused by the fluxion of saline particles, can strengthen and heal. Perhaps the English people, too, were "destined by nature having acquired peace through war, that they might come upon subjects agreeable to themselves and finally be more closely united to them."[25]

25 *de Fermentatione*, p. 90.

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