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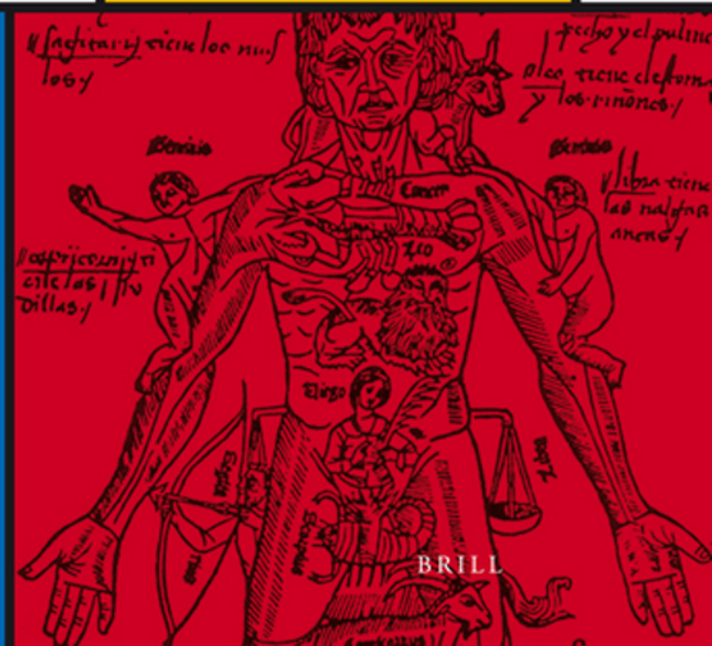
Fatal Thirst

Diabetes in Britain until Insulin

ELIZABETH LANE FURDELL



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Diabetes in Britain until Insulin

By
Elizabeth Lane Furdell

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2009

Cover illustration: "Zodiac man" in Johannes de Ketham, *Fasciculus Medicinae* (Burgos: Juan de Burgos, 1495).

This book is printed on acid-free paper.

Library of Congress Cataloging-in-Publication Data

Furdell, Elizabeth Lane.
Fatal thirst : diabetes in Britain until insulin / by Elizabeth Lane Furdell.
p. ; cm. -- (History of science and medicine library, ISSN 1872-0684 ; v. 9)
Includes bibliographical references and index.
ISBN 978-90-04-17250-0 (hardback : alk. paper) 1. Diabetes--Great Britain--History. I. Title. II. Series.
[DNLM: 1. Diabetes Mellitus--history--Great Britain. 2. Insulin--history--Great Britain. WK 11 FA1 F983f 2009]

RC660.F87 2009
362.196'46200941--dc22

2008038914

ISSN 1872-0684
ISBN 978 90 04 17250 0

PRINTED IN THE NETHERLANDS

For the Glamour Dogs

and Alex

CONTENTS

PREFACE AND ACKNOWLEDGMENTS

From its earliest descriptions by classical physicians to the era of experimentation before the discovery of insulin, diabetes has puzzled doctors and plagued sufferers. *Fatal Thirst: Diabetes in Britain until Insulin* examines the impact of the disease on patients and society in England with a particular focus before 1920. Drawing upon published and unpublished medical casebooks, printed books and articles aimed at a broad readership, and the recorded reactions of diabetics themselves, this study creates the first "biography" of a Janus-faced disease coupled to a social history of its effects. Striking its victims with similar symptoms, the "pissing evil," as diabetes was called by one seventeenth-century specialist, manifested itself in conspicuously different ways depending on the age of the sufferer. Youthful diabetics did not always produce the sweet urine characteristic of their older counterparts, confusing physicians and the sick alike. This discrepancy led to a dizzying variety of dietary regimens and medicines prescribed for diabetes and to competition among medical scientists and laymen from the Middle Ages to the twentieth century to find a cure.

In analyzing this range of conflicting advice, *Fatal Thirst* pays particular attention to the implications of a diabetes diagnosis, to what doctors expected of their diabetic patients, and to the place of diabetes in English medical controversies surrounding contradictory theories of healing and competing iatric jurisdictions. In addition, the treatment afforded different classes of diabetics is assayed, as are the ethical problems of patient consent and confidentiality before the establishment of modern professional principles. The application of insulin to treatment after 1922 surely prolonged lives but did not allay the psychological effects of the disease, the force of which equally distressed pre-modern diabetics.

According to the World Health Organization, 180 million people worldwide currently suffer from diabetes, and this figure will more than double by 2030. In 2005, 1.1 million people died from it. I am diabetic myself. Epidemiologists label diabetes a modern pestilence, particularly Type 2 or adult (insulin-resistant) diabetes. But doctors in early mod-

ern England witnessed a notable increase in the frequency of the disease, attributing its rise to overindulgence in the pleasures of the flesh and the table. Though specialists acknowledged that some child diabetics likely inherited their maladies, they lambasted the moral laxity of their adult patients, often identifying the miscreants by name in print and detailing their physical, even sexual, aberrations. While aristocrats and the wealthy were usually spared such embarrassment, enjoying the privilege of house calls and respectful privacy, female diabetics in general did not have the benefit of exemption from discomfiture; published reports conveyed vivid particulars about the bodily consequences of the disease regardless of the patient's gender. *Fatal Thirst* reconstructs a history of diabetic life by considering the courses of therapy dictated to patients, regimes that often included lengthy stays for the poor in the physician-controlled environment of hospitals, rigorous measuring of liquid intake and urine production, and humiliating symptoms that transformed diabetics into family and community pariahs.

I owe many people and institutions gratitude for their support and encouragement. The University of North Florida provided me with three summer research grants, travel monies, and a sabbatical for exploring the archives here and abroad and for writing up my findings on historical diabetes. The Wellcome Trust funded my travel to London in 2004 so that I might access materials in its extensive collection. The Southern Conference on British Studies awarded me its inaugural Hanft Travel Award in 2005 to delve into medical resources at the British Library and elsewhere in Britain. The Wellcome Library's staff in London proved enormously helpful to me and I also benefited from research visits to the Folger Shakespeare Library in Washington, D.C. UNF's library personnel, especially Barbara Tuck and Alisa Craddock, got information and books to me from far afield when I was not on the road. The results of my efforts to try to reconstruct diabetic life based on early modern casebooks were tested at the 2004 Southern Conference on British Studies gathering in Memphis; I thank my fellow panelists, especially commentator Robert Frankle, and a lively audience for valuable advice. As usual, I relied on the professional expertise and common sense of my husband and colleague, Theo Prousis, as well as the advice of other scholars at my home institution and elsewhere: orchids to Patricia Geesey, Harry Rothschild, Robert Martensen, Carole Levin, Wallace MacCaffrey, William St. Clair, Alexis Weedon, Judith Flanders, anonymous referees at Brill Academic Press and Common Ground Publishing and to my longtime

mentor, Robert V. Remini, for his exuberant counsel. Portions of Chapter Four appeared as "Willis and Sydenham on Diabetes" in *Textual Healing: Essays on Medieval and Early Modern Medicine*, an anthology of twelve authors' perspectives in medical history, edited by me and published in 2005 by Brill. That essay in turn sprang from a paper delivered at the 2003 Duke University meeting of the Southern Association for the History of Medicine and Science, demonstrating the natural evolution of academic scholarship from conference paper to book chapter or article and then to monograph. Similarly, a paper I delivered to the 4th International Conference on the Book in Boston in 2006 became a longer article, "The Race for A Cure" in *The International Journal on the Book*, before finally emerging as Chapter Six in this volume. New material developed for the 2008 Conference of the Southern Association for the History of Medicine and Science on a diabetic diet in the Victorian manual of domestic medicine, *The Family Physician*, further augmented Chapter Six.

Having had a happy experience with Brill doing *Textual Healing* three years ago, I am again delighted to be working with senior editor Hendrik van Leusen and assistant editor in history Boris van Gool. Moreover, I cannot imagine assembling any manuscript without the technological savvy of Marianne Roberts, the office manager of UNF's History Department, or without the hearty enthusiasm of my dear children, James and Kimberly, Andrew and Julia, currently residing in my own home town of Seattle. They could hardly be further from me geographically or nearer in affection.

Finally, I dedicate this volume to my first grandchild, Alexander James Furdell, surely a scholar in the making, and to my fellow members of the Glamour Dog Book Club, begun in 1987 and still going strong. We've stayed together as a unit, meeting bi-monthly and reading good literature, through marriages and divorces, the births of children and grandchildren, the deaths of parents, cosmetic surgeries, and health scares. Though none in the group except me is an academic, these women not only cheered my professional successes over the years but they even opted to read one of my staid tomes, bringing me flowers the night we discussed it, as if I were a visiting celebrity author on a publicity tour. I tried to convey to them, as I do to my students and to readers of my other works, that historical medicine, its practitioners, and their patients deserve our heartfelt respect. Chronological bias can blind us to the serious endeavors of bygone physicians and lay healers to find cures for chronic ailments, efforts that sophisticated

"moderns" like us might find ridiculous, pitiful, or gruesome, just as our descendents are likely to judge today's medical treatments. In particular, mindful of the determination of past healers to find the cause and cure of diabetes, and of the courage of their diabetic patients, let us respectfully remember that their lives led us to whatever progress in dealing with the disease we benefit from today. Reconstructing diabetic life before insulin has shown me traits in searchers and sufferers worthy of admiration and emulation. Sir Lewis Namier expressed this judgment in a broader sense, but it seems particularly apt here: "History writing is not a visit of condolence."

Jacksonville, Florida
2008

INTRODUCTION

THE "BIOGRAPHY" OF A DISEASE AND ITS SUFFERERS

Sir George Alberti, past President of the Royal College of Physicians and also President of the International Diabetes Federation, has predicted that the number of diabetics in Britain would increase by 50 % during the next decade. The RCP has calculated that half the British people with Type 2 (insulin resistant, formerly known as "adult onset") diabetes mellitus are presently undiagnosed, but even those who are aware of their disease remain at catastrophic risk due to a shortage of diabetes specialists. Calling the situation "a time bomb," Alberti demanded that the government place more doctors in training posts to become consultants in diabetes.[1] His admonition coincided with forecasts from British diabetologists in *Diabetic Medicine* and the World Health Organization that predict a significant upsurge in worldwide diabetes. Between 1995 and 2025, for the world as a whole, the number of people with diabetes mellitus will increase by 122 percent.[2] The growing problem of diabetes in industrialized nations has been well-documented, but in 2006 the International Diabetes Federation announced that the skyrocketing number of people suffering from diabetes includes millions in developing countries like China (39 million or 2.7 % of the adult population) and India (30 million or 6 % of the adult population). In some Caribbean and Middle East states, the percentage of diabetics ranges from twelve to twenty percent. Seven of the ten countries with the highest number of diabetics are rapidly industrializing nations.

Type 1 diabetes (a hereditary auto-immune disease formerly called "juvenile" because of its early onset) is an extremely grave disorder

[1] Royal College of Physicians *News*, 21 May 2002. The RCP has since instituted a series of on-line live events featuring news and information about diabetes, such as one on 4 July 2005.

[2] William A. Petit, *The Encyclopedia of Diabetes* (New York: Facts on File, 2002), xxiv–xxv. Diabetes insipidus, also known as "water diabetes," is often mistaken for diabetes mellitus or "sugar" diabetes. It is a rare disease, not widely diagnosed, in which the kidneys produce abnormally large volumes of diluted urine.

in which the sufferer's body reacts against the insulin-producing beta cells of the pancreas, the jelly-like gland attached to the back of the abdomen behind and below the stomach. Because of this reaction, the diabetic cannot metabolize glucose and sugars that accumulate in the blood. Large quantities of sugar-laden urine are secreted to flush out the glucose concentrations, hence the "sweetness" implied by "mellitus," while to compensate for lack of energy caused by the inability to utilize sugar as a food, the body consumes its fat, resulting in wasting. The diabetic becomes very hungry and thirsty, rapidly loses weight, and dies. Those who develop Type 1 diabetes, approximately five to ten percent of cases today, have a genetic predisposition to it, but the disease does not materialize until an environmental trigger, probably a virus, devastates the beta cells; a small number of sufferers require no trigger at all and their disease is an entirely auto-immune destruction of the beta cells.

The symptoms of Type 2 diabetes are similar, albeit more gradual, to those of Type 1, but its sufferers are usually somewhat older, more sedentary and obese, particularly in the upper body. These victims experience unusual fatigue, frequent urination and thirst, blurred vision, infections that are slow to heal, numbness in the feet or legs, and heart disease. Type 2 diabetes, which accounts for over 90 % of all cases today, arises from sluggish pancreatic secretion of insulin or reduced responsiveness in target cells of the body to secreted insulin. Genetic inheritance contributes to the insulin-resistance of the disease, but the ignition of full-blown diabetes comes from getting older, poor eating habits, and lack of exercise. Though usually associated with industrialized societies, people with a history of malnutrition are also susceptible to diabetes as they grow older and their pancreases cannot handle the load of increased food intake. Indeed, whole ethnic and national groups subject to "famine and feast" cycles succumb to diabetes.[3] In developing countries, residents consume cheap, fattening food while burning off fewer calories, causing weight gain and leading to greater risk of diabetes. As the global economy creates more sedentary lifestyles and the world's population ages, Type 2 diabetes becomes more prevalent, but either type of diabetes can occur at any stage of life. An additional alarm has been sounded recently by diabetologists who are seeing the

[3] Jared Diamond, "The Double Puzzle of Diabetes," *Nature* 423/6940 (2003): 599–602. For more on the spread of the disease, see Jean-Marie Ekoé, Paul Zimmet, and Rhys Williams, *The Epidemiology of Diabetes Mellitus* (New York: John Wiley, 2001).

new phenomenon of "double diabetes:" overweight Type 1 diabetics at high risk for developing Type 2 and Type 2s unresponsive to therapy who acquire the insulin-dependent form of the disease. The mix, called type 3 by some, can strike at any age and hints at the trouble ahead ministering to victims who need contrasting treatments.[4] Physicians in the 1880s noted a variety of diabetes that occurs only during pregnancy, gestational diabetes, a form of the disease difficult to distinguish from Type 2 and found most often among city dwellers and certain ethnic groups.

Before the isolation of insulin in the 1920s by a quartet of Canadian researchers, most Type 1 diabetic patients died within a brief time after onset. Even though that imminent death sentence has been erased by ever more sophisticated insulin delivery systems, Type 1 diabetics still must anticipate living shorter lives, fifteen years shorter, than those without the disease. For Type 2 diabetics, insulin and other medications, when combined with effective diet and exercise, can stave off the worst complications and prolong lives, but their life expectancy falls six to ten years below that of non-diabetics. One-third of modern diabetics worldwide go undiagnosed.[5] Untreated diabetes causes ketoacidosis, the accumulation of ketones or the results of fat breakdown, and acid in the blood. The continued buildup of the toxic products of disordered carbohydrate and fat metabolism results in nausea and vomiting, and eventually the patient goes into a diabetic coma. Serious Type 2 complications include diabetic retinopathy (changes in the retina that can cause blindness), kidney disease, heart disease, vascular complications and frequent infection in the limbs that leads to amputations. Diabetes today ranks among the top ten causes of death in developed countries, number seven in Western nations. Data since the early twentieth century document a decrease in early diabetes mortality because of increasing sophistication in therapeutic approaches, particularly the wide-scale use of insulin. Despite these successes, dia-

[4] The Children's Hospital of Pittsburgh counts about 25 percent of overweight child patients with Type 1 diabetes at risk for Type 2, according to Dorothy Becker, a pediatric endocrinologist and leading researcher on double diabetes, as reported in the Associated Press July 19, 2005. A form of diabetes found in many tropical areas of the world, hence "tropical diabetes," manifests characteristics of Types 1 and 2.

[5] Carol Jagger et al, "Active Life Expectancy in People with and without Diabetes," *Journal of Public Health Medicine* 25 (2003): 42–46; G.S. Bale and P.S. Entmacher, "Estimated Life Expectancy of Diabetics." *Diabetes* 26 (1977): 534–558.

betes endures and escalates as a pervasive health problem in the modern world, tormenting its sufferers and their families. According to Dr. Martin Silink, President of the International Diabetes Federation, "diabetes is one of the biggest health catastrophes the world has ever seen." To help stem the tide of the disease, the federation seeks a resolution from the United Nations recognizing the problem, the first of its kind for a non-communicable disease.[6]

But what was it like to be diabetic before 1922? In the past decade or so, medical historians have developed a new genre within their specialty: descriptions of particular maladies that ravaged populations in the past and left their mark on the culture of an age. For instance, Roy Porter and G.S. Rousseau essayed gout, categorizing it as a rich man's ailment. Kevin Siena spotlighted venereal disease and connected its treatment to the issue of privacy; others have pointed to the influence "the French pox" had on European-wide culture in the Renaissance. Cholera received a thorough review from Peter Vinten-Johansen and five co-authors through the prism of the life of Victorian physician John Snow.[7] These aforementioned studies have included the effect of a disease's existence on society as well as on its victims. Yet despite a challenge from other scholars to do so, no such historical inquiry to date has focused on diabetes or on the diabetic.[8] This ought to be a subject of general interest, given that diabetes was one of the first metabolic disorders successfully treated, made chronic instead of acute, and given the huge numbers of diabetics today who should know the history of their illness as science struggles towards a cure. For unlike the past scourges of these previous disease "biographies," diabetes, particularly Type 2,

[6] Marc Santora, "Concern Grows over Increase in Diabetes around the World," *New York Times* 11 June 2006.

[7] Roy Porter and G.S. Rousseau, *Gou: The Patrician Malady* (New Haven, Conn.: Yale University Press, 1998), Kevin Siena, *Venereal Disease, Hospitals and the Urban Poor* (Rochester, N.Y.: University of Rochester Press, 2004); Jon Arrizabalaga, John Henderson and Roger French, *The Great Pox: The French Disease in Renaissance Europe* (New Haven, Conn.: Yale University Press, 1997); Peter Vinten-Johansen, et al., *Cholera, Chloroform and the Science of Medicine: A Life of John Snow* (Oxford: Oxford University Press, 2003). Raymond Crawfurd's early work, *The King's Evil* (Oxford: Oxford University Press, 1911), focused more on the royal touch than on those touched. Likewise, *The Fever Bark Tree* by M.L. Duran-Reynals (Garden City, N.J.: Doubleday, 1946) is less about malaria and more about the transmission of quinine.

[8] Mirko D. Grmek, *Diseases in the Ancient Greek World* (Baltimore, Md.: Johns Hopkins University Press, 1989), 12.

persists and spreads as a modern plague with dire political, economic and social implications for individuals, their families, health-care systems and governments.

I have chosen to focus on examining diabetes in Great Britain for a number of reasons. First, the disease, or some similar manifestation of its symptoms, has been part of the British medical consciousness since the transmission of classical medical doctrines in the Middle Ages. Healers, learned and laypersons, noticed an increase in diabetic cases as early as the sixteenth-century with the word for the condition, especially discernible in unquenchable thirst and incessant urination. The term diabetes became broadly and indiscriminately used by the mid 1600s, a fact due to the rise of vernacular medical literature. That escalation intensified with the beginnings of industrialization and the transformation from a largely agrarian and rural society to an urban manufacturing one, a process in which Britain led the way. Diabetes continued to accompany modernization after industrialization triumphed and into modern times. As W.P.D. Logan has demonstrated in his study of English and Welsh deaths from 1848 to 1947, mortality from diabetes rose steadily among men and women for the next century, declining only among boys after the introduction of insulin and in both sexes during wartime deprivations.[9] Surely the former group had Type 1 diabetes and the latter Type 2, the affliction that bedevils modern Britons.

Secondly, the theoretical and jurisdictional squabbles within medicine from the Renaissance onward had their clearest expression in the private and public discussions of physicians, surgeons, apothecaries and irregular practitioners. Adherents to traditional humoral medicine could be found in all the categories of "doctors," and they initially resisted new iatric principles based in chemistry that denied an imbalance produced disease, instead looking for external reasons for illness. These disagreements undoubtedly affected the diffusion of collegial interpretations about diseases like diabetes and may have prolonged arrival at an understanding of its etiology. Nonetheless, a mix of the opposing schools of thought did develop before the firm establishment of the scientific method. Indeed, there were more continuities, repeated therapies, and fewer changes in medical ideology than all the vitriol might suggest. The same cannot be said about jurisdictional argument

[9] W.P.D. Logan, "Mortality in England and Wales from 1848 to 1947," *Population Studies* 4 (1950): 142.

as livelihoods were involved. Elite physicians intended to keep their prerogatives within the profession and if that meant trying to compartmentalize and marginalize their competitors, so be it. Competition for professional dominance among regulated doctors, surgeons and apothecaries masked the popularity of unlicensed healers who were cheaper and more widely accessible than their "betters."

Thirdly, the study of pre-modern medicine in Britain is a lively field, exciting to be a part of. Set against current historiographical debates, the struggle for control of the medical marketplace has attracted the attention of many scholars all over the world. Some academics have enthusiastically addressed these professional disputes while others in more recent years have just as passionately directed their attention to the patient's part of the story, emphasizing the social history of medicine. But every aspect of medicine's history is necessarily social, whether acted out in a laboratory, a library or at the bedside. Chronic disease plays a more fundamental social role than the dramatic but episodic epidemics of infectious disease that have influenced historians enraptured by plague but not by consumption. As Charles Rosenberg has reminded us, chronic diseases entail economic and personal dilemmas for families and long-term welfare problems for communities.[10] Diabetes in particular manifests physical, psychological, social and intellectual aspects as well as its scientific basis. Prior to the discovery of insulin as a treatment for diabetes, victims often suffered shame and degradation in addition to the pain and agony produced by the disease. Incessant thirst and repulsive urination marked yesterday's diabetic as a pariah, a burden to kith and kin. A similar antipathy takes shape today as many governmental agencies and insurance companies blame the Type 2 diabetic for leading a life that proceeds to illness, a campaign creating a face-off with diabetics over money that tends to cloud the implications of the disease if left untreated. Should resources dwindle for contending with diabetes now and eventually for providing a cure, the consequences could be shattering. Without treatment, a diagnosis of diabetes remains a death sentence. Diabetics in modern western nations can live for many years with proper medications and therapies, but in places like twenty-first century Mozambique and Mali an untreated sufferer can count on a year or two of exquisite anguish

[10] Charles E. Rosenberg, "Framing Disease: Illness, Society and History," in *Framing Disease: Studies in Cultural History*, eds. Charles Rosenberg and Janet Golden (New Brunswick, N.J.: Rutgers University Press, 1992), xiv, xix–xx.

before dying from the disease. We can behold an image of a worsening life for African diabetics in the modern era and sympathize with its terrors; that picture mirrors diabetic life in Britain before the discovery of insulin.

Roy Porter contended over twenty years ago that the patient's view of sickness ought to be better explored by historians. Until then, the medical past largely remained the province of academics who focused exclusively on the careers and achievements of outstanding practitioners or the realm of physician-antiquarians interested in the history of their profession. Their sources lay almost exclusively in the papers of famous doctors and the annals of their collegial institutions. Parrying the thrust of those who argued that few victims of disease offered distinctive information on medicine, Porter believed that a "people's history of health" would show sufferers to be more "fertile in their resources than yet recognized."[11] Sick people, then as now, did not always consult with licensed physicians, but sought out medical treatment when they could afford it and where it was available. Many "irregular" care-givers—surgeons, apothecaries, gentle ladies and quacks—wrote about their patients and how they ministered to them. Subsequent scholars have proven Porter right, plumbing an imaginative variety of records to get at the perspective of a medical casualty.

Accordingly, I have attempted to examine the history of diabetes in Britain from the dual perspectives of doctor and patient, charting the work of those who tried to learn about the disorder and find a cure, as well as illuminating what the life of a pre-insulin diabetic was like. Physicians' casebooks, however, remained rare throughout the Renaissance. One exceptional medico who kept extensive accounts of his patients was Simon Forman, the Elizabethan astrologer-physician. He logged 8,000 consultations during his years of practice, sixty percent of whom were female.[12] Theodore Mayerne, court physician to James I and a bridge between Galenists and Paracelsians, was another early record-keeper, crafting medical portraits of his patients in Latin as he advanced from diagnosis to prognosis and therapeutics; men outnumbered women among Mayerne's more than 3000 folios covering 310 patients. The notes depict fifty years of doctoring from 1603–1653 when

[11] Roy Porter, "Doing Medical History from Below," *Theory and Society* 14 (1985): 194.

[12] Lauren Kassell, "How to Read Simon Forman's Casebooks," *Social History of Medicine* 12 (1999): 4.

he edited the entire compilation with the intention of publishing it as a sort of personal diary, an ephemeredes, that endorsed his synergistic medical principles.[13] Explicit descriptions like Mayerne's remained scarce for another generation when prominent physicians like Thomas Willis and Thomas Sydenham recognized the necessity of keeping written medical records. Furthermore, though snippets of medical information can be unearthed in early modern letters and diaries, until the twentieth century sufferers themselves did not usually chronicle much about their afflictions, a genre called pathography, as chronic illness connoted a sort of moral laxity for many; only a few Victorian era invalids described their sickrooms in detail. Although perhaps not providing the complete personal narrative of diabetes that one might read today, there are enough bits and pieces of many lives in doctors' case studies from the eighteenth-century onward that enable us to view the diabetic past. One can find in the records of these later physicians from all over Britain prescriptions for diabetic remedies ranging from special potions to opium and, since patient urine contained so much sweetness, even sugar to replace what was lost.

My research has therefore brought together two iatric skeins: a history of the disease set against a background of medical factionalism in Britain and the stories of the victims of that disease. Diabetes can be used as a vehicle to study the entire range of British medical history and the changing medical context for the disease illuminates the treatments afforded its sufferers. While some may question the use of anecdotal information, "the fragmented 'stuff' of historical narratization," to arrive at general assumptions, one can draw certain conclusions about the shifting medical scene from diabetic cases over time.[14] The puzzled private musings and disparate clinical activities of healers set in motion more public efforts to understand the disease. Classical physicians wrote little about diabetes, although remarks in the work of Galen indicate some form of the disease, which he located in the kidneys, existed in the ancient world. Traditional remedies reflected a general belief in the humoral system of wellness, requiring balance in the patient through various, and highly individualized means, either

[13] See Brian Nance, *Turquet de Mayerne as Baroque Physician: The Art of Medical Portraiture* (Amsterdam: Ridopi, 2001), 29, 31, 36, 53.

[14] For a defense of using anecdotal materials to understand the past, see Sonja Laden, "Recuperating the Archive: Anecdotal Evidence and Questions of 'Historical Realism,'" *Poetics Today* 25 (2004): 1–28.

adding to or taking away the appropriate bodily fluid. Adherence to Galenic medicine persisted in Britain through the Middle Ages and Renaissance despite challenges from proponents of chemical medicine who searched for specific cures for specific diseases. The printing press deepened the debate over medical theory as dueling doctors quarreled about the cause of diabetes and what therapies to apply. Most diabetics before our own times were Type 1 sufferers and very young, kept in hospitals away from their families for months at a time to be sure they followed their regimens exactly. And in the end they always died prematurely, lapsing into diabetic coma described in detail by attending physicians.

Nonetheless, "cures" abounded, recommended by licensed doctors and unlicensed healers, advertised in print and sold in apothecary stores and bookshops. The theoretical and jurisdictional disagreements among early modern health care providers—elite physicians, surgeons, apothecaries and unlicensed "irregulars"—clouded the effort to locate the site of the disease and find a way to cure it, an effort that continued through the Victorian era. Competing specialists devised a wide array of diets and other therapies for their patients; some kept close accounts of their patients' progress. And while some of the therapies used may seem strange and dangerous to us today, they probably satisfied patient need for prognosis and cure. In short, there was no evenly paced, "Whiggish" progress towards the discovery of insulin in 1922, but rather a series of syncopated transitions from one basic understanding to the next about the body in general and diabetes in particular, as well as the repetition of certain treatments over time like the administering of certain non-diuretic herbs and the low-starch or starvation diet.

In Chapter One, readers will uncover the earliest discoveries about diabetes, ancient through medieval, and consider the remedies afforded sufferers by healers practicing medicine rooted in the humoral theories of Galen. Acceptance of the four humors and their effect on health persisted for over a thousand years, taking root in Britain, as did the conviction that each person's constitution differed sufficiently from all others to warrant highly individualized care. Limning the lives of a trio of likely notable victims of the disease, Chapter Two considers dietary regimens and diabetic treatment in the Renaissance when most writers believed that malfunctioning kidneys produced too much urine or that the stars aligned in such a way as to cause patient distress. It also explores the challenges made to Galenism by the new medical theories of Paracelsus and other chemical doctors who looked for specific cures

to specific diseases that would apply to all sufferers. Chapter Three focuses on the growing body of vernacular literature about diabetes in the early modern period, much of it still occupied with astrological diagnosis and humoral treatment, with particular emphasis on the contributions of the famed herbalist, apothecary and radical, Nicholas Culpeper. The political views of healers entered into their calculations, as some unlicensed physicians sought to popularize their cures so as to empower "the middling sort" to treat their own ailments and to rebuff the elite doctors from the College of Physicians. Especially during the Civil War era and Restoration, such partisan attitudes colored the research of medicos into diabetes and prevented cooperation between factions; no better example of the conflict exists than in the work of two of the most famous doctors of the time, Thomas Willis and Thomas Sydenham, subjects of Chapter Four. Willis, who thought diabetes on the rise because his compatriots consumed too much food and wine, documented the treatment of "a noble earl" who clearly suffered from Type 2 diabetes. After tasting his patient's urine, which Willis found "wonderfully sweet," he prescribed an abstemious diet and vigorous activity for the man. As long as his patient followed doctor's orders he improved, but staying on Willis' regimen proved too difficult for him.

Based upon many heretofore-unpublished documents, Chapter Five describes the life of a diabetic before the discovery of insulin, citing particular cases and regimens applied. Under the influence of some well-known medical researchers, focus shifted to the liver as the culprit organ in excess sugar production and solutions shifted, too. Lives cut short by Types 1 and 2 of the disease cannot help but evoke sympathy, and as if the suffering and pain caused by diabetes itself were not enough to bear, its victims endured long hospital stays and starvation diets, only to die in agony anyway, as well as social ostracism for their inordinate thirst and disagreeably frequent urination. Chapter Six concentrates on developments in diabetic research during the long nineteenth century while the incidence of diabetes rose and suffering continued. Many colorful characters tried to figure out the enigma of the disease, attempting a variety of imaginative experiments and finally establishing the locus of the problem in the pancreas. It was the era of the low carbohydrate, high fat diet, popularized by a weight-loss success story, that anticipated similar regimens today. And Chapter Seven records the cumulative events and discoveries at the turn of the twentieth century that led up to the great breakthrough in the 1920s when insulin was given successfully by a research team in Toronto for the

first time to Type 1 diabetics, enabling them to survive the onslaught of problems associated with the hormone's insufficiency and to manage their disease. This achievement did not occur, however, without some resistance, post-insulin confusion, and governmental controversy among medical scientists, physicians and politicians alike. Neither did that feat eliminate many of the collateral troubles that couple with diabetes, including psychological stress and progressive neuropathy; nor did the discovery of insulin or its eventual manufacture actually cure either form of diabetes. Nonetheless, understanding the disease and its sufferers, up to and just beyond that essential moment in 1922, opens up a corner of medical and social history in Britain that has been previously ignored.

People all over the world, juveniles and older, still fall ill with Type 1 diabetes, as trigger viruses that may provoke the disease in those who are genetically susceptible have not yet been pinpointed and vaccinations to block it are not practical.[15] The explosion of Type 2 diabetes in the western world, engendered by genetic inheritance coupled with obesity and physical inactivity, has occurred more recently and offers further pharmaceutical challenges to the medical establishment, to governments and other corporate bodies charged with financing health care, and to the millions of those diagnosed. Patients themselves become confused about possible therapies available to them and, just as there was resistance to insulin therapy in the 1920s, many Type 2 sufferers openly balk at shifting from their pills to insulin; others avoid the regular blood-sugar testing needed to scrutinize their glucose levels regardless of how pain-free their monitors claim to be. An almost daily barrage of diabetes news highlights unpredictable developments in the treatment of the disease. On one day, Type 1 diabetics lobby openly for pancreas transplants as a cure for their particular affliction.[16] On another day, the National Institutes of Health abruptly halts a 10,000 patient study in the United States called ACCORD, some eighteen months before its completion, when aggressively treated Type 2 patients mysteriously died at higher rates than those given standard care. Pushing blood sugar levels to near-normal levels with multiple medications

[15] Doctors have tried vaccines in places where Type 1 occurs most frequently, but have failed to prevent a rise in the number of new cases.

[16] See Deb Butterfield, *Showdown with Diabetes*. (New York: Norton, 1999). I thank Ms. Butterfield for her personal communications with me. The Diabetes Portal website she founded has, until its recent shutdown, offered information, peer-support, and referrals to diabetics of all ages around the world.

did not protect those diabetics from the higher risk of heart attack or stroke; the following week, another study contradicts those findings. On still another day, researchers announce studies that seem to prove the curative benefits of weight-loss surgery, either using lap bands or gastric bypass techniques; the costs of these surgeries, however, put them out of reach of the typical diabetic. Many Type 1 sufferers hold out hope, despite political controversy, for stem cell research to provide cures in the not-too-distant future. These bewildering contemporary shifts in current and potential diabetes remedies echo how treatments altered in the centuries before the discovery of insulin, the principal subject of my work of history. The saga of the modern phenomenon of diabetes today, however, has yet to be written.

CHAPTER ONE

THE EARLY HISTORY OF DIABETES FROM CLASSICAL TIMES TO THE RENAISSANCE: DIAGNOSES AND DESCRIPTIONS

Concern for those afflicted with diabetes dates to the 16th century B.C., when ancient Hindu authors noted the terrible thirst (polydipsia) and constant urination (polyuria) of diabetics, conditions that preceded a prolonged and sometimes painful death. Using the term broadly, they attributed the fatal wasting condition to excessive food and drink. The first possible reference to diabetes in the West occurs in the famous Ebers papyrus, a treatise on therapeutics already antique in the days of the great Hippocrates and in which there is a prescription for "the too great emptying of the urine."[1] Treatments recommended in the Egyptian text include a liquid extract of bones, grain, grit, wheat, green lead and earth, a concoction no less efficacious than remedies prescribed 3,200 years later. Other desiccating tonics in the time of the Pharaohs could be made from twigs of the kadet plant, grapes, honey, berries of the u'an tree and sweet beer.[2] Hippocrates, c. 400 B.C., did not himself mention the diabetes by name, but he did limn excessive urinary flow accompanied by wasting of the body. Asserting that "in food, medicine," he would have looked to dietary remedies to counter that withering away.[3] Though rare in the ancient world, Hippocrates probably encountered the disorder although few authorities recognized

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[1] Quoted in S. Francis Marwood, "Notes on the History of Diabetes Mellitus," *History of Medicine* 6/2 (1974): 18. The papers, unearthed in 1862 in Thebes, were named for renowned Egyptologist Georg Ebers. For general histories of diabetes and its investigators, see books by Dietrich von Engelhardt, ed., *Diabetes, Its Medical and Cultural History* (Berlin: Springer-Verlag, 1989); and E. Poulsen, *Features of the History of Diabetology* (Copenhagen: Munksgaard, 1982). Important articles include Peter Beck, "Sweetness and Light," *Bulletin of the Medical Sciences Historical Society* 5 (1986): 59–64; and Lester S. King, "Empiricism, Rationalism, and Diabetes," *Journal of the American Medical Association (JAMA)* 187/7 (Feb. 1964): 521–526.

[2] A.C. Wootton, *Chronicles of Pharmacy* (Boston: Milford House, 1971 reprint), 43.

[3] Hippocrates cited by Galen in "On the Powers of Food: Book One," translated by Mark Grant in *Galen on Food and Diet* (London: Routledge, 2000), 73. See also John Longrigg, *Greek Medicine from the Heroic to the Hellenistic Age* (New York: Routledge, 1998).

the difference between diabetics and patients afflicted with some other type of polyuria, a pouring out of urine. Apollonius of Memphis gets credit for naming the disease around 230 B.C., employing the Ionian Greek for "siphon" to emphasize its victims' symptoms. The Latin encyclopedist Aulus Cornelius Celsus, whose stylistic influence became profound in the Renaissance, left a description in the first century A.D. of a painless but lethal polyuria associated with incurable thirst, hunger and dangerous emaciation. A hundred years later, Archigenes of Apamaea, a Syrian physician in Trajan's Rome best known as the father of dentistry, studied diabetes along with other ailments assumed to be nervous in origin and recorded the use of narcotics as a treatment.

These ancients applied the name "relaxation" to any condition where the body could not hold fluids and thus flowed or wasted away. Included in this category of ailments were excessive sweating, salivation, digestive secretion, diarrhea, menstrual bleeding and urination. Diabetes seemed to fit this theoretical grouping because of the net loss of fluids, and in traditional western medicine healers used various astringents to treat the symptoms of excessive urination. Among the prominent cooling astringent herbs and barks brewed in decoctions for relaxation problems since classical times are raspberry and blackberry, witch hazel, sumac bark, wild geranium or herb Robert, oak bark and royal fern. Sage, horse chestnut and bayberry bark taken internally warmed and stimulated the patient.[4] Early herbalists, however, failed to distinguish between the kinds of diabetic wasting these plants were to treat, prescribing sumac, for instance, in cases of diabetes with and without sugary urine. Nonetheless, not all relaxation maladies were alike nor was polyuria.

Physician Aretaeus of Cappadocia, a second-century contemporary and follower of Archigenes, reiterated the name diabetes, but at last distinguished between types of the disorder, what we now call diabetes mellitus and diabetes insipidus, a completely different malady. Devoting an entire chapter in his medical textbook to diabetes, he designated the ailment "wonderful" because of its rarity, "not very common to man," and its relentless "melting down of the flesh and limbs into urine."[5] Aretaeus subscribed to a general view of health, prevalent in

[4] Matthew Wood, *The Practice of Traditional Western Herbalism* (Berkeley, Cal.: North Atlantic Books, 2004), 199–219. Many of these remedies are still in use today by practitioners of alternative medicine.

[5] Francis Adams, ed. and trans., "Of the Causes and Signs of Acute and Chronic

the classical world, as dependent on a balance of the body's four major humors: blood, phlegm, yellow bile and black bile. First associated with Hippocrates who paired each humor with a season of the year, these substances corresponded to the four elements of earth, fire, water, and air; the humors would wax and wane in the body depending on diet and activity. Each humor had its particular organ source and inherent quality: blood, warm and moist, from the liver; phlegm, cold and moist, from the brain and lungs; yellow bile, warm and dry, from the gallbladder; and black bile, cold and dry, from the spleen. Any humoral imbalance or "dyscrasia," whether a surfeit or a deficit, led to illness. Moreover, as later popularized by Galen of Pergamum (129–c. 199), court physician to Marcus Aurelius, humors affected one's temperament and character, producing such distinctive types as the sanguine (ruddy-faced and passionate from too much blood), the phlegmatic (clam and unemotional from excess phlegm), the choleric (angry and bad-tempered due to extra yellow bile) and the melancholiac (despondent and sleepless from surplus black bile). Standard humoral remedies included purges and bloodletting to restore the body's equilibrium or "eucrasia," and using a remedy opposite to a symptom produced symmetry. For instance, for fever and the sweat it produced humoralists prescribed a cool and dry medication. Though humors formed in the body and were not ingested, certain foods created humoral responses; warm victuals produced yellow bile and cold dishes phlegm. In turn, yellow bile ushered in warm diseases while black bile generated cold ones. The loss of fluids could be construed as a form of death, so great care had to be taken to get the humoral balance just right.[6]

As a humoralist, Aretaeus attributed diabetes to a cold and humid nature and compared its origins to dropsy, a term used a millennium later to describe a variety of health problems. Dropsy, however, results in congestion around the heart since there is no outlet for the excess

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Diseases," in *The Extant Works of Aretaeus the Cappadocian* (London: Sydenham Society, 1856), 338. N.S. Papasyros translates Aretaeus' description of diabetes as "dreadful:" Papasyros, *The History of Diabetes Mellitus*, 2nd ed. (Stuttgart: Thieme, 1964). John Rollo, an eighteenth-century British doctor, added the terms mellitus and insipidus as descriptors to diabetes in a paper he wrote, *An Account of Two Cases of Diabetes Mellitus* (London: T. Gillet, 1797), distinguishing the sweet taste of diabetic urine from the tasteless urine of other polyuric patients.

[6] For more on humoralism, see Noga Arikha, *Passions and Tempers: A History of the Humours* (New York: Harper Collins, 2007).

humor, while diabetics have almost continual fluid flow and elimination. He argued that the disease was usually chronic, located in the kidneys and bladder, but that it could become acute, rapidly accelerating the patient's decline and death; it could also, he averred, be brought on by snakebite. The wasting described by Aretaeus surely applies to Type 1 diabetes, but the purges and abstemious diet he prescribed might have temporarily helped any Type 2 sufferers he encountered.

Aretaeus also acknowledged the social cost of being a diabetic with a fatal need for liquids and uncontrollable urination. "(A diabetic's) life is disgusting and painful; thirst unquenchable; excessive drinking; and one cannot stop them either from drinking or making water…. But by what method could they be restrained from making water? Or how can shame become more potent than pain?"[7] From this question one might wonder if diabetics in the ancient world were regarded as undesirables in their communities, shunned as if leprous. Aretaeus showed considerable pity for the sufferer: "If he stops for a very brief period and leaves off drinking, the mouth becomes parched, the body dry; the bowels seem on fire, he is wretched and uneasy, and soon dies, tormented with burning thirst."[8]

Galen, who single-handedly made prevalent the humoralism that influenced western iatric practice for the next 1500 years, only saw two cases of diabetes in his lifetime of service to the Roman Empire, probably diabetes insipidus, but he discussed "chamber pot dropsy" in a number of works, identifying the kidneys as the site of the disorder. And while Galen believed a "peculiarity of constitution" necessitated individualized treatment for sufferers of any malaise, he generally blamed diabetes on a "weakness of the kidneys that can not hold back water."[9] Unlike early modern doctors, Galen did not associate any variety of polyuria with obesity or even sluggishness of body, but he did pay close attention to diet as it impacted the humors, recommending a "thinning diet" for the majority of chronic diseases and especially helpful for the kidneys. He endorsed plants of the onion family (allium) like garlic and leeks as the best foods for this diet aimed at reducing phlegm, listing milk and cheese as the worst because they contributed to an accu-

[7] Adams, ed., *Works of Aretaeus*, 338. See also Folke Henschen, "On the Term Diabetes in the Works of Aretaeus and Galen," *Medical History* 13 (1969): 190–192.

[8] Quoted in *Diabetes: A Medical Odyssey* (Tuckahoe, N.Y.: USV Pharmaceutical Corp., 1971), 6.

[9] Galen, trans. Grant, "On the Powers of Foods: Book One," 70.

mulation of thick, sticky and cold humors.[10] Although Galen regarded diabetes as uncommon, dubbing the malaise a "urinous diarrhea," he nonetheless came up with a good exercise therapy that would quell the impulse to discharge excessive urine: horseback riding. From then on, followers of Galen prescribed vigorous exercise, preferably on horseback, to obviate disproportionate and precipitant urination.

Chinese doctors in the third century A.D. knew of diabetes, its sweet urine and the fatal dehydration it produced. The Chinese Hippocrates, Zhang Zhongjing, called diabetes "the malady of thirst," while a later countryman branded disproportionate hunger, thirst, and urination as a triad of symptoms that definitely signified diabetes. Almost simultaneously there appeared in the writings of Hindu physicians in the Ayur Valley of India reports that ants and flies were attracted to the urine of some people, that the urine tasted sweet, and that this was associated with various diseases. The Indian name for diabetes, *madhumeha*, means "urine of honey."[11] In the fourth or fifth centuries, the father of Indian medicine, the surgeon Suśruta, accurately described these diseases, including diabetes; he pointed out the difference between younger, slender victims and a heavier group that developed diabetes at a more advanced age. He recommended weight loss and exercise, but his insight would not be rediscovered by Europeans for another millennium. A century or so after Suśruta, a great Hindu physician, Caraka, recounted the sweet-tasting substances in some polyurics' urine; he could then distinguish between chronic diabetes affecting older, fatter people and thin, young people who did not survive long.[12]

From ancient times on, the incidence of diabetes rose slowly and became familiar to doctors in the early Byzantine Empire, still under

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[10] John Wilkins, "Galen's *De Subtiliante Diaeta*," in *The Unknown Galen*, edited by Vivian Nutton (London: Institute of Classical Studies, 2002), 48–49.

[11] Papaspyros, *History of Diabetes*, 1–2.

[12] L.L. Frank, "Diabetes Mellitus in the Texts of Old Hindu Medicine (Charaka, Suśruta, Vāgbhaṭa)," *American Journal of Gastroenterology* 27/1 (Jan. 1957): 76–95. There is contention over when Suśruta and Caraka lived, with confident assertions ranging from 1000 B.C. to the fifth century A.D. Vāgbhaṭa, the foremost Indian medical writer, compiled their texts after 500 A.D. See Ian Macfarlane, "Matthew Dobson and Diabetes," *Medical Historian* 7 (1994): 16; Beck, "Sweetness and Light," 59; Poulsen, Features of Diabetology, 13; Papaspyros, *History of Diabetes Mellitus*, 11; and Marwood, "Notes," 19. Macfarlane and Beck put Chinese and Japanese awareness of diabetes earlier than Indian Āyurvedic literature, which located diabetes mainly among the rich who overate rice, flour, and sugar, and whose urine ants flocked around. In 1907 J.P. Bose remarked that "what gout is to the nobility of England, diabetes is to the aristocracy of India:" von Engelhardt, *Diabetes*, 7.

the influence of Hippocratic and Galenic doctrines. The two greatest medical personalities of this early period in Byzantium studied in Alexandria, but came from Asia Minor. Born near the river Tigris, Aëtius of Amida, Christian court physician to Justinian in sixth-century Constantinople, compiled a sixteen-volume medical encyclopedia in which he prescribed for diabetes a heat-reducing diet reinforced by the application of cooling remedies to the haunches. He also called for opiates, though his use of narcotics for diabetes was hardly a new development, and he gave sufferers oriental mandrake, a sedative, in the later stages of the disease. Aëtius categorized diabetes as a kidney disease, as did other Byzantine encyclopedists, but without distinction between diabetic types. A century later, Paul of Aegina's seven-volume *Epitome*, another compendium of established humoral medicine, attributed diabetes to weak kidneys that led to dehydration. Practicing in Alexandria even after the Arab occupation of the city in 641 A.D., Paul advocated a concoction of herbs and lettuces (to quench thirst) mixed with rock fish, dates, myrtle (a drying agent), knotgrass and elecampane in red wine to be quaffed when the symptoms of the disease are first detected. Knotgrass or coral necklace, an astringent, was often taken to provoke urine; the root of elecampane, wild sunflower, contains inulin, a vegetable starch used to promote sweat and to determine renal function. Like Aëtius, who also insisted on hydrating sufferers, Paul buttressed his oral remedy with a topical application of vinegar, rose oil, and navelwort (or kidneywort), the latter regarded as a cooling agent best used in poultices.[13] Given the insatiable thirst and frequent urination of diabetics, Paul reproached doctors who called for diuretics in diabetes but sanctioned venesection to mitigate fever. Translated 200 years later into Arabic and around 800 A.D. into Latin, Paul's seven books combined ancient traditional knowledge with direct clinical experience.[14]

The Arab writer Rhazea interpreted Hindu teachings about diabetes in the ninth century, translating diabetes information from the

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[13] See *Culpeper's Color Herbal*, ed. David Potterton (New York: Sterling Publishing, 1983), passim.

[14] See Francis Adams, ed., *The Seven Books of Paulus Aegineta*, 3 vols. (London: Sydenham Society, 1844–1847). For more on Aëtius and Paul, see R.J. Durling, "Addenda Lexicis, primarily from Aëtius of Amida and Paul of Aegina" *Glotta* 44 (1986): 30–36; Effie Poulakou-Rebelakou and Spyros G. Marketos, "Kidney Disease in Byzantine Medical Texts," *American Journal of Nephrology* 19 (1999): 172–176. Many erstwhile reputable web sites err in situating Byzantine medicos far too early, an error repeated by other, less reputable sources and term-paper mills.

Āyurveda, or "knowledge of life" from indigenous Indian medical science, but his renditions and the ancient wisdom they held stayed in the eastern world until the late Renaissance. Likewise, the legacy of Greek medicine preserved in *The Royal Book* of Haly Abbas, a tenth-century Persian, had to wait many generations for transmission to the west. The verdict on diabetes within it was that diabetes emanated from excessive heat within the viscus; he called it "dysentery of the discrepancy."[15] During the Middle Ages and at some western universities well into the seventeenth centuries, doctors relied on the wisdom of Avicenna (980–1037), an ethnic Persian. In his monumental iatric encyclopedia, *The Canon of Medicine*, he recorded an accurate description of the clinical features of diabetes, as well as several of its complications including gangrene, blindness, and loss of sexual function. He added the presence of carbuncles as part of the diagnosis. Some translations of Avicenna's works credit him, court physician in Hamadan (Iran), with the first hypothesis about a nervous origin for diabetes as well as the first theory of the role of the liver in the disease. Directing that all diuretic foods and drugs be avoided, Avicenna told his diabetic patients to take emetics and sudorifics, medicinal plants like fenugreek, lupin, and wormseed that brought on vomiting and perspiration.[16] He also ordered them to exercise and to "employ moderate friction" when massaging their limbs, evidence that physicians knew of the loss of feeling diabetics experienced in their extremities. Like Aretaeus, Avicenna wrote of primary and secondary diabetes, but Avicenna, arguably the most important medical authority for centuries and usually regarded as the chief representative of Islamic medicine, also drew attention to the sweetness of diabetic urine, something Aretaeus had failed to mention. Avicenna and some of his contemporary physicians employed "water tasters" to diagnose diabetes, sweet urine indicating a positive test.

But the western Caliphate, predisposed to Christian medicine, produced iatric thinkers antagonistic to the "eastern" teachings of Avicenna. Averroës, a Córdoban philosopher, jurist, and physician who traveled the Iberian-Arab world in the twelfth century, attached greater importance to the practicalities of medical literature than to its dialec-

[15] Quoted in Benjamin Lee Gordon, *Medieval and Renaissance Medicine* (New York: Philosophical Library, 1959), 542.

[16] Avicenna made famous the aphorism that food is assimilated by the body, but medicine assimilated the body to itself. Nancy Siraisi, *Medieval and Early Renaissance Medicine* (Chicago: University of Chicago Press, 1990), 121.

tical conceits. Known as Ibn Rushd in Arabic, the language in which he wrote, Averroës penned commentaries on Plato and Aristotle and around 1160 composed *Generalities*, a medical encyclopedia based in part on his association with Avenzoar, a great Muslim clinician and author of a complementary text that Averroës urged him to write, *Particularities*. Averroës, personal physician to an Almohad prince and a Movahid sultan in Marrakesh, also produced observations on Avicenna, of whom he was very critical, and summaries of Hippocratic and Galenic thought, the latter accentuating how he linked his era to the classical age. Hence, Averroës shaped Jewish and Christian iatric theory more than he did that of the Arab world, especially with his emphasis on the nexus between physical and mental health through faith.

Acknowledging their debt to Arabists, many medieval English healers made a similar connection as they linked virtuous conduct and health, not surprising since most university-educated doctors were priests, too. The sick body cast off bad humors, so based on the common understanding that bodily discharge evinced lifestyle, these physicians concentrated on the "superfluities of digestion;" they insisted that "diet" included one's entire way of life. Excretions like urine, menstrual blood, phlegm, and sweat demonstrated what was going on inside the body. Factors outside the body also influenced one's well-being. Galen's interpreters called these factors non-naturals and they included food, drink, sleep, emotions and sex. Moderating these non-naturals, according to a personalized regimen fashioned by a patient's physician, brought good health; capitulating to them meant unambiguous sickness.[17]

Although they agreed with the need to live a life in principled equilibrium, medieval doctors in the British Isles brought something fresh to medicine.[18] Modern scholars have elevated the status of Anglo-Saxon healers, denigrated for centuries as mere imitators of the ancients or

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[17] Faye Getz, *Medicine in the English Middle Ages* (Princeton, N.J.: Princeton University Press, 1998), 87. Although some doctors prescribed group diets for collectives like monasteries, nutritional regimes worked best if suited to the individual. See Siraisi, *Medieval and Early Renaissance Medicine*, 120.

[18] M.L. Cameron itemizes the many medical writings that could have been known in England by the middle of the eighth century in "The Sources of Medical Knowledge in Anglo-Saxon England," *Anglo-Saxon England* 11 (1983): 135–155; he concludes that English physicians "were using the same texts as were available elsewhere in Europe."

the Arabists, based upon fresh readings of Old English manuscripts. Early medieval medicine had a theoretical basis of its own with a particular emphasis on the sick rather than the cause of sickness.[19] Linda Voigts underscores the stress Anglo-Saxon remedy books placed on symptoms and therapeutics, applauding the "sophisticated handling" of original texts by their users and the vernacular revisions that made the texts even more valuable for healers. Voigts argues that Pre-Conquest healers actually read medieval herbals, not because they slavishly imitated classical works, but because they contained practical information. Indeed, the most famous vernacular medical text of the Anglo-Saxons, the tenth-century *Leechbook of Bald*, emerged as a "unique" amalgamated work not derived from any single Latin source. Voigts notes that Old English herbals included updates on changing plant names, advice on where best to grow an herb, and how to use it in recipes. Clearly adapted for local use, these herbals manifest confirmation of a lively vegetal trade that coupled with home-grown plants to make for a dynamic pharmacopoeia. Not just artifacts, Anglo-Saxon medical manuscripts should be considered "living remedy" books. For further proof Voigt calls attention to contemporary marginalia and addenda found in surviving texts and manuscripts.[20]

The legendary Michael Scot (or Scotus), whose surname indicates his Border country origins, studied mathematics at Oxford and Paris before entering the service of Don Phillip, clerk register for the Holy Roman Emperor, Frederick II, at his palace in Sicily. Knowledge of Arabic, gained while furthering his education at Toledo during the first decade of the thirteenth century, led him to decipher and publish an abbreviated Latin anthology of Avicenna's works in 1210; he also translated Aristotle and Averroës. A priest, Scot was known in papal circles and worked for Popes Honorius III and Gregory IX, but he turned down their offers of an Irish benefice. From about 1220 Scot held the office of astrologer-physician to Frederick's court where he combined astronomy with alchemy in the usual medieval manner. His "Liber Introductorius," composed for the emperor, deals with astrology and prognostics, and he ministered to Frederick, a patron of science and medicine, during several of the emperor's illnesses. Best known as a

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[19] See Brian Lawn, *The Salernitan Questions* (Oxford: Clarendon Press, 1963); John Riddle, "Theory and Practice in Medieval Medicine," *Viator* 5 (1974): 157–184.

[20] Linda E. Voigts, "Anglo-Saxon Plant Remedies and the Anglo-Saxons," *Isis* 70 (1979): 250–268.

magician and master of the occult, Scot had recipes for turning lead into gold and copper into silver, as did most alchemists; however, he had a particular fascination for "certain medical receipts," especially those concerning urine. Frederick sent Scot on a tour of several European universities to promote his Latin translations of Aristotle and the Arab medical greats, a circuit that included a triumphant return to Oxford in 1230. The Oxonian Roger Bacon, then a student, met Scot there and later belittled his erudition and scholarly output with "the jealousy of a rival." Even harder on the wizard a couple of generations later, Dante Alighieri damned Scot along with other necromancers who occupy the eighth circle of Hell in *The Inferno*.[21]

Around 1230 England's "first notable medical writer," Gilbertus Anglicus (Gilbert the Englishman or Gilbert Eagle), produced *Compendium medicinae*, a work that was translated into Middle English in the early fifteenth century.[22] Chapter XVII, Part 3 of the *Compendium* discusses "diabites, … an unmesurable pissing of urin that comes of grete drienes of the reynes" (kidneys) that accelerates when additional "moistnes" flows from veins, liver and stomach. From Gilbert's treatise one can discern typical treatments and glean something about the lives of those persons afflicted with any sort of polyuria. Employing humoral terms and the concept that opposites cure, Gilbert asserted that when the kidneys get too dry, they "soke moche moistnes" from the veins that come from the liver, stomach and intestines, as well as from moisture that is in the patient himself. When all that wetness comes to the kidneys, it passes swiftly to the bladder and "so passes forth as it comes." Gilbert identified the causes of diabetes as overwork, "to moche medling with women," or becoming too warm from use of heat-producing ointments near the kidneys or from fever; diabetes can also arise from an imbalance, "distempering" that likely emanated from a

[21] J. Wood Brown, *Life and Legend of Michael Scot* (Edinburgh: David Douglas, 1897); S. Harrison Thomson, "The Texts of Michael Scot's Ars Alchemie," *Osiris* 5 (1938): 523–559. See Dante's *The Divine Comedy* (*Inferno*, canto xx, 115–117). Boccaccio and Pico della Mirandola also blasted Scot for wizardry, but Walter Scott immortalized his reputation for magic in "The Lay of the Last Minstrel." Scot's "Liber Introductorius" is MS 266 in the Bodleian Library and portions are contained in the British Library's Additional MSS 41600.

[22] Faye Getz, *Healing and Society in Medieval England: A Middle English Translation of the Pharmaceutical Writings of Gilbertus Anglicus* (Madison: University of Wisconsin Press, 1991), xi. Getz used the Middle English Gilbertus Anglicus in the Wellcome Library, MS 537 and provides a helpful glossary. "Diabetes" appears for the first time in Middle English in 1425.

humor that causes pain in the kidneys. Sufferers experience ache, heaviness, "prickling and gnawing" about the kidneys, continual thirst and "a grete appetit to pisse" after drinking. Certain wines stimulate the flow to the bladder and strong ones inhibit the feeble diabetic liver's ability to digest. Gilbert cautioned healers not to mistake "coldness of the liver" or "dampness," diseases of the bladder, for diabetes. Instead, he prescribed medicines to "abate the grete hete" of the kidneys and to "defie" or disburse the harmful humors, starting with "oximel," a base for electuaries made of two parts vinegar and one part honey. Using that base, he said to make a purging electuary about the size of a chestnut combining the juice of roses, preferably mixed with plum (diaprunis) and sugar. After additional purging on the second day, follow with an up-to-the-navel bath on the third, in which roses, plantain, lettuce, purslane, syngrene (houseleek), pimpernel, violet, and ribwort have steeped. These cooling herbs should balance the heat from the kidneys. Finish with a rub around the kidneys that penetrates through the pores. On the fourth day, bleed the diabetic under the ankle and administer more of the rose and plum electuary.

At this point in his recommended course of therapy Gilbert noted that the honey used in the electuary for a "hoot cause" (hot case) should be purified with water in which plums or violets have soaked; for cold cases use heating herbs in the mix instead. Evidently Gilbert hedged his bets about the hot or cold cause of diabetes because he prescribed alternative treatments throughout the section; the healer must determine what temperature is appropriate. After the electuary, he suggested using a syrup efficacious in dysentery cases, then proceed to anoint the kidneys with oil of roses, elixir of violet, and elixir of mandrake or water lilies. Next crush three kinds of sandalwood and spodium (quicklime) into a powder, add about the same amount of barley meal, and mix until thick with the juice of "solatre" (bittersweet), elixir of syngrene and purslane; plaster it upon the kidneys. Gilbert cautioned healers not to apply moist medicines as they make the kidneys "neisshe" or soft, filled with phlegm or blood; nor should they overuse dry medicines.

Gilbert concluded his section on diabetes with more recipes, including one for a concoction to put into food. Take the seeds of hockis (common mallow), lettuce, purslane and plantain, each about the same quantity; grind them together and blend with an equal amount of gum Arabic (viscous material from the acacia) and dragagant (tragacanth, a sticky substance from the pea family); add sugar in sufficient measure.

Let the patient take as much of this mixture as he can pinch between his thumb and two fingers. Gilbert continued: Remind the patient to avoid victuals that might make him thirsty and to eat the cold sort of meals that reduce heat. Let him drink white wine mixed with water, but admonish him to be wary of too much drinking. And every month, purge him as before. In the event that the cures work too well and the patient finds urination difficult (strangury), make a plaster of rue, wine and oil and smear it on the "shere" (groin). If by chance the patient's sickness comes from "cold aboute the reines," give him potions of hot medicines that are comforting and constricting, like mint or any others useful in curing dysentery. Make him plasters to apply to the kidneys, first having purged him of the humor that is the cause of his sickness. Flush him out every month with cathartics and "diet him" with temperately hot meals, cautioning him to be wary of polypody, a fern often used in purges, "for that opens the veines and makes the blod ren oute."[23]

Since few discourses from the medieval era incorporated such specific material on the cause and treatment of diabetes, another route to one of its characteristics symptoms, excessive urination, can be traced through the texts by medicos who touted uroscopy and tested urine. Evaluating urine persisted as the most common way to test whether a patient maintained a prudent life and enabled the medieval practitioner to appraise the state of the digestion, a process central to physiology in the Middle Ages and a key to diabetes treatment. Constantine the African (d. 1087) expressed surprise at learning the Latin world had no medical books on prognostication based on urinalysis, so widespread was this course of action in his day.[24] From about the tenth century, Anglo-Saxons demonstrated their acquaintance with medical learning in Latin. Physicians soon acquired and shared information on urine casting: a little evident in native books, occasionally in Old English translations of Latin texts, and often in works entirely in Latin. One Anglo-Saxon compilation of Latin medical material, found in the *Canterbury Classbook*, contains a morsel on uroscopy wrongly attributed to Galen that describes how examining patient urine can reveal when death will arrive. "Urine dark in the morning is very bad. Urine pure

[23] Ibid., 260–264.

[24] Roger French, *Medicine before Science* (Cambridge: Cambridge University Press, 2003), 65.

and cloudy signifies approaching death. Red urine if it has sediment is not dangerous. Urine white in the morning, clear again after breakfast is best."[25]

So vital did urine seem to Adelard of Bath, a twelfth-century teacher and translator of Arabic texts into Latin, that he had his "nephew" inquire about animal urination in *Questiones Naturales*. Adelard's nephew asks why birds do not urinate, even though they drink a lot. Adelard replies that birds have neither a bladder nor do they urinate because they eat dry food; he argues that the moisture they do take in is only a lubricant for food and therefore does not require a separate exit.[26] The nephew's preoccupation with birds continues, however, and he seeks from his uncle a cure for an ailing hawk that refused to fly. Perhaps because of that avian absence of urine, Adelard prescribes for the hawk "a little tender cow's meat that you have put in urine [and] he will be eager to fly."[27] Other informal evidence of English interest in uroscopy abounds, found in marginalia and in pieces added to other manuscripts, for instance a Latin tract on urine "in a twelfth-century hand" written on the end leaf of an illustrated vernacular herbal.[28] The volume of charts and books make apparent that in medieval England, as it had for centuries elsewhere, urine inspection reigned as medicine's chief diagnostic and prognostic tool, much more than just a means to discern the state of a patient's liver.

Englishmen hired as town physicians could expect to examine the entire municipality's urine as a first chore, often wearing around their necks a urine flask, the recognized symbol of a medical practitioner. One historian asserts that by 1400 the flask had replaced the Hippocratic staff as the emblem of English physicians.[29] Monasteries and other religious communities often generated their own healers to examine urine or employed "local leeches" to do the same. For instance, Master Marck, early fifteenth-century physician in Norwich, performed

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[25] Quoted in M.L. Cameron, *Anglo-Saxon Medicine* (Cambridge: Cambridge University Press, 1993), 51.

[26] Charles Burnett, ed., *Adelard of Bath, Conversations with His Nephew* (Cambridge: Cambridge University Press, 1998), 109.

[27] Ibid., 265.

[28] Voigts identifies the specific manuscript in question as Cotton Vitellius C iii.

[29] Siraisi, *Medieval and Early Renaissance Medicine*, 125. Robert S. Gottfried, *Doctors and Medicine in Medieval England, 1340–1530* (Princeton, N.J.: Princeton University Press, 1986), 178. The flask was also known as a "jordan," a term found in Chaucer. Geoffrey Chaucer, *Works*, ed. F.N. Robinson (Oxford: 1970), 148, cited in Carole Rawcliffe, *Medicine and Society in Later Medieval England* (Stroud, U.K.: Sutton, 1997), 46.

urinalysis on several occasions for the sick brethren of the Cathedral Priory there; Master Ralph succeeded him there a generation later. Likewise, the Infirmarers Rolls for Norwich Cathedral Priory recorded that Conrad, *medicus*, attended sick monks there in 1480, receiving 3s. 4d. for urine inspection.[30] Members of monastic communities without in-house healers had routine check-ups through urine testing, making sure their quarters had urinals and flagons on hand when the doctor called. Physicians did not have to do urine inspection in person, however, and the majority received urine samples from patients they had not actually consulted. Patients or their servants dropped off containers for doctors to examine at local markets, taverns or other business establishments. From these samples, so-called "piss prophets" claimed they could determine what was wrong and prescribe cures, often in conjunction with private data and astrological tables. Amalgamating the signs of the zodiac to various body parts created a sort of "celestial anatomy" that could be interpreted for each individual patient and led somewhat contradictorily to more personalized but less personal patient treatment.[31] Consider the exploits of William of England, a practitioner in thirteenth-century Marseilles, who constructed a unique scheme of prognosis that went even further than those approaches combining uroscopy and astrology. Since medical astronomy assessed the influence of heavenly bodies on earthly ones, a learned physician could calculate the relationship between the planets and patients. In his 1219 tract *De Urina non Visa* (*If One Cannot Inspect the Urine*), William boasted that using the stars and the signs of the zodiac he could make judgments about urine without actually seeing it![32]

The matchless quality of human urine reflected not just the differences among individual bodies but also the variety of factors affecting that body. Although suffering from similar disorders, bodies could develop those disorders from dissimilar humors. The skilled *medicus* could differentiate the causes of a malady by reading the patient's urine to determine what was out of balance. For instance, "highly colored and greasy" urine resulted from an excess of choler; phlegm pro-

[30] C.H. Talbot and E.A. Hammond, *Medical Practitioners in Medieval England* (London: Wellcome Historical Medical Library, 1965), 30, 209, 263.

[31] Gilbert Maminot, physician and chaplain to William the Conqueror, predicted the Norman's death from a riding accident in Rouen in 1087 by means of uroscopy. St. Albans abbot John of Cella (d. 1214), an incomparable judge of urines, foretold his own death by three days: Getz, *Medicine in the English Middle Ages*, 15, 25.

[32] French, *Medicine before Science*, 132. William's tract was taught by statute at Bologna.

duced "feeble" colored urine, while "thin, cloudy urine, full of tiny particles" meant that an excess of black bile bedeviled the sick person. Virgin urine appeared light and bright to the trained urine caster, but the urine of the sexually promiscuous was "tinged with lead."[33] Not everyone applauded uroscopies, however, as an unambiguous way to ascertain the cause of a person's illness. Satires in song and rhyme ridiculed "piss prophets" and their gullible patients who bought, dearly, into urine casting. Uromancers claimed they could not only define disease by analyzing patient urine, they could also foretell the future. Artists sketched many likenesses of money-grubbing charlatans fooling sick people and their families with gibberish about the nearly imperceptible qualities in the colors, character and smells they could discern in excreta. Depictions of uroscopy even found their way onto the sometimes-ribald misericords on the underside of choir seats in English churches.[34]

Although some newer universities dropped small dissertations on urines from their core medical curricula, perhaps because they associated urine testing with less academic tradition, western physicians continued to refer to and use urinalysis as a diagnostic and prognostic tool. When in the mid-twelfth century Durham physician Master Herbert assembled a basic medical library for the monks of the cathedral priory, he included two treatises on urine. Herbert's contemporary John of Worcester vividly sketched Henry I's physician Grimbald consulting a color chart while holding a bottle of the royal urine up to the light. Even with the somewhat restricted palette available to medieval artists, the charts that doctors like Grimbald consulted might have differentiated among more than twenty gradations of color to be found in urine. Those colors were important for they signaled specific disorders and the site of the bodily problem. Around 1250 Gilbert the Englishman produced another important piece, a translated commentary on the uroscopy of Gilles of Corbeil (c. 1165–1213), a Frenchman trained at Salerno; Gilles' Latin verse treatise, *De urinis*, remained the most popular in the West until the sixteenth century. In it, readers are informed that "thick urine, whitish, milky or bluish white, indicates dropsy, colic, the stone, headache, excess of phlegm, rheum in the members or a

[33] Rawcliffe, *Medicine and Society*, 46, 48.

[34] See Henry Connor, "Medieval Uroscopy and Its Representation on Misericords. Part 1: Uroscopy," *Clinical Medicine* 1/6 (2001): 507–509, and "Part 2: Misericords" 2/1 (2002): 75–77.

flux."[35] A century later Simon Bredon (d. 1372), a cleric at Merton College and physician to the Earl of Arundel, focused on urine in his *Trifolium*, a largely derivative and unfinished manuscript intended for scholars that dates to the fourteenth century.[36] It contains a long section on prognoses from urines and manifests a mathematical pharmacy based on Aristotle. Later, Bredon got into trouble when he refused to perform regular phlebotomies and urinalyses on the residents of a priory in Lewes. A judge ruled that Bredon had a contractual obligation to travel to treat the monks because they could not minister to themselves.[37]

After the Norman Conquest the number of medical books in the English language declined, but the quantity of Latin tomes doubled.[38] Gradually, however, Middle English-language medical books made a comeback, evident in the 1379 uroscopy of Henry Daniel, a Dominican friar and famed botanist. Drawing upon numerous classical texts and commentaries, Daniel candidly pointed to the need for books on uroscopy in the vernacular while touting the value of urinalysis as a science, one that could only develop from divinely-inspired experience. Presaging a similar remark by Paracelsus, a Reformation-era physician, Daniel claimed not to have learned how to write about urines from anyone, "save … from the gift of the holy spirit."[39] Daniel defended examining urine as the best way of determining humoral imbalance and the diseases that imbalance causes, although he recognized that even the definition of urine was subject to dispute. Is urine the byproduct of the blood filtered or is it also composed of filtered humors? Though acknowledging and debating the theoretical bases for this dis-

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[35] Quoted in David C. Lindberg, *The Beginnings of Western Science* (Chicago: University of Chicago Press, 1992), 335.

[36] See C.H. Talbot, "Simon Bredon, Physician, Mathematician and Astronomer," *British Journal for the History of Science* 1 (1962): 19–30.

[37] J.B. Post, "Doctor versus Patient: Two Fourteenth-Century Law Suits," *Medical History* 16 (1972): 298–300. Bredon bequeathed medical books to various Oxford colleges.

[38] Edward J. Kealey, *Medieval Medicus: A Social History of Anglo-Saxon Medicine* (Baltimore: Johns Hopkins University Press, 1981), 5. After 1066, medical texts in French circulated widely until the fourteenth century when "native pride in the English tongue reasserted itself." Getz, *Medicine in the English Middle Ages*, 86 and "Charity, Translation and the Language of Medical Learning in Medieval England," *Bulletin of the History of Medicine* 64 (1990): 4, n. 18. Linda Voigts calls early vernacular texts Anglo-Norman: see her "Multitudes of Middle English Medical Manuscripts" in Margaret R. Schleissner, ed., *Manuscript Sources of Medieval Medicine* (New York: Garland, 1995), 184.

[39] Quoted in Getz, "Charity, Translation and Language," 15.

pute in his Latin prologue, Daniel eschewed defining urine in the English treatise, but he did inform readers how urine is generated. Moreover, while he surely intended to disseminate uroscopic methods to a lay audience unable to decipher Latin, the disparity between Latin and vernacular texts may be slight. Widely circulated in more than twenty copied manuscripts, some on grimy, shoddy paper, Daniel's *Liber Uricrisiarum* succeeded in spreading prevailing medical culture among his readers and popularizing complex scientific materials.[40] It should be noted, however, that Latin works were not exclusively earmarked for erudite healers nor were texts in the vernacular only intended for laymen and women. Many profitable and broadly accepted manuals, as well as lesser-known folios such as William Kylinghale's fifteenth-century tract on urines, appeared in more than one language.[41]

Another book on urines in the vernacular, made available at the urging of Henry IV (1367–1413), appeared as *Liber de Judiciis Urinarum*.[42] Although we know little about the lives of specific diabetics before the age of print, diabetes may have been the cause of the death of Henry IV and the bane of the House of Lancaster. According to amateur historian Ian C. Sharman and surgeon Donald Campbell, the health of the tall nobleman first deteriorated precipitously in 1390, felling him while he was serving in Lithuania with the Teutonic Knights and planning a crusade to Jerusalem. Eight years later while in Paris, exiled by Richard II for conspiring against him, Henry suffered a "spasm," the aftereffects of which made his robust body shrivel "to the size of a twelve year old." But he must have bounced back rather

[40] Joanne Jaslin, "The Transmission of Learned Medical Literature in the Middle English *Liber Uricrisiarum*," *Medical History* 37 (1993): 313–329; and Ralph Hanna III, "Henry Daniel's *Liber Uricrisiarum*" in *Popular and Practical Science of Medieval England*, ed. Lister Matheson (East Lansing, Mich.: Colleagues Press, 1994), 185–218. Daniel's manuscript cites *De urinus* by Isaac Judaeus (or Isaac Israeli), an early tenth-century Jewish physician who had specifically warned against using urinalysis for diagnosing disorders outside the urinary tract: Rawcliffe, *Medicine and Society*, 48.

[41] Nutton, "Medieval Western Medicine," 145; Rossell Hope Robbins, "Medical Manuscripts in Middle English," *Speculum* 45 (1970): 394 n. 2; Talbot and Hammond, *Medical Practitioners*, 405. See also Elizabeth Lane Furdell, *Publishing and Medicine in Early Modern England* (Rochester, N.Y.: University of Rochester Press/Boydell and Brewer, 2002).

[42] Many tracts use this title and it is even an alternative to the Henry Daniel work. Some scholars attribute this treatise to John Arderne, but Arderne died around 1376, even before the Daniel uroscopy. However, no less an authority than D'Arcy Power, editor of Arderne's text on fistula, excludes him from authorship and from service to Henry IV. See also Talbot and Hammond, *Medical Practitioners*, 112.

quickly, because in the following year, after Richard confiscated the vast Lancastrian estates in England, he ousted the unpopular king and seized the throne for himself.

As Henry IV he faced insurrections from supporters of the deposed king, from the Welsh and the Scots, and from former allies including Richard Scrope, Archbishop of York. In June 1405 the king ordered the beheading of the cleric for participating in an unsuccessful rebellion. The evening after Scrope was executed, Henry had a seizure in which he accused his servants of "throwing fire" over him; giant pustules appeared on his face. Sharman and Campbell assert that paranoia and skin eruptions characterize untreated diabetes.[43] Following his seizure, Henry's servants gave him Vernage, a sweet Tuscan wine high in the glucose Type 1 diabetics lack. For the remainder of his life, Henry was plagued by fainting fits, anxiety attacks, circulatory problems, sweating, hyperactivity and depression, all classic symptoms of diabetes. By 1412 he could no longer walk and could hardly ride, despite the ministrations of his Italian physician, David de Nigarellis.[44] Furthermore, instead of the sleek figure he displayed as a youth, Henry IV died a bloated, obese man at forty-six, evident from his tomb effigy at Canterbury Cathedral.[45] Sharman and Campbell have ruled out other reasons for the king's attacks of ill health including the legend, perpetuated by Shakespeare, that demons possessed Henry or that he had leprosy. The diagnosis of heart disease and circulatory deficiency made by Peter McNiven twenty years ago does not contradict an underlying diabetes disorder; indeed, prevailing long-term complications from diabetes include heart disease, vascular disease and neuropathy.[46] Moreover, Sharman and Campbell believe they have found evidence of other

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[43] Nigel Jones, "Henry IV and His Diabetic Dynasty," *BBC History* (April 2002), based on Sharman's self-published biography whose title recalls Henry IV's motto, "remember me": *Henry IV 1399–1413: Souvenez Vous de Moi* (London: Chronica, 2003). He has also penned *Henry IV* (London: Plantangenet Press, 2002).

[44] According to Faye Getz, the number and influence of Italian medical practitioners in England rose at the end of the medieval period: *Medicine in the English Middle Ages*, 27. Henry's many other doctors included John Malverne, a canon of St. Paul's in London; Elias Sabot, a Jew who attended the king in England, and Frenchman Louis Recouches, appointed keeper of the King's mint within the Tower in 1404. Talbot and Hammond, *Medical Practitioners*, 166–167; 43; 204–205.

[45] For the importance of funerary evidence to history, see Nigel Saul. *Death, Art, and Memory in Medieval England: The Cobham Family and Its Monuments 1300–1500* (New York: Oxford University Press, 2001).

[46] Peter McNiven also rules out leprosy and congenital syphilis; see his "The Problem of Henry IV's Health, 1405–1413," *English Historical Review* 100 (1985): 747–772.

diabetics in the king's family including his uncle, Edward the Black Prince, who could not walk in middle age; Henry's son, Henry V, who died with a "shrunken, hollow face;" and Henry's grandson, the pinch-faced Henry VI, whose fits of catatonia and bouts of lethargy helped instigate the Wars of the Roses. The outcome of those aristocratic wars in 1485 and the victory of Henry Tudor (Henry VII) allowed for the creation of a new dynasty.

Some Tudor-era medical writers derived knowledge from Arabic medicine and acknowledged their debt to these iatric intermediaries. Thomas Elyot expressed this debt in his 1539 *Castel of Health*, referencing Haly Abbas, Avicenna and Averroës in the same breath as Hippocrates, Galen, and Celsus. But interest in Arabic medicine waned in the sixteenth century as reformers and nationalists rejected these go-betweens for clouding the content of classical doctrines and barbarously distorting the language of healing.[47] A generation earlier, with the invention of printing and signs of an eager audience, Latin translations of original sources appeared in Europe. A cadre of experts in Greek, however, argued persuasively that only through knowledge of the primary documents, rather than through later Latin versions, could medicine advance. To avoid the errors of translations, access for elite scholars to Greek manuscripts, especially Galen in Greek, became the *sine qua non* of a medical revival. Equipped with a mastery of Greek learned at All Souls College, Oxford, Thomas Linacre, later Henry VIII's principal doctor and the inaugural president of the College of Physicians in London, earned a medical degree in 1496 at Padua, then the most prestigious institution of higher learning in Europe. Appalled at the poverty of medical education in Britain, Linacre resolved to renew Galenism there by restoring the classical foundation of humoral therapy minus the complicated and unwarranted additions that had accrued over the centuries.[48] Working from manuscripts that he had obtained from private collectors during his twelve-year Italian residence, Linacre translated Galen's treatises on

[47] Andrew Wear, "English Medical Writers and Their Interest in Classical Arabic Medicine in the Seventeenth Century," in *The 'Arabick' Interest of the Natural Philosophers in Seventeenth-Century England* (Leiden: Brill, 1994), 266.

[48] Linacre also declared virtual war on uroscopy, maligning its diagnostic efficacy and bashing those who relied on the procedure. See J. Bolodeoku and D. Donaldson, "Origins of Urinalysis in Clinical Diagnosis," *Journal of Clinical Pathology* 49/8 (1996): 623–626; and R.B. Bush, "'Urine is an Harlot or a Lier,'" *JAMA* 208 (1969): 131–134.

hygiene and medical treatment from Greek into Latin. Patrons like the Medici opened their archives of Galen's works, albeit with many restrictions, and individuals such as Niccolò Leoniceno, Professor of Medicine at Ferrara, assembled Galenic texts for their personal edification. Medical men and philosophers evinced widespread interest in the printed treatises that would spring from the originals, but because highly technical Greek remained obscure to most translators, published discourses were usually just familiar essays rendered in humanist Latin.[49]

Then from the Aldine Press came the 1525 publication of Galen and Hippocrates, making available the classical medical corpus in its original language and setting off in turn an avalanche of Latin translations for doctors whose Greek left something to be desired. There is an English connection to the Aldine editions. Linacre knew Aldus Manutius, founder of the press, and had stayed with him during an earlier sojourn in Venice. Four Oxford men participated in production of the Aldine Galen, three of them lecturers in Greek at Corpus Christi College and another a fellow of Oriel College. Historian Vivian Nutton finds irony in the propagation of Galenic medicine in the first half of the sixteenth century and the "equally vigorous denunciation" of Galen that followed. Even Henrician era enthusiasts, however, tempered their excitement at the appearance of the text. The international scholar Erasmus, ensconced at Oxford to hone his Greek by studying with Linacre, found the works corrupt and full of mistakes; one of the Oxford editors admitted that errors had been caused by carelessness.[50] In 1537 a consortium of printers in Basel accomplished a second edition of Galen in Greek, the edition one of England's most eminent physicians, John Caius, bought and used. Caius, like Linacre a Padua M.D. and teacher of Greek, venerated Galen and as President of the College of Physicians at mid-century championed medical examinations based on Galenic texts. Though he was a classical scholar of the first rank, Caius violated scholarly tradition by publishing several books in the vernacular, including an English-language treatise on the sweating

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[49] Vivian Nutton, *John Caius and the Manuscripts of Galen* (Cambridge: Cambridge Philological Society, 1987), 22–29. Nutton notes that the printing of Galen in Greek stopped between 1500 and 1525, perhaps because of the cost to set up Galen's bulky writings and an anemic market for them.

[50] Ibid., 38–44. The Oxford quartet consisted of John Clement, a friend of Thomas More; Edward Wotton, a Padua-degreed physician and naturalist; William Rose, described as an astrologer, doctor, and philosopher; and Thomas Lupset, a protégé of Cardinal Wolsey and a comrade of Linacre.

sickness. Nonetheless, Galenic medicine with its emphasis on humoralism had definitely returned to Britain due to the influence of Linacre and Caius. On the continent, however, challengers to Galenism had begun to repudiate its doctrines, marking Linacre and especially Caius anachronisms in their own time.[51] It does seem that just as links to past medical knowledge—Greek, Roman, and Arabic—were forged, they broke.

Nonetheless, one traditional nexus that did not weaken in either the Islamic or European worlds was the connection between medicine and astrology. Ptolemy wrote a handbook that survives from ancient times, comparing the similar ends of both arts, acknowledging that doctors and astrologers borrowed ideas and techniques from one another, and praising the Egyptians for unifying the two arts.[52] In the medieval period, medical universities in East and West combined the disciplines, offering formal courses in astrology for medical men whose patients asked for consultations that fixed wellness in the stars. Astronomical art received praise for its usefulness in helping to determine the best time for cauterization, the lancing of abscesses, and bleeding. One had to avoid, for instance, letting blood on the part of the body governed by the reigning sign of the zodiac, but there were other days, like the Ides, that also made phlebotomy perilous. Auspicious times to draw blood always included St. Patrick's Day, especially if taken from the right arm to protect against fevers; April 11 if from the left arm to prevent blindness; May 28–29 from either arm to counter all diseases and disorders; and September 17, St. Lambert's Day, for specific fortification against dropsy, frenzy, palsy, gout and epilepsy.[53] Henry I's doctor pronounced that medicine could not "be fully mastered except through astronomy."[54] Some physicians tried to "apply the precise, quantitative

[51] Elizabeth Lane Furdell, *The Royal Doctors* (Rochester, N.Y.: Rochester University Press, 2001), 45–47. For a critical view of Caius, see Charles D. O'Malley, *English Medical Humanists* (Lawrence: University of Kansas Press, 1965).

[52] Ann Geneva, however, scoffs at the interchangeable use of astronomy and astrology, noting Ptolemy himself separated the two subjects into discrete volumes; see her *Astrology and the Seventeenth Century Mind* (Manchester: Manchester University Press, 1995), 6.

[53] Linne R. Mooney, "Diet and Bloodletting: A Monthly Regimen," in *Popular and Practical Science of Medieval England*, ed. Lister M. Matheson (East Lansing, Mich.: Colleagues Press, 1994), 246–247.

[54] Petrus Alfonsi, quoted in Stephen C. McCluskey, *Astronomies and Cultures in Early Medieval Europe* (Cambridge: Cambridge University Press, 1998), 182.

methods of astrology" in their practice, all the while debating which illnesses fitted better into astrological or medical categories.[55]

Medical literature in the West before the Renaissance largely gives diabetes short shrift, although dietary advice rooted in Hippocrates and Galen was plentiful enough. Medical dietetics followed the traditional theory that individual temperaments required compatible foods for maintenance of health but contrary foods for restoration of wellness. Some items, like temperate chicken and veal, received a nearly universal seal of approval, but melons were seen as hazardous to one's health. Doctors took social conditions into account, however, deeming certain vegetables appropriate only for peasants.[56] Paracelsus (Theophrastus Phillipus Aureolus Bombastus von Hohenheim), the sixteenth-century Swiss maverick who paid homage to Celsus with his nom de plume, challenged Galenic assumptions when it came to diet and disease. He shunned classical preferences for bleeding and purging to balance the body's humors and contended that an accumulation of salt caused diabetes, prescribing anodynes to extinguish the excessive thirst of sufferers. In general, he championed the body's natural healing processes and advocated milder doses of medications and opiates. Paracelsus' admonition to physicians to personally monitor patient symptoms carefully activated the belief among his followers that once observed, signals recognizable by even the sick person could lead to correct diagnosis and proper countermeasures.

As for uroscopy, Paracelsus relied on the old association with astrology and a new approach to urinalysis through distillation. Most at home in his Basel laboratory, he argued that a medicus could not know a disease by merely inspecting patient urine; the physician-chemist had to chemically "dissect" the urine, precipitating out abnormal amounts of substances like salt, sulphur or mercury. Some followers of Paracelsus used distillation cylinders shaped like the body, "anatomical furnaces" even as large as the body, believing that the abnormal urine would lay

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[55] Anthony Grafton, *Cardano's Cosmos* (Cambridge, Mass.: Harvard University Press, 1999), 12. See also Alan Chapman, "Astrological Medicine," in *Health, Medicine and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 275–300.

[56] Nancy Siraisi, *The Clock and the Mirror* (Princeton, N.J.: Princeton University Press, 1997), 72. See also Allen J. Grieco, "The Social Politics of Pre-Linnaean Botanical Classification," *I Tatti Studies: Essays in the Renaissance* 4 (1991): 131–149; Massimo Montanari, *The Culture of Food* (Oxford: Oxford University Press, 1994).

deposits in the locations corresponding to the patient's sick parts.[57] Evidence for the presence of disease allowed Paracelsus to apply his antihumoral theory that "like cured like." Specific diseases like diabetes required specific cures, remedies revealed to a talented healer by God. Knowing the secrets of nature was a gift few doctors had, certainly not one to be gotten from books.[58] After his death in 1541, adherents published Paracelsian writings, bringing his iatric thought to some universities, continental royal courts and Protestant noble houses. Given his anti-bookish, anti-authoritarian bent, the acceptance of Paracelsianism among the elite seems particularly ironic. Similarly incongruous, uroscopy, identified closely with Paracelsus, who was almost always depicted with a urine flask, almost simultaneously fell out of favor, condemned by learned physicians as the province of quacks and uromancers.[59]

Although several European universities endorsed the more experimental medical theories of Paracelsus in their curricula, Oxford and Cambridge, the only schools where medical education was available in Renaissance England, remained true to Galenism. But interest in chemical therapy burgeoned in Great Britain with the 1559 publication of Conrad Gesner's *Treasure of Euonymus*, which stirred debate among the largely Galenist Fellows at the College of Physicians in London.[60] When physicians trained in Paracelsian-influenced medicine began to make their way to England, the College responded by tripling its fees for members with foreign degrees. Historian Allen Debus terms Richard Bostocke, practicing around 1585 and the author of *Difference*

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[57] Paracelsus, *Paracelsus: Selected Writings*, edited by Jolande Jacobi. (Princeton, N.J.: Princeton University Press, 1951). See the illustration of an anatomical furnace in Wear, "Medicine in Early Modern Europe," 314.

[58] Medical writers before Paracelsus had likewise insisted that medicine could not just be learned from books. Gilbert Eagle's mid-thirteenth century commentary on the uroscopy of Gilles of Corbeil said much the same thing. Getz, *Medicine in the English Middle Ages*, 68.

[59] For more on Paracelsus and his legacy, see Walter Pagel, *Paracelsus* (Basel: Karger, 1958); Ole Peter Grell, ed., *Paracelsus* (Leiden: Brill, 1998); Theodore M. Brown, "The College of Physicians and the Acceptance of Iatromechanism in England," *Bulletin of the History of Medicine* 44 (1970): 12–30; and Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*. 2 vols. (New York: Science History Publications, 1977).

[60] A brouhaha erupted among the Fellows when John Geynes repudiated Galenism, but was forced to recant after three days of debate. Annals of the College of Physicians, vol. 1, f. 22a, Library of the Royal College of Physicians, London. The author thanks the College Librarian for permission to quote from the unpublished Annals.

between the Auncient Phisicke … and the Latter Phisicke, the first English Paracelsian. Anglicized Scotsman Thomas Moffett, a prominent graduate of the University of Basel, transmitted "the sophisticated form of Paracelsianism into England" and influenced the Fellows in the 1580s to consider a section on chemical medicine for a proposed College pharmacopoeia; Moffett called Paracelsus "the Hippocrates of a new age." At the end of the Tudor century fully one-third of the College Fellows had graduated from universities with chemical therapy among their requirements and their numbers only increased in the next generation.[61]

Nonetheless, at the beginning of the Stuart era an implicit doctrinal truce prevailed within the English medical profession. Theodore Turquet de Mayerne, royal doctor to James I, personified that concord, embracing the experimental chemical remedies championed by Paracelsus while sustaining a belief in the efficacy of bleeding and purging. His deft professionalism and excellence as a clinician enabled Mayerne to preserve the quiet syncretistic compromise effected by the College Fellows and preserved until the Civil War when chemical doctors again denounced Galenists in print. This time the challengers invoked the name of Jan Baptista van Helmont, pioneer chemist and mystic from Louvain. Debus labels van Helmont's oeuvre, printed posthumously by his son, "among the most influential medical and scientific publications of the seventeenth century."[62] Van Helmont considered the ancients heathens, chiding Galen for his unwarranted conclusions and lamenting that enemies of Christianity—Greeks, Arabs and Jews—had cultivated medicine for their own purposes. Rejecting the doctrine of humors altogether, van Helmont insisted that only through chemistry could the nature of the healing arts be understood. At the same time, he disavowed the metaphysical basis of Paracelsianism. The impact of the struggle for medical supremacy in England, both a theoretical and

[61] Allan G. Debus, *The English Paracelsians* (London: Oldbourne, 1965), 24, 43, 57, 62; Charles Webster, "Alchemical and Paracelsian Medicine," in *Health, Medicine and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 330; and Hugh Trevor Roper, "The Court Physician and Paracelsianism," in *Medicine in the Courts of Europe*, ed. Vivian Nutton (London: Routledge, 1990), 90–91.

[62] Debus, *The Chemical Philosophy*, 2: 303–304, 310–311. For more on van Helmont see Walter Pagel, *From Paracelsus to Van Helmont*, ed. Marianne Winder (London: Variorum Reprints, 1986), and Antonio Clericuzio, "From van Helmont to Boyle: A Study of the Helmontian Chemical and Medical Theories in Seventeenth-Century England," *British Journal for the History of Science* 26 (1993): 303–335.

jurisdictional mêlée, had a direct bearing on all doctors and patients. Because of the particular qualities of diabetic disorders, victims of that malady found themselves subjected to the excesses of Galenic bleedings and purgings as well as to the extremes of corrosive chemical therapies recommended by the reformers.

CHAPTER TWO

RENAISSANCE DIABETICS AND THEIR DOCTORS: CHANGING TREATMENTS FOR REVOLUTIONARY TIMES

Determining what illnesses beset victims long dead is a tricky proposition, especially if reliable, medically astute observers are scarce. Moreover, the sixteenth and seventeenth centuries in Britain, racked by political and religious ferment, generated equally turbulent disputes in medicine. Many healers questioned the traditions of Galen, some abandoning humoralism altogether for new theories of chemical medicine and new quests for specific cures. Diseases unfamiliar to Europeans bedeviled doctors as the double-edged impact of overseas exploration and conquest became clearer: the world outside of Europe offered equally the possibility of exotic medication and alien sickness. Although diabetes was not unknown in Renaissance England, to perceptive chroniclers its incidence did appear to be on the rise and its etiology mysterious. Given the fractious nature of medicine and the inscrutability of diabetes, the disease offered a sort of living laboratory in which rival physicians could investigate fiercely differing treatments as sufferers fell victim to myriad woes, pathological and provoked. Let us examine a trio of possible diabetic cases in Tudor and Stuart Britain.

The Oxford Dictionary of National Biography lists over 150 diabetic sufferers in its recent compilation of famous lives; its predecessor, *The Dictionary of National Biography*, counts only a handful of victims of diabetes, most of them in the nineteenth-century.[1] Among the few Renaissance era diabetics profiled in the pages of both editions are Thomas Cardinal Wolsey (1473–1530), Henry VIII's first chief minister; Elizabethan Lord Chancellor Sir Christopher Hatton (1540–1591); and poet Thomas Stanley (1625–1678). Cardinal Wolsey's rotund image, immortalized in his best-known portrait (c. 1520) by an anonymous artist, underscores the historical perception that his legendary greediness extended to

[1] The *Oxford DNB* omits some of the original *DNB*'s purported diabetics but adds many more, primarily from the twentieth century.

overeating.[2] However, in the *Oxford DNB* historian Sybil Jack points out that only poet John Skelton, Wolsey's avowed enemy, actually accused him of gluttony. But we do know something about consumption in Wolsey's household based on accounts of lavish banquets hosted by the cardinal. George Cavendish, who attended such an event, described a feast that included huge amounts of wild animal roasts served with fatty sauces and elaborate sugar desserts shaped into castles, sword fights and dancing ladies. Since sumptuary laws restricted according to rank the number of courses served, no limits would curtail the menu of the king's principal minister; boar (only to be eaten by noblemen), venison, peacock, and swan, as well as oysters, lobster, and crab for garnish, adorned Wolsey's table.[3] Butter featured prominently at noble meals, a staple usually eaten as physicians suggested at the start of a repast. Tudor-era doctor Andrew Boorde asserted that if butter were consumed in a later course, it "would swim above the brinks of the stomach, as fatness doth swim above the boiling pot, and cause eructions" or belching.[4]

Thomas Linacre, court physician to Henry VIII from 1509, also ministered to Wolsey's health and in return Wolsey procured supplementary income for the London-based cleric-doctor as choir director for Wells Cathedral. A staunch Galenist, Linacre took to reforming the medical profession by persuading the king to found the College of Physicians in 1518. Furthermore, he determined to use his influence to cleanse medicine of complicated and unwarranted additions and to restore the classical foundation of humoral therapies.[5] Linacre translated classical treatises from Greek into Latin, making available the ancients' assertions that the stages of medical care began with diet, followed by drugs and finally surgery. Galenism posited that the innate heat of the body cooked foods as it digested them, but certain diets produced putrification and fever. Galen's most important treatise, *On the Powers of Foods*, described the eating habits of the second-century

[2] See the Wolsey, Hatton, and Stanley portraits in the National Portrait Gallery or on-line at www.npg.uk.org.

[3] Ken Albala, *Food in Early Modern Europe* (Westport, Conn.: Greenwood Press, 2003), 166 and passim.

[4] Andrew Boorde, *A Compendyous Regiment* (London: Early English Text Society, reprint 1870), 46.

[5] Elizabeth Lane Furdell, *The Royal Doctors, 1485–1714: Medical Personnel at the Tudor and Stuart Courts* (Rochester, N.Y.: University of Rochester Press/Boydell and Brewer, 2001), 22–23; Vivian Nutton, "John Caius and the Linacre Tradition," *Medical History* 23 (1979): 374.

Roman Empire and asserted that a faulty diet could undermine balanced humors and good health. An excess of phlegm, generated by excessive eating and characteristic of the aging, brought on indigestion and had to be counteracted with a hot, dry remedy. A good doctor should take into account the age of his patient, as some foods benefited the young but not the old. Galen also had insisted a physician should be a cook, able to provide soothing recipes like barley broth for those with health problems related to digestion. No one knew the demands of Galen's work better than Linacre who would have applied humoral principles to his treatment of a dyspeptic Cardinal Wolsey.[6]

So what diet would Linacre have put Wolsey on? Matching the proper foods to an individual's humoral composition was a key to health. No universal set of prescribed nutritional guidelines, let alone the notion of good foods or bad foods, could fit into such a bespoke course of therapy. Just as medicines that were deemed cold and dry could counteract an excessively hot and moist body, so, too, could foods provide the balance and cure a sick person. A food's texture and consistency factored into a physician's calculations when prescribing a diet that aided digestion. Workers should eat hearty, sustaining meals featuring beef and beans; more sedentary men like Cardinal Wolsey should consume lighter meals with chicken and eggs that are more easily digested. Linacre would also have taken into account what Galenists called "non-naturals," external factors ranging from sleep patterns to bowel movements that could heat, cool, moisten or dry a body, adjusted for seasonal variations. And he would have allowed for his patient's age and gender when designing the Cardinal's regimen. As an older man, Wolsey had lost the vital fluids and heat of his youth, so his diet should include warmer more easily digested foods, although dining on venison was thought to prolong life. Of course, dining practices at court infuriated royal physicians, and they railed against eating too many foods at one meal, especially mixing meat and fish, then following up with sweet confections. Moreover, they argued that foods ought to be consumed in a certain order. Like Boorde's description of the effect of buttery excess, if fruit were consumed too late in a meal it would rise to the top of the stomach's contents and send out noxious vapors into the brain.[7] Wolsey likely ignored any of Linacre's admonitions and delighted in courtly banquets.

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[6] Mark Grant, *Galen on Food and Diet* (London: New York: Routledge, 2000), 6–11.
[7] Albala, *Food in Early Modern Europe*, 214–221.

In poems written against Wolsey in 1521, John Skelton described the cardinal, known for succumbing to all pleasures of the flesh, as syphilitic and suffering from eye trouble. The eye ailment hints at diabetic retinopathy, cataracts or glaucoma, the latter two common long-term problems for people with diabetes. Moreover, as he aged Wolsey endured a myriad of health problems, such as gallstones, jaundice, colic, and edema. After his fall from grace, he lost his appetite and slept badly, exacerbating his already compromised constitution. The Venetian ambassador, an eyewitness to Wolsey's decline, reported that after his arrest, Wolsey experienced profound vomiting and looseness of the bowels, identified by contemporaries as symptoms of diabetes. Physicians experimented with different dietary measures to try to control diabetes and they knew that failure to take regular meals endangered sufferers; Wolsey's refusal to eat at all destroyed any chance to ameliorate his condition. Given his general symptoms, Sybil Jack does find adult-onset diabetes a probable diagnosis and concludes that this illness led to a final and fatal coma.[8]

Similarly, Sir Christopher Hatton, known for his fun-loving energy as "the dancing chancellor," presented himself to the world in robust, stout glory. A portrait of Hatton by an unknown artist, painted on the occasion of his being named Chancellor of Oxford University in 1588, shows a man of substance and weight. Even in Nicholas Hilliard's famous full-length miniature (after 1588), the hefty likeness of Hatton exudes the sort of dietary self-indulgence one associates with Type 2 diabetes.[9] Hatton's contemporary, the historian William Camden, ascribed his death to diabetes in the 1615 Latin edition of his *Annales* of Queen Elizabeth. However, in the English translation of Camden (1625), the word "diabetes" is rendered as "a flux of the urine." In correspondence of that period about his death, writers referred to "excoriation," rawness in the neck of the bladder as the cause of

[8] Henry VIII himself ballooned into the sort of adult obesity that often guarantees diabetes. In 1514 at age 23 his six-feet, two inch frame required armor to fit a thirty-five inch waist and forty-two inch chest; by 1540 at forty-nine years of age his waist measured a vast fifty-four inches and his chest fifty-eight inches. He may have weighed more than twenty-eight stone or nearly 400 pounds. See Robert Hutchinson, *The Last Days of Henry VIII* (London: Weidenfeld and Nicholson, 2005).

[9] The Hilliard full-length miniatures of Hatton are in the Victoria and Albert Museum and at Belvoir castle. Hilliard soon abandoned the experimental and unpopular format: see Roy Strong, *The English Renaissance Miniature* (London: Thames and Hudson, rev. ed., 1984), 97. Sylvester Harding adapted the Hilliard for a head and shoulders representation of Hatton in 1848.

death.[10] Although stress and emotional upheavals are not factors that cause the disorder, Hatton's diabetes, according to the old *Dictionary of National Biography*, came on because Queen Elizabeth upset him by demanding payment of a large sum of money that he owed her as receiver of tenths and first fruits, perhaps as high as £40,000.[11]

Camden's narrative was embroidered and given a sentimental flavor a bit later by Thomas Fuller in his 1662 *History of the Worthies of England*. Describing the Hatton-Elizabeth drama, Fuller wrote:

> It brake his heart that the queen (which seldom gave boons, and never forgave due debts) rigorously demanded the present payment of some arrears, which Sir Christopher did not hope to have remitted, but did only desire to be forborne; failing herein in his expectation, it went to his heart, and cast him into a mortal disease. The queen afterwards did endeavour what she could to recover him, bringing, as some say, cordial broths unto him with her own hands; but all would not do. Thus no pulleys can draw up a heart once cast down, though a queen herself should set her hand thereunto.[12]

Drawing upon Camden's *Annals*, Sir Nicholas Harris Nicolas specified the amount demanded by the crown, £42,139, and hinted at the furtive ways, "defeasance" as he calls it, that Hatton used some of the money to suborn Sir Edward Coke, then Elizabeth's Attorney General. Nicolas introduces his readers to an undated letter Hatton sent to the queen, the effusive language of which supports the notion of health ruined by imperial disdain. Hatton wrote:

> If the wounds of the thought were not most dangerous of all without speedy dressing, I should not now trouble your Majesty with the lines of my complaint. And if whatsoever came from you were not either very gracious or grievous to me, what you said would not sink so deeply in my bosom.[13]

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[10] Personal correspondence from Wallace T. MacCaffrey to the author, 13 March 2005. I thank Prof. MacCaffrey, profiler of Hatton in the *Oxford DNB*, for his insights.

[11] J.M. Rigg wrote the DNB entry in 1908. There is no evidence that stress causes any type of diabetes, but stress can exacerbate already elevated glucose levels in Type 2 diabetics. See Umut Ozcan, et al, "Obesity, Stress and Diabetes," *Science* 306/5695 (2004): 457.

[12] Both parts of Camden's chronicle are in his *Annals or the History of the Most Renowned and Victorious Princesse Elizabeth* (London: Printed by T. Harper for B. Fisher, 1635); Thomas Fuller, *History of the Worthies of England*, ed. John Freeman (London, George Allen and Unwin, 1952) 435.

[13] Nicholas Harris Nicolas, *Memoirs of the Life and Times of Sir Christopher Hatton* (London: Richard Bentley, 1847), 495–496, citing Harleian MSS, 993, f. 75. Nicolas noted that John Lord Campbell was Hatton's "latest biographer;" see Campbell, *Lives*

Although he concludes that the queen's conduct did not cause Hatton's death, Nicolas accepts Camden's medical verdict that "his health had been long impaired, and he died of diabetes, a disease almost always mortal, and to which his constitution seems to have long had a tendency."[14]

While he refers to the *DNB* account of Hatton's life as "the most accurate and up-to-date," in his 1946 biography Eric St. John Brooks nonetheless dismisses depression brought on by personal finances as a cause of the Lord Chancellor's death and proffers a different, less dubious diagnosis for Hatton: cystitis.[15] Quoting from a letter Hatton wrote in September 1591 to his friend the English Ambassador in Paris, Sir Henry Upton, Brooks reveals Hatton complaining of "distemperature of body." A month later a courtier named Thomas Phelippes described Hatton as "very sick with a strangury, and not likely to recover."[16] References twenty years earlier to trouble in his kidneys and being "dashed" by disease explain his visits to health spas; remembrances twenty years later remark on the furious pain and howls of anguish that bladder spasms produced in sufferers. Given the romantic picture painted by chroniclers Camden and Fuller of a distraught courtier and a queen who tried to raise up the "heart she had once cast down," the same chroniclers who first fancifully coupled Hatton's disease with diabetes, it seems imprudent, lacking genuine evidence, to call Hatton a diabetic. It is worth noting, however, that Elizabeth had definitely launched proceedings against Hatton to recover the amount overdue. Hatton claimed that the lingering financial burden from his installation as Lord Chancellor kept him from repaying the arrears. And while she may have tended him at his London house during his final days, following his death on November 20 at age fifty-one the queen moved to

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of the Lord Chancellors and Keepers of the Great Seal of England, 1st ser., 3 vols. (London: John Murray, 1845) 2: 155–159. For Hatton's illness and the queen's daily ministrations, see also John Strype, *Strype's Works*, 21 vols. (Oxford: Clarendon Press, 1820–1849) A II ii, 457.

[14] Nicolas, *Memoirs*, 498.

[15] Eric St. John Brooks, *Sir Christopher Hatton* (London: Cape, 1946), 375, 351. Brooks also rejects a rumor originating with certain Jesuits that Puritans poisoned Hatton for his Catholic sympathies. A full account of Hatton's health and his death can be found in Chapter 34 and a concise discussion of his portraits in Appendix 6.

[16] Paul E.J. Hammer, "Letters from Sir Robert Cecil to Sir Christopher Hatton, 1590–1591," in *Religion, Politics, and Society in Sixteenth-Century England*, ed. Ian Archer, Camden Fifth Series, Vol. 22 (Cambridge: Cambridge University Press, 2003), 220 n. 101.

extend his estate for the money Hatton owed.[17] Court politics and the crown's implacable need for revenue would grind anyone down.

Both Wolsey and Hatton were ministered to by English physicians immersed in largely unadulterated Galenic teachings, and their remedies unquestionably included the usual bleedings, cuppings, and purgings aimed at restoring humoral balance. Most remedies sprang from the belief that an abundance of bad humors caused illness, hence the heroic measures undertaken to dispel the excess. But imbalance could also arise from a humoral deficit and in those cases, patients needed to ingest substances that would enhance retention of a humor. Diabetics of either type with their distinctive thirst and disproportionate urination hardly required desiccating purgatives; they needed medicines and a diet that would re-establish a healthy balance in the body. A widely-repeated theme in almanacs and other medically-related literature centered on consuming foods that had the opposite qualities of a patient's humors, so for a diabetic (or someone who displayed characteristics we associate today with diabetes) a moist, cold diet should alleviate the loss of all that moisture and slake patient thirst. Such a diet might include chicken, perch, egg yolks, grains, ground almonds and sugar, foods thought to be therapeutic and temperately moist. To allay heat, the sick were advised to eat cooling meals that included cucumbers, lettuce and asparagus; the occasional remedy included consumption of fruit to rehydrate a body robbed of fluid by polyuria. Additionally, most healers subscribed to a graduated scale of humoral qualities in certain foods: they categorized lamb and pork as hot to the first degree, hare and turkey to the second degree, vegetables like onions to the third degree, and garlic hot to the fourth degree.[18]

Tudor-Stuart era doctors usually relied on urinalysis as the principal diagnostic tool, a tradition made even more explicit by printed iatric literature, as well as by more popular references understood by all. That some of those allusions mocked "piss prophets" only demonstrates the widespread understanding that urine was likely to be tested by most healers, regular or irregular, licensed or not. Thomas Linacre overtly distrusted the diagnostic worth of uroscopy, raising the hackles of men

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[17] Ibid., 220.

[18] Louise Hill Curth, *English Almanacs, Astrology and Popular Medicine: 1550–1700* (Manchester: Manchester University Press, 2007), 162–164; see also Jack C. Drummond and Anne Wilbraham, *The Englishman's Food: Five Centuries of English Diet* (London: Cape, 1958), 123; and Ken Albala, *Eating Right in the Renaissance* (Berkeley: University of California Press, 2002), 66.

sympathetic to the practice.[19] Many outside of medicine also mocked urine tests. In Shakespeare's *Henry IV*, Falstaff inquires of his page what the doctor thought of Falstaff's water and his page replies that "the water itself was a good healthy water; but for the party that owned it, he might have more diseases than he knew for."[20]

But, ridiculed or not, urinalysis continued to be taught in the sixteenth and seventeenth centuries as a standard part of clinical teaching in such prestigious universities as Padua.[21] The Oxford mathematician Robert Recorde (1510–1558), who later claimed to be a doctor to both Edward VI and Mary I, in 1547 penned a popular work in English, *The Urinal of Physick*, typical of the persistent adherence to humoralism and the wisdom of urine casting. Recorde professed that he wished all Englishmen to have access to his traditional medical text, one full of sensible nursing practice.[22] However, the influence of continental doctors steeped in a more multifarious ethos could be perceived as foreign medicos visited Britain; their health-related works were translated into English and made available to the reading public. For example, in the autumn of 1552 the Duke of Northumberland summoned to treat young Edward VI the Milanese magus Girolamo Cardano, then in Scotland ministering to John Hamilton, Archbishop of St. Andrews. Though he was barred by illegitimate birth from the profession of physician, Cardano had embarked on a career as a medical astrologer and enjoyed a reputation in European medicine second only to Vesalius. His prowess detecting diseases trumped the claims of other healers and led him to boast in his autobiography that no one should be astonished at his therapeutic successes "since I also had a perfect command

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[19] R.B. Bush "'Urine is an Harlot or a Lier,'" *JAMA* 208 (1969): 131–134.

[20] Part II, Act 1, Scene 2. Given the prevailing diagnosis (see Chapter One) that Henry IV may have had diabetes, the evocation of Falstaff is particularly pointed.

[21] Jerome J. Bylebyl, "Padua and Humanistic Medicine," in *Health, Medicine and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 350. Hardly an anachronism, urinalysis remains of central importance to this day in the initial diagnosis of diabetes.

[22] Robert Recorde, *The Urinal of Physick* (London: Reynolde Wolfe, 1547). Margaret Pelling and Charles Webster have argued for a "more eclectic nature" in Cambridge medical culture; see their "Medical Practitioners," in *Health, Medicine and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 204. No records bear out Recorde's claim to be a royal caregiver and he ended his life imprisoned for debt after losing a £1000 libel suit to a Marian courtier, William Herbert, the Earl of Pembroke. See Furdell, *Royal Doctors*, and J.J. O'Connor and E.F. Robertson, "Robert Recorde," ⟨http://www-history.mcs.st-andrews.ac.uk/Biographies/Recorde.html⟩ (April 2002).

of the part of medicine concerned with diagnostics."[23] For Cardano, medicine and astrology worked wonders together, the product of natural laws formerly unknown, but they also were discrete arts of prediction.

Despite Cardano's social imperfections, he became professor of medicine at the University of Pavia in 1543, but even at the peak of his fame he assiduously eschewed the life of a court doctor. Nonetheless, prior to examining Edward in London, Cardano cast the teenager's horoscope and found omens of great calamity. Since it was treasonous to foretell the death of a king, Cardano predicted a long life, describing ailments that Edward, who died the next year, would manifest at fifty-five, and recommended rest.[24] All the same, it was through this royal sickbed call that Englishmen became better acquainted with Cardano and his iatric observations. Known also for his accomplishments in algebra and game theory, he was the first to describe typhoid fever, but for our purposes he is noteworthy for making a singular contribution to the history of diabetes. Leave it to a mathematician to make plain the disparity between the fluid intake and output that Cardano found in his diabetic patients when he measured their incoming and outgoing liquids: they suffered a net loss of water for unknown reasons. His religio-medical empiricism reveals the complexity of Renaissance thought and the interrelationship between magic, science, and religion. As Nancy Siraisi has made clear, Cardano's recognition that mystery and luck played a role in his accomplishments "undercut his other claim" that success in practice "emerged from wisdom and erudition."[25] Before Cardano's death in 1576, Edward de Vere, the "Earle of Oxenforde," ordered that *Cardanus Comforte* be translated into English and published; nearly a hundred years later it was reissued as *Three Books of Consolation Englished, Of Great Use in These Times*, demonstrating the durable relevance of this Italian polymath to Britain and the growing intricacy of medical philosophy.[26]

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[23] Quoted in Grafton, *Cardano's Cosmos*, 160. For more on Cardano's Scottish house call, see ibid., 113.

[24] Furdell, *Royal Doctors*, 49. Cardano achieved notoriety for his astrological horoscope of Christ; see Cardano's *Book of My Life* (New York: Dover, 1962); Wayne Shumaker, *Renaissance Curiosa* (Binghamton: State University of New York Press, 1982); and Anthony Grafton, *Cardano's Cosmos* (Cambridge, Mass.: Harvard, 1999).

[25] Nancy G. Siraisi, "Girolamo Cardano and the Art of Medical Narrative," *Journal of the History of Ideas* 52 (1991): 595.

[26] Girolamo Cardano, *Cardanus Comforte Translated into English by Thomas Bedingfeld* (London: Thomas Marshe, 1573); *Three Books of Consolation* (London: B. Aylmer, 1683).

Consequently, by the Stuart century, many established doctors in Britain tempered their Galenism with new theories about specific cures for specific diseases. James I's physician Theodore Turquet de Mayerne became something of an apostle for this eclectic approach to healing. Experiments with native and non-native plants and with chemicals became the hallmark of medical mavericks who followed lines of inquiry installed by the Swiss Protestant doctor known as Paracelsus and sustained by the Flemish chemist Jan Baptista van Helmont. Paracelsus identified diabetes as a serious disorder, mentioning it five times in his written works. Paracelsian and Helmontian influences strongly colored iatric reform attempts before, during, and after the English Civil War, but did they affect the treatment of diabetes? Though iatrochemists thought about the body in different terms than their Galenist counterparts, they did not significantly alter the conception of digestion. Instead of humorally-produced heat breaking down food, Paracelsians and Helmontians substituted sulfur as the key to all combustion, flammability, and change inside the human body. Although Paracelsus did favor lemon balm to increase longevity, adherents of the new medicine did not propose a significant modification of diet or oppose traditional Galenic approaches to foods for their sick patients.

Thomas Stanley, mid-seventeenth century royalist poet, philosopher, and translator, evinced poor health in the last half of his life.[27] As early as the 1640s, Stanley's concerned friend John Hall remarked on his sickness in a January 1647 letter to Samuel Hartlib. Hall, who later dedicated his *Poems* to Stanley, wrote that his wealthy mentor ("under whose shade I enjoy my studious leisure") had been taken suddenly ill, calling Hall "abruptly out of the University," and that Stanley needed to spend an extended period of recuperation in the country.[28] After publishing a volume of poems in 1651, Stanley turned to classical scholarship, but a bout with smallpox, chronicled by his uncle and mentor William Hammond, likely stalled his progress writing a history of philosophy. As was true of Christopher Hatton, financial anxieties troubled Stanley in the late 1650s and he spent much time trying to

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[27] For Stanley's circle of pro-monarchy writers during the 1640s, see Stella P. Revard, "Thomas Stanley and 'A Register of Friends'", in *Literary Circles and Cultural Communites in Renaissance England*, eds. Claude J. Summers and Ted-Larry Pebworth (Columbia: University of Missouri Press, 2000), 148–172.

[28] G.H. Turnbull, "John Hall's Letters to Samuel Hartlib," *Review of English Studies*, New Series, 4/15 (1953): 231.

free himself after the Restoration from debts inherited from his father-in-law; he managed to do so in 1663 by petitioning the king multiple times for redress. A 1660 portrait of the poet by Gerard Soest, on the eve of Stanley's election to the Royal Society, presents an attractive man with a double chin and ostensible physical well-being.[29] In spite of this, another one of the poet's protégés, John Davies of Kidwelly, informed Stanley in 1665 that he heard he had died after a serious illness, while one more admirer wrote a verse dedicated to the Helmontian doctor, Luke Ridgeley, who gave "Balsome to Stanley's Life." Stanley himself complained about his condition in a 1669 letter to his neighbor Sir Justinian Isham.[30] Whatever his health woes, Stanley continued to publish, write poems, and serve as Justice of the Peace in Hertfordshire into the mid-1670s. Warren Chernaik, author of Stanley's entry in the *Oxford DNB*, recounts that the poet's physical condition was never good and deduces from the chronic nature of his illness that he "may have been diabetic." If so, there is no evidence that Ridgeley's brand of doctoring made any difference in the end.

The Wolsey, Hatton, and Stanley diabetes diagnoses, however, cannot rely on portraiture for evidence of anything except perhaps corpulence. Many factors militate against the integrity of portraits even when painted by celebrated artists like Nicholas Hilliard. Sir Roy Strong, former Director of the Victoria and Albert Museum, asserts that in the Hatton miniatures Hilliard displayed "total ignorance of the laws of perspective," hardly encouraging if one is looking for evidence of medical problems. "Unknown artists," such as Wolsey's 1520 and Hatton's 1588 portraitists, are even more problematic when it comes to evaluating a likeness for accuracy of features and signs of sickness. A systematic study for visible diseases in 3615 Swiss portraits from the fourteenth to the twentieth century, 2989 of individuals whose names are known, concluded that familiar health problems like goiter were underrepresented in the people depicted in these images. Attempting to learn

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[29] Another portrait of Stanley, a 1655 engraving by William Faithorne, is in the NPG collection. Coincidentally, one of the other charter members of the Society and a correspondent of Stanley's was Baron Christopher Hatton (d. 1670), prominent royalist and heir of the Elizabethan Hatton.

[30] "Introduction: The Life of Thomas Stanley," in *Poems and Translations*, ed. Galbraith Miller Crump (Oxford: Oxford University Press, 1962), xxxiii. The verse praising Dr. Ridgeley, son of William Harvey's friend Thomas Ridgeley, is on the flyleaf of Isham's copy of Stanley's *History of Philosophy*. See Gyles Isham, "A Further Note on Thomas Stanley," *Notes and Queries*, new series v, (1958): 544–546.

whether a collection of regional portraits could be useful for studying certain noticeable disorders, scholars associated with the University of Berne determined that although upwards of 80 % of the population in the landlocked canton of Berne was affected by severe endemic goiter because of iodine deficiency, only 41 % of the portraits of identified women and 24 % of the identified men revealed signs of goiter in the characteristic swelling of the anterior neck. Moreover, other conditions like missing teeth or amputated limbs were conspicuously exceptional in the collection. The Swiss researchers concluded that "artistic idealization is a likely explanation" for the discrepancy between statistics and images along with "artistic skills and contemporary fashion."[31]

Sitters wanted to leave images of themselves as a testament to their personal successes and since some disfiguring ailments produced a negative moral judgment in spectators, portraitists likely emphasized the positive personality traits of those who commissioned them rather than any physical oddity. Because goiter was then often linked with cretinism, painters, the accomplished and amateurish alike, probably did not realistically represent that deformity, at least among their wealthy clientele. Fashion also affects and limits any clinical signs of disease apparent in portraits. For instance, while the necks of most Bernese men were hidden by collars, necklaces, ribbons, and embroidery obscured those of many females. In addition, the portraits demonstrated that sitters were often conspicuously stout, especially men aged forty or more, a condition painters evidently did not try to hide, as moderate overweight connoted determination, health, and wealth. So while stigmatizing health details may have been omitted or mitigated in these portraits, flattering ones were not. Surely, a painter would enhance or embellish the likeness of a Lord Chancellor or a patron of the arts like Stanley even more. Nonetheless, even if Wolsey and Hatton were obese and Stanley double-chinned, and even if they were accurately revealed as such in their portraits, one cannot be confident that they were diabetics. Unfortunately, evidence beyond the visual is similarly imperfect.

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[31] C. Als, Y. Stussi, U. Boschung, U. Trohler, and J.H. Waber, "Visible Signs of Illness from the 14th to the 20th Century: Systematic Review of Portraits," *British Medical Journal* 325/7378 (21 December 2002): 1499. The authors also note that the well-to-do sitters may not be representative of the general Bernese population.

Commentaries on diabetes by physicians before 1650 are few and far between. As noted above, during the early Renaissance, Galenic medicine with its emphasis on humoral balance still held sway throughout Europe. Customary Galenic therapies aimed at keeping humors in equilibrium included bleeding and purging. Thinking wasting disease monolithic, Galenists prescribed the use of emetics to relieve strain on the kidneys of diabetics, as well as astringents and refrigerant remedies. The belated awareness in sixteenth-century Europe that diabetics lost more water than they took in left physicians puzzled, as balance could hardly be sustained in a body that resisted harmony. The fascination of western medical reformers with uroscopy, inspection of the urine, led to renewed interest in diabetes. One of those reformers was Paracelsus, the eccentric continental physician who contemptuously discarded the four humors of Galen and belittled the humoral calculations of Galenists. Instead, he conducted chemical and metallurgical experiments combined with a sort of mysticism to attack disease. Paracelsus had a true sense of the dramatic. In 1527, while city physician of Basel, he tossed the works of Hippocrates and Galen, as well as the canon of Avicenna, into the St. John's Day bonfire. Ownership of and access to medical books was crucial to learned Galenists, but Paracelsus ridiculed academic doctors and published very little himself by the time of his death in 1541.[32] Nonetheless, he upset the medical profession with his unorthodox ideas, monumental ego, and insistence on writing in German rather than Latin. Impugning the lack of patient examination and symptom observation he believed to be characteristic of Galenic theory, Paracelsus argued that disease emanated from external causes and became localized in particular organs. He deemed astrology and alchemy the twin nuclei of medical doctrine, central sources of reliable therapies and dietetic advice.[33]

Despite his disdain for Galen, however, Paracelsus retained admiration for the medieval diagnostic tool of uroscopy. In the Middle Ages and Renaissance, physicians still relied on urine-casting to win approval of their medicines, to serve as proof of their own interpretive skill and the efficacy of their recipes. Championed also by Paracel-

[32] See Jolande Jacobi, ed., *Paracelsus: Selected Writings* (Princeton, N.J.: Princeton University Press, 1951).

[33] Grafton, *Cardano's Cosmos*, 12. Girolamo Cardano examined his own urine, finding ominous black particles that ceased to appear in his urine after his son was executed: Siraisi, *Clock and the Mirror*, 136.

sus, examination of the patient's "amber waters" constituted an important part of any analytical evaluation. But Paracelsus ridiculed diagnosis based solely on the visible characteristics of urine, instead distilling patient urine to separate its parts. He deduced the nature of his patients' ailments by gauging the quality and quantity of the distillates, an approach novel and far-reaching. Paracelsus termed his urine analysis "chemical dissection" for its combination of laboratory analysis and a quantitative evaluation of urine weight and volume, and he carried his patient's weighed urine around his neck in a gauged cylinder flask shaped like the human body.[34] More importantly for our purposes, he studied the urine of a diabetic in his laboratory, observing a white, powdery residue when the urine evaporated. He concluded that the powder was some sort of salt and that salt deposits in the kidneys made those organs overly thirsty and caused the polydipsia and polyuria characteristic of diabetics.[35] While Paracelsus agreed with Galenists that the stomach was of prime importance to patient health, his description of the digestive process drastically departed from Galenic theory. Paracelsus' influence should not be underestimated, especially during the so-called Paracelsian moment of the 1570s, which revolutionized medical training on the continent through a more empirically-based course of study tied to the observation of patient symptoms and the insistence on better nutrition.[36]

Andrew Boorde, famed Henrician-era doctor, wrote practical manuals in the vernacular for Englishmen and women who wanted to know more about health and illness. Like many early Tudor physicians, he

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[34] Stanley Joel Reiser, *Medicine and the Reign of Technology* (Cambridge: Cambridge University Press, 1978), 122–123; Allen Debus, *The English Paracelsians* (London: Oldbourne, 1965), 30, 157.

[35] See Hans Schadewaldt, "Paracelsus and the Sugar Disease," in *Diabetes: Its Medical and Cultural History*, edited by Dietrich von Engelhardt (Berlin: Springer-Verlag, 1989), 201–208.

[36] Charles Webster posits that French Paracelsianism was at its height between 1610 and 1650, whereas English Paracelsianism bloomed after 1650: Webster, *From Paracelsus to Newton* (Cambridge: Cambridge University Press, 1982). Peter Murray Jones counters that medical books from the continent were available in Cambridge from 1530 onwards: Jones, "Reading Medicine in Tudor Cambridge," in *History of Medical Education in Britain*, eds. Vivian Nutton and Roy Porter (Amsterdam: Rodopi, 1995). For Paracelsus' life, see Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance* (New York: S. Karger, 1958); for his writings, see Hugh Trevor-Roper, *Renaissance Essays* (Chicago: University of Chicago Press, 1985), 149–199.

began his career as a monk, a Carthusian eventually discharged from his vows. He traveled extensively on the continent, conferring with medical men from prestigious universities where strict Galenism was under attack. Boorde came to associate Greek and Roman medicine with obsolescence and he determined to convey his fresh iatric words of wisdom in English. While abroad, he procured plants and seeds to send to England, dispatching rhubarb seeds to Henry VIII's chancellor Thomas Cromwell in 1535. He settled for a while in Montpellier, site of his favorite medical faculty. Around 1540, anonymously at first, then later under his name, he began producing health guides brimming with remedies and preventives gleaned from his travels. Returning to England in 1547, Boorde personally steered his works through publication. Written in a popular and confident style, his *Dyetary of Helth* (1542), *The Introduction of Knowledge* (1542) and *The Breviary of Health* (1547) targeted the literate layman. These straightforward books, widely published and disseminated, had a profound impact on medicine, challenging as they did the tenets of secrecy and hierarchy embraced by university-trained physicians.[37]

Because familiar Renaissance-era physicians like Paracelsus and Boorde believed so strongly in the diagnostic properties of urine and proselytized for more uroscopies, entire books began to appear on both sides of the English Channel touting the usefulness of urine inspection. In particular, uroscopy had the capacity to disclose what ailed a patient, especially since it was believed that urine was drawn from all parts of the body and could provide clues to both general bodily and specific organ health. For instance, pale or light-colored urine was a sign of "exulceration of the lungs and corruption."[38] In 1562 an anonymous author-produced *Seynge of Urynes* appeared in London. Printed in black-letter type, one identified with the common people, the unpaginated book boasted little drawn flasks to highlight new topics and important information.[39] Readers of the tome are cautioned

[37] See my entry on Boorde in the *Oxford DNB*.

[38] John Fletcher, *The Difference, Causes and Judgements of Urine* (London: John Legatt, 1641), 32. This piece was first published in 1598.

[39] For more on the significance of print types for audiences, see Keith Thomas, "The Meaning of Literacy in Early Modern England," in *The Written Word*, ed. Gerd Bauman (Oxford: Clarendon Press, 1986); Mary Fissell, "Readers, Texts and Context: Vernacular Medical Works in Early Modern England," in *The Popularization of Medicine*, ed. Roy Porter (London: Routledge, 1992); and Derek Nuttall, "English Printers and

to heed four things in analyzing urine: substance, colors, regions, and contents. Most of the text, however, is devoted to color, with hues of urine ranging from "white as clay water" through "red as the lyver of a beast" to "black as cole." The author warns of certain urine types and what to do for those who emit them, especially when urine "betokens death."[40]

Jean Fernel, a sixteenth-century Parisian physician and Galenic reformer, wrote two essays in Latin on the traditional value of taking the patient's pulse and examining urine. Although he was mindful of the challenges that "new" diseases like syphilis and gout presented to classically-trained physicians, Fernel could not bring himself to discard Galen altogether and crafted a convincing synthesis of ancient, medieval, and Renaissance medical thought. Continental medical curricula soon reflected this synthesis.[41] As was often the case in the centuries before copyright laws, seventeenth-century English medical insurgents wishing to challenge the stubborn domination of traditional Galenism at Oxford and Cambridge expropriated Fernel's work and sometimes even claimed it for their own. One such borrowing, albeit a credited one, produced an English translation of the two treatises. Sometime before his death in 1654, London apothecary Nicholas Culpeper (see Chapter Three) rendered Fernel into a vernacular handbook during the peak of the iatric culture war in London.[42] Culpeper's publisher, Peter Cole, sought to bring the Fernel piece into print and enlisted Abdiah Cole, an English physician who spent much time abroad and possibly a relative, to edit these essays. In his intro-

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Their Typefaces, 1600–1700," in *Aspects of Printing from 1600*, ed. Robin Myers and Michael Harris (Oxford: Oxford Polytechnic, 1987).

[40] Anonymous, *Seynge of Urynes* (London: William Powell, 1562), n.p.

[41] See Laurence Brockliss and Colin Jones, *The Medical World of Early Modern France* (Oxford: Clarendon Press, 1997); Charles Coury, "The Teaching of Medicine in France from the Beginning of the Seventeenth Century," in *The History of Medical Education*, ed. Charles D. O'Malley (Berkeley: University of California Press, 1970); A.H.T. Robb-Smith, "Medical Education at Oxford and Cambridge Prior to 1850," in *The Evolution of Medical Education in Britain*, ed. F.N.L. Poynter (London: Pitman Medical Publishing, 1966); and Robert G. Frank, Jr., "Science, Medicine and the Universities of Early Modern England: Background and Sources, Part I," *History of Science* 11 (1973): 194–216.

[42] For more on the sources of the struggle before 1640, see Margaret Pelling, *Medical Conflicts in Early Modern London* (Oxford: Oxford University Press). Other continental authors whose writings found their way into Englished editions included Lazare Rivière and Daniel Sennert.

duction, Abdiah Cole reiterated the claim that "by inspection into the urine and by feeling of the pulse, many diseases maybe found out."[43]

Fernel agreed with the premise that urine provided clues to sickness, "because the excrements of the body are a portion of the parts affected," and was the chief demonstrative sign of trouble, the "vehiculum of the blood separated from it by the force of the kidnies." Fernel's treatise advised doctors to treat urine carefully when examining it and gave specific instructions for its diagnostic use. All of the first urine after sleep should be gathered in a white urinal big enough to hold it; be sure to keep it from sun, cold and wind, and let it stand still "til it be cold" and "be kept not above six hours lest it corrupt." Once gathered, the urine inspector should ascertain what food and drink the patient had the night before, since too much water or thin white wine "makes urine plentiful, thin and crude, and such does not shew the diseases of the parts or humours." Saffron, cassia, rhubarb, senna, and madder change the color of urine; garlic and turpentine change its scent. "Thicker and troubled urine" might indicate an ulcer in the kidneys, bladder, "ureters or yard," the latter a euphemism for the penis. Fernel distinguished male from female urine, and that of old people from youngsters. He cautioned his readers to be on the lookout for three types of "troubled" urine: "turbata," thick, obscure and troubled from external sources; thick urine from "ulcerated reins;" and "confused urine, in which nothing appears to swim but is all alike in every part" and has no sediment. Sometimes, however, "the whole body and humors melts into urine." Fernel remarked that this excessive urine sometimes comes from "a fault in the reins (kidneys), when they continually draw the serum from the whole body by a great force and send it forth." A doctor can confidently identify this syndrome "when a feaver that burns the bowels, hath melt'd the matter collected, which is drawn by the reins. This disease is called diabetes, from a sudden passage of the urine, which is much, white, thin, and without sediment." Before pronouncing judgment, however, a physician should consider how the time of year, the weather, and local manifestations of disease might alter patient urine.[44]

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[43] John Fernelius (Jean Fernel), Abdiah Cole, and Nicholas Culpeper, *Two Treatises: the first of Pulses, the second of Urines* (London: Peter Cole, 1662), B2. This "Englished" version was one of ninety-seven complete editions or translations of Fernel between 1554 and 1680: Roy Porter, *The Greatest Benefit to Mankind* (New York: Norton, 1999), 174.

[44] Ibid., 34, 37–39, 43, 54–55, 75. As his modern editor acknowledges, Thomas

With encouragement from continentally-trained authorities like Paracelsus, Boorde, and Fernel, most English doctors, even those schooled in Galenism at Oxford and Cambridge continued to scrutinize urine as part of their regular patient appraisals.

Indeed, inspection of a patient's urine persisted as a cornerstone of the doctor's visit. A century after Boorde, William Lilly claimed to have evaluated and cured Parliamentary leader Bulstrode Whitelock when a sample of the ailing man's urine was brought to him for diagnosis; moreover, predicting Whitelock's recovery earned Lilly his patronage and protection.[45] Even when demand for medical self-help material had greatly expanded and many sufferers tried to get healthy without a doctor's service, Restoration-era doctor Daniel Coxe wrote that "the business and care of the Physician" was "to visit the Patient, to feel his Pulse, and consider his Urine…."[46] The doctor had to be aware of any unsettling of the specimen itself, perhaps from jiggling the sample or from extreme temperature, let alone the effect of the patient's last meal on the color and consistency of the urine. How did the urine appear and what did it smell like? These were questions every physician had to ask of the sample. There was also the business of taste, often the final arbiter of urine health and one addressed in 1665 by Royal Society curator of experiments Robert Hooke in tandem with his work on microscopy. In *Micrographia* Hooke explored the appearance of crystalline materials and offered the hypothesis that these regular three-dimensional structures can be explained by close packing of spheres. He detected that the hexagonal crystals on the surface of frozen urine could be huge, especially those "observ'd in ditches which have been full of foul water." Seeking the nature of the urine crystals, Hooke tasted "several cleer pieces of the ice, [and] could not find any urinous taste in them, but those few [he] tasted seem'd as insipid as water."[47] However, even a practical man like Paracelsus had balked at imbibing

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Palmer, in his 1696 *Admirable Secrets of Physick*, the earliest book of its kind written in America, pirated the Culpeper-Cole translation of Fernel without attribution; see the new issue, edited by Thomas Rogers Forbes (New Haven: Yale, 1984).

45 Ann Geneva, *Astrology and the Seventeenth Century Mind* (Manchester: Manchester University Press, 1995), 56–57.

46 Daniel Coxe, *A Discourse, wherein the Interest of the Patient…is Soberly Debated* (London: Richard Chiswel, 1669), 220–221.

47 Robert Hooke, *Micrographia: Or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses* (London: Joseph Martyn and James Allestry, 1665), 88–93. At about the same time, an obscure Hamburg chemist, Hennig Brand, discovered phosphorus by distilling a urine syrup, adding the retort's black carbon residue, and heating it again:

patient urine, which is why he mistook the sugary residue from diabetic urine for salt. He would have agreed with Englishman John Fletcher's assertion that tasting the urine of a sick person was "too base for the Physitian."[48]

Not all practitioners, however, were sanguine about uroscopy. Many licensed physicians disparaged it as a sole means of diagnosis, especially if the doctor had not examined the patient himself, and began to criticize urine-casting as the custom of fraudulent empirics, who also happened to be their competitors. For instance, James Hart, an English Puritan who studied at Paris and Basel, ridiculed the idea that ignorant quacks, pushy women, and clerics, who passed as doctors but who could never be licensed, claimed to diagnose the ill accurately by examining their urine.[49] Abdiah Cole charged that "many illiterate mountebanks have from the people's simplicities taken advantage to read unto them a variety of piss-pot lectures to delude them … strange piss-prophecies … [in] no way discoverable by urine."[50] Nonetheless, he went on to argue that even if there were uroscopic abuses, it was illogical not to use urine examination as a diagnostic tool. Even those who supported uroscopy realized, however, that doctors could be tricked by medical jokesters. One English contemporary of Boorde, Robert Recorde, urged "all men, not to mock and jest with any physitian" by supplying animal urine instead of a man's or "mens water for womens."[51]

Learned physicians, hence, relied on more than urine-casting and pulse-taking to make diagnoses about disease in general and diabetes in particular. Another development in the treatment of diabetes was the keeping of written records on individual patients, records that formed a narrative on cases. In the sixteenth century, Girolamo Cardano employed the narrative form when brooding over the ambiguity of medical and astrological prognostications; he "tried to make sense of the

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a fiery secret hidden within our own bodies! See John Emsley, *The Thirteenth Element* (New York: John Wiley, 2000), 3–24.

48 Fletcher, *The Difference, Causes and Judgements of Urine*, 5.

49 James Hart, *The Arraignment of Urines* (London: G. Eld, 1623) and *The Anatomie of Urines* (London: Richard Field, 1625); Hart translated the tome by Pieter van Foreest into English. See also Thomas Brian, *The Piss-Prophet or Certain Pisse-Pot Lectures* (London: Sarah Griffin, 1655), first printed in 1637, and Henry Hamand, *Ourography or Speculations on the Excrements of Urines* (London: Francis Eglesfield, 1655).

50 Fernel, *Two Treatises*, B2.

51 Robert Record, *The Urinal of Physick* (London: Gertrude Dawson, 1651). Recorde first published this piece in 1547.

relation of symptoms to processes going on inside the body that could not be directly investigated."[52] His influential accounts of disease used anecdotes from his own practice while, as records of consultation, did not require any mention of outcomes. Even when Cardano wrote of some "remarkable cures" he effected, he gave few details of the treatments he implemented.

The French-educated Jacobean court physician Mayerne kept Latin casebooks, *Ephemerides Morborum (Diaries of Disease)*, in which he fused humoral theory with chemical principles. Unlike later medical record-keepers who kept the confidences of the wealthy and powerful by maintaining their anonymity, Mayerne filled his casebooks with named patients who belonged to the peerage or the gentry. He did not treat those of lesser rank. Social standing also seems to have had a bearing on the length of the individual notes: the higher the person's standing, the longer the case. Although he built no theoretical system or published any important works on practice or achieved a profound medical breakthrough, Mayerne possessed the talents of a good physician; his attributes made him a great clinician.[53] His balanced approach to healing also influenced the College of Physicians, and he spearheaded the completion of its long-awaited London *Pharmacopoeia*, a blend of chemical and mineral medicaments as well as Galenic standbys.[54] In his casebooks, Mayerne followed a careful pattern of description, evaluation, diagnosis, prognosis, and therapeutics, clearly intending to publish his notes one day and garner public support for his medical principles; he spent the last years of his life editing the records.

Mayerne examined his privileged patients carefully, unlike some licensed physicians who "saw" their middling patients through the eyes of affiliated surgeons and apothecaries. He recorded informative details about each patient's appearance, his *habitus*, and judged the patient's state of mind by appraising his expression and gestures. Although uroscopy remained a primary tool for Jacobean era doctors, Mayerne had his doubts about its unwavering efficacy. Nowhere in his casebooks does he diagnose and treat a patient based solely on a urine sample.[55] But

[52] Siraisi, "Girolamo Cardano and Medical Narrative," 587, 590.
[53] Brian Nance, *Turquet de Mayerne as Baroque Physician* (Amsterdam: Ridopi, 2001), 13.
[54] Furdell, *Royal Doctors*, 103–105; Pyrali Rattansi, "Paracelsus and the Puritan Revolution," *Ambix* 11 (1963): 24.
[55] Ibid., 75–76.

Mayerne did adhere to another of Paracelsus' dicta: the principle that salts in the body replicated salts in the macrocosm. Mayerne argued that excess salt, whether in solution or solid, produced tartarous diseases like arthritis, gout, or kidney stones. He claimed to have no cure for salt-caused ailments, but he tried a number of different therapies, each designed for a particular patient. Rather than develop a specific, a treatment that would work for everyone with a similar set of symptoms, Mayerne embraced the uniqueness of each patient's condition. His variations on how to alleviate salt-related ailments correspond to potential treatments for diabetes.

How did Mayerne deal with the enigma of diabetes, a disease that appeared to involve some sort of chemical imbalance but perplexed the healer with its odd combination of excessive urination and unquenchable thirst, of teen-aged skeletons and obese elders? Mayerne described one case of diabetic thirst in his *Opera Medica*, but there is little doubt that Mayerne saw more cases of Type 2 diabetes than many of his predecessors and that he was aware lifestyle affected health.[56] His medical portraits of Jacobean courtiers show men and women born for diseases of the inactive and intemperate. Aristocrats did not perform manual labor, certainly, but Mayerne encouraged those who would listen to exercise and sweat out those nasty salts that caused bodies trouble; he also urged his patients to make use of saunas, drink in moderation, and eat less. As Susan Scott and C.J. Duncan have written, from Mayerne's time on, the "more affluent social classes lived on diets in which meat, fish and cheese formed a much larger proportion of the meals than bread," as well as butter and honey. Elites avoided milk, deeming it appropriate only for infants and to be discarded after weaning; they also eschewed edible vegetables, the food of peasants. So while the top social classes enjoyed better nutrition than others, their diet still fell short in certain vitamins and minerals. A typical daily consumption for these adult elites included four ounces of cheese, one and a half pounds of meat, six ounces of herring, an ounce of butter, a pound of bread, a quart of ale, a pint of wine, and honey for sweetener.[57] Regarding

[56] See Joseph Browne's edition, largely drawn from the *Ephemerides* (London: R. Everingham, 1700), 208.

[57] Susan Scott and C.J. Duncan, "Interacting Effects of Nutrition and Social Class Differentials on Fertility and Infant Mortality in a Pre-Industrial Population," *Population Studies* 54 (2000): 78, 83. The authors note the presence of butteries and beehives in wills and inventories of the elite.

diet, Mayerne quipped that one's diet should "be simple, and the chief sauce, hunger."[58] Of course, he was himself obese and suffered from gout, defying the Hippocratic aphorism that the patient must do his duty as well as the physician.

[58] SL 2063, ff. 6–7, quoted in Nance, *Turquet de Mayerne*, 162. Another Jacobean era doctor, Thomas Browne, pointed out that one of his wealthy patients indulged "most excessively" in sleep, food, and drink and that he was "averse" to exercise. Murdock MacKinnon, "An Unpublished Consultation Letter of Sir Thomas Browne," *Bulletin of the History of Medicine* 27 (1953): 510.

CHAPTER THREE

EARLY MODERN MEDICINE IN PRINT AND DIABETES: PUBLISHED ADVICE AND IMAGERY

The dissemination of information through publishing transformed Britain from the early sixteenth-century onwards. Around four hundred books were printed by 1510, with production rising rapidly over the next two hundred years to 32,000 volumes.[1] As it did with politics and religion, the printing press revolutionized western medicine and democratized knowledge about sickness and health, making even technical and specialized information available to the literate and to those who could listen to material read aloud. Published medical books and brochures became a popular staple in London bookshops and stalls, creating a burgeoning market for self-help health literature. Deliberately omitting herbals and almanacs from his inventory, K.F. Russell categorized medical material printed before 1600 into three distinct areas: popular health recipes issued for the general public; works on the plague; and translations of Latin staples, made more accessible to both medical professionals and the hoi polloi.[2] To his select list one must add literature about the monstrous, objects of wonder and fear, typified by an anonymous broadside printed for London bookman Toby Coke entitled: *The Description of a Moste Dreadfull and Mervelous Monster borne in Manchester, within the county of Lancaster upon Tusdaye being the fourteenth of August last past 1579*. Besides plague, individual diseases were profiled in books on gout, sweating sickness, the stone (kidney and bladder), and French pox, venereal disease named for England's perennial foe,

[1] James Raven, Helen Small and Naomi Tadmor, "Introduction: The Practice and Representation of Reading in England," in *The Practice and Representation of Reading in England* (Cambridge: Cambridge University Press, 1999), 5. This figure does not include "ephemeral" literature in brochures, pamphlets and almanacs.

[2] K.F. Russell, "A Check List of Medical Books Published in English before 1600," *Bulletin of the History of Medicine* 21 (1947): 923. See also Elizabeth Lane Furdell, *Publishing and Medicine in Early Modern England* (Rochester, N.Y.: University of Rochester Press/Boydell and Brewer, 2002).

which returned the favor by dubbing it the English disease.[3] Elsewhere, nationalism asserted itself into the multitude of books on herbs, the popularity of which exploded in the sixteenth century when English naturalists suggested that indigenous plants might better cure local people.[4] Timothy Bright argued "the sufficiency of English medicine for the cure of all diseases cured with medicine" in his 1580 treatise and throughout the Stuart century Englishmen muscularly asserted the priority of their experimental achievements in medical science compared with other nations.[5] Likewise, one can discern by the mid-sixteenth century a growing number of published entries in the iatric wars that pitted university-trained physicians against their more humble counterparts in surgery, apothecary, and amateur remedy.[6]

Although the College of Physicians in London had regulatory power, granted to it in 1518 by royal charter, its authority was limited and erratic. Moreover, its jurisdiction applied to London, leaving defense of the profession outside of its environs to individual doctors. For example, Northamptonshire physician John Cotta uncompromisingly maintained, using short case studies for proof, that only trained, qualified healers should give medical advice; he warned that patients who consulted unconventional practitioners risked being misled, injured or killed outright.[7] Licensed doctors throughout England lamented unfet-

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[3] For instance, see Christopher Balista, *Overthrow of the Gowte*, written in Latin verse, translated by Barnaby Googe (London: Abraham Veale, 1577); John Caius, *A Book or Counseill against the Disease Commonly Called the Sweate or Sweatyng Sicknesse* (London: Richard Grafton, 1552); Walter Cary, *A Hammer for the Stone* (London: H. Denham, 1580); Phillip Herman, *An Excellent Treatise Teaching Howe to Cure the French-Pockes*, put into English by J. Hester (London: J. Charlwood, 1590) and Ulrich von Hutton, *De Morbo Gallico*, "Englished" by T. Paynell (London: Thomas Berthelet, 1533).

[4] See Rachel Poliquin, "Vegetal Prejudice and Healing Territories in Early Modern England," in *Textual Healing: Essays on Medieval and Early Modern Medicine*, ed. Elizabeth Lane Furdell (Leiden: Brill, 2005), 159–193.

[5] Timothy Bright, *A Treatise wherein is Declared the Sufficiencie of English Medicines* (London: H. Middleton, 1580); A. Rupert Hall, "English Medicine in the Royal Society's Correspondence," *Medical History* 15 (1971):123. Hall admonishes students of medical history to take this "virulence of national pride" into account when assessing scientific communication in the seventeenth century.

[6] See, for example, John Securis, *A Detection and Querimonie of the Daily Enormities and Abuses Committed in Physick* (London: Thomas Marshe, 1566), and by a self-described "practitioner in physicke," A.T., *A Rich Storehouse or Treasury for the Diseased…Now set forth for the great benefit and comport of the poorer sort of people* (London: T. Purfoot and R. Blower, 1596). For modern analysis of the seventeenth-century squabbles between traditional doctors and their nemeses, see Harold J. Cook, *The Decline of the Old Medical Regime in Stuart London* (Ithaca, N.Y.: Cornell University Press, 1986).

[7] Todd Pettigrew, "'Profitable unto the Vulgar:' The Case and Cases of John

tered efforts in print by the unscrupulous to divulge professional arcana and opposed accrediting quacks, claiming they did so to protect the sick from charlatans and mountebanks. Many "irregulars," however, though not turning away from the profits to be made selling information in the medical marketplace, genuinely sought to democratize health information. Besides self-help manuals, they printed and distributed anatomical fugitive sheets, paper doll-like figures whose "inward partes [were] lyvyely set fourthe and dylegently." Beginning in England in 1538, these delineations of the human body, done in letterpress and copper engravings, met with resounding commercial success. Some later versions were tinted various shades with superimposed strips of paper that, when raised in sequence, uncovered the body's internal organs.[8]

Most of the medical volumes on bookstore shelves surveyed illness in general, proffering explanations for the causes of sickness and promising cures usually based on secret ingredients. These general works enjoyed remarkably long shelf lives. An early entry into medical publishing is Sir Thomas Elyot's *Castel of Helth*, available as an eight-volume set from Thomas Berthelet in 1539; fourteen editions followed, the last in 1610. At about the same time, Thomas Moulton produced *The Myrrour or Glasse of Helth Necessary and Needful for Every Person to Loke in* (London: Robert Wyer); it tied together disease and planetary alignment, showing its readers remedies for many diverse infirmities through seventeen printings by eleven different printers from 1530 to 1580.[9] A *Dyetary of Helth* by Andrew Boorde, a Carthusian monk who accepted the Henrician schism, appeared first in 1542 (London: Robert Wyer) with other editions to follow. His *Breviary of Helthe, for all manner of sicknesses and diseases the whiche may be in man or woman doth folowe*, came out from printer William Middleton in 1547. Reissued repeatedly through the sixteenth century, the latter undertook to express "the obscure terms of Greke, Araby, Latyn, and Barbary into English concerning phisicke and Chierurgye." Robert Recorde, whose *Urinal of Physick* was earlier noted, might have been bemused to see what happened to

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Cotta's *Short Discoverie*," in *Textual Healing: Essays on Medieval and Early Modern Medicine*, ed. Elizabeth Lane Furdell (Leiden: Brill, 2005), 133.

[8] Russell, "List of Medical Works," 939; Andrea Carlino, *Paper Bodies: A Catalogue of Anatomical Fugitive Sheets, 1538–1687* (London: Wellcome Institute, 1999), 61.

[9] Paul Slack, "Mirrors of Health and Treasures of Poor Men," in *Health, Medicine and Mortality in the Sixteenth Century*, edited by Charles Webster (Cambridge: Cambridge University Press, 1979), 237–238. Slack counts 153 medical titles published in the vernacular between 1586 and 1604.

his 1547 tome, issued for the fifth time in 1651 with the addition of an "ingenious treatise concerning physicians, apothecaries, and chyrugians." The addition was a savage polemic "set forth by a Dr. in Queen Elizabeths dayes" that purported to demonstrate how unskilled doctors, especially surgeons, apothecaries and unlicensed irregulars hurt their patients and the profession. Though the Wellcome Library catalogue suggests that anti-irregular John Securis (c. 1566) might have penned the diatribe, others argue the section is not Elizabethan but contemporary with its mid-seventeenth century publication.[10] Prolific publisher Gertrude Dawson probably hoped to sell titles, given the acrimonious nature of the jurisdictional debates within medicine in the middle of the seventeenth century.[11]

It must seem that virtually everybody, regular and irregular, got into the medical publishing endeavor. John Jones, trying to crack the market himself, wrote in 1566 that medical "books seem rather to want readers than readers books."[12] An influential "nurse-surgeon" who cared for Henry VIII, William Bullein, wrote two general health manuals: *The Government of Helthe* (London: John Day, 1558) and *Bulwarke of Defence against All Sicknes, Sornes, and Woundes that dooe daily assaulte mankinde* (London: John Kyngston, 1562). The former contained "notable rules for men's preservation with sundry simple and other matters," and the latter admittedly a compendium gathered and practiced "from the most worthie learned, both old and new." Philip Barrough published his *Methode of Phisicke* in 1583 (London: Thomas Vautroullier) with eight subsequent editions as late as 1639, and Peter Levens in 1587 (London: Edward Allde) authored *A Right Profitable Booke for All Diseases Called the Pathway to Health*, its cachet lasting until a final edition in 1664. All this activity implies significant financial rewards to those who took up pen or lined up print, but historian Paul Slack estimates that for the

[10] Robert Recorde, *The Urinal of Physick*, 5th ed. (London: Gertrude Dawson, 1651). Reissues of Recorde also appeared in 1567, 1582, 1599 and 1612; the digest was published again in 1665 and as *The Judgment of Urines* in 1679. See also William B. Ober, "Medical Polemic of 1651," *New York State Journal of Medicine* 71 (1971): 1880–1886.

[11] Despite the bias against unlicensed healers evident in the "ingenious treatise," Dawson hedged her bets by producing at least seven editions of the Countess of Kent's *A Choice Manual of Rare and Select Secrets in Physick and Chyrurgery*, containing a variety of wellness recipes aimed at females responsible for extended households. Maureen Bell counts eighty-eight imprints of Mrs. Dawson, whose large shop employed six apprentices: Bell, "Women in the English Book Trade, 1557–1700," *Leipziger Jahrbuch zur Buchgeschichte* 6 (1996): 34.

[12] John Jones, *A Diall for all Agues* (London: W. Seres, 1566), sig. Aviiir.

Tudor century medical works represented "only a small proportion of English publishing, probably some 3 per cent of the total output of books."[13]

Indeed, before 1600 the "astonishing originality, versatility, and vigor of the English Renaissance" can be attributed to the great variety and overlap of texts. Historian William St. Clair points to the multitude of anthologies, abridgements and adaptations, however, as challenging to authorities, a situation hinting at lack of control and potential trouble untangling intellectual property claims. After 1600 "private intellectual property ownership became more narrowly textual," discouraging the compilation of anthologies in all fields including medicine. Without the necessary permissions forthcoming to quote from older pieces, St. Clair contends that along with rising book prices these restrictions severely slowed the transmission of ideas from elites to the wider public.[14] However, the abolition in 1641 of the Star Chamber, a prerogative court that had used a strict licensing system to control the press, ended governmental repression of print for two decades and encouraged the proliferation of new works. A Licensing Act in 1662 re-established restraints on writers and printers and installed a censorship czar, Roger L'Estrange, to monitor dangerous materials, but enforcement proved intermittent.[15] Nonetheless, even with tighter regulation, things seem to have picked up considerably for pen and book men peddling health information in the vernacular, since medical literature seemed less politically contentious to the government.

The Short Title Catalogues cover the entire Tudor-Stuart age and include enough information on over two hundred printers and sellers who handled iatric books to substantiate their medical specialization. Some of the titles combined genres to attract a diverse audience. For instance, John Harington translated a medical poem, "The School of Salerno," retitled it *The Englishmans Doctor*, and had it printed by John Helme and John Busby, Jr. in 1608. The frontispiece suggested purchasing the work at "the little shop next Cliffords Inn-Gate in Fleet Street." It contained practical advice in verse aimed at Harington's fellow citizens, such as:

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[13] Slack, "Mirrors of Health," 239–240.

[14] William St. Clair, *The Reading Nation in the Romantic Period* (Cambridge: Cambridge University Press, 2004), 76–77.

[15] Jeremy Black, *The English Press, 1621–1681* (Stroud, U.K.: Sutton, 2001), 5.

> Use three physicians still; first Doctor Quiet,
> Next Doctor Merry-man, and Doctor Diet.
>
> Rise early in the morn, and straight remember
> With water cold to wash your hands and eyes,
> In gentle fashion reaching every member,
> And to refresh your brain when as you rise,
> In heat, in cold, in July and December,
> Both comb your head, and rub your teeth likewise;
> If fined, to stand or walk will do no harm.[16]

Publishers later advertised their varied wares in *The Term Catalogues*, compiled from 1668 to 1709 by London printer Robert Clavell.[17] It was not a list of all books printed in those years, since fees had to be paid to Clavell for inclusion in the inventory, but does provides additional information about who wrote and sold medical literature. Authors representing all sides of the healing arts rushed their writings into print, some to shore up the position of learned physicians against any challengers and others to cultivate a growing audience of irregulars and laymen. Medicine had become "beyond comparison the most pamphlet-ridden of the early modern professions" and health care literature a field unto itself.[18] Outbreaks of disease often boosted production of such works, as did the government's encouragement of public health measures, but interest in the new directions of continental medicine contributed to a flood of translations sold in England. "How to" books often targeted would-be apothecaries or the self-appointed keepers of household health; though most repeated the humoral aphorisms of Galenic well-being, some were ingenious and novel in their approach to maintaining health and avoiding sickness.

For example, Jonas Moore, a mathematician, suggested a new method of calculating the composition of compound medicines. Published in 1650, *Moores Arithmetick* confronted a dilemma among healers: while physicians recommended compound medicines, they were often com-

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[16] John Harington, trans., *The Englishmans Doctor or The School of Salerno* (London: John Helme and John Busby, Jr., 1608), verses 75 and 76.

[17] See A.W. Pollard and G.R. Redgrave, *A Short Title Catalogue of Books Printed in England, Scotland, Ireland …, 1475–1640*, 2nd ed., 2 vols. (London: Bibliographical Society, 1976); Donald Wing, *Short Title Catalogue of Books Printed in England, Scotland, Ireland … 1641–1700*, 2nd ed., 3 vols. (New York: Modern Language Association, 1994): and Edward Arber, ed., *The Term Catalogues, 1668–1709 (and Easter Term of 1711)*, 3 vols. (New York: Johnson Reprint, 1965).

[18] Geoffrey S. Holmes, *Augustan England: Professions State and Society* (London: George Allen and Unwin, 1982), 309.

plicated to make.[19] Moreover, given a wide-spread preference for less expensive "simples," single-ingredient remedies, many believed that multipart mixtures might be rendered useless by contradictions within their composition. Continentally-trained James Primrose went so far as to accuse quacks of promoting compound medicines and other critics charged that compounds were old-fashioned and impure.[20] Moore proffered help to physicians, their apothecaries or anyone who needed to know how to make drugs by providing eight rules to follow, rules that reflected Galenic traditions within the context of popularizing medicine. His technique was called allegation alternate, "an advanced arithmetical operation" adapted to figuring out proportion and consistency in assembling remedies, and Moore was the "first practical mathematician to promote [it] systematically to a medical application."[21] The value of his *Arithmetick* to all levels of healers surely proved a selling point in the middle of the seventeenth century. Indeed, after the Civil War, when reformers sought to challenge elite physicians on their theories and status within the profession, books touching all health angles streamed from English presses. Whether out of a desire to undercut authority and make "everyman his own doctor" or just to make a nice profit, publishers resolutely added more medical titles to their shelves.[22]

In his analysis of vernacular medical material in the sixteenth century, Paul Slack identifies common complaints addressed in Tudor remedy and recipe books. Though agues and fevers along with bladder stones command the lion's share of attention in the collections he consulted, urinary complaints and pain in the kidneys constitute a significant number of symptoms presented to be alleviated. The urinary disorders noted by Slack, however, indicate "too little piss" rather than too much and there is no mention of inordinate thirst or reference to diabetes as a patient problem.[23] Seventeenth-century authors also

[19] Jonas Moore, *Moores Arithmetick* (London: Nathaniel Brookes, 1650).

[20] James Primrose, *Popular Errours or the Errours of People in Physick* (London: Nicholas Bourne, 1651), 24–25; for criticism of compounds see Marchamont Nedham, *Medela Medicinae* (London: Richard Lowndes, 1665).

[21] Alvan Bregman, "Alligation Alternate and the Composition of Medicines: Arithmetic and Medicine in Early Modern England," *Medical History* 49 (2005): 299–300.

[22] John Archer, *Everyman His Own Doctor* (London: Peter Lillicrap, 1671). Since most publishers put out books on both sides of the debates about medical theory and professional jurisdictions, and since most sellers carried titles to appeal to buyers in either camp, I have argued profit rather than principle as a motivating factor. See Furdell, *Publishing and Medicine in Early Modern England*, 49–92.

[23] Slack, "Mirrors of Health," 263–264.

concentrated on urinary troubles, with many claiming to have derived healthy regimens for the sick by drawing upon the teachings of "ancient philosophers, Greeke, Latine, and Arabian." Northamptonshire practitioner James Hart did just that in his lengthy tome entitled *Klinikë or the Diet of the Diseased*. Published in 1633 and carrying the imprimatur of the College of Physicians where he was himself a Fellow, Hart's book commenced with the standard boilerplate against unlicensed practitioners, bemoaning "the lawless intrusion of many ignorant persons upon the profession of physicke."[24] However, he noted that while erudite physicians learned the signs of diseases and were conversant about their cures, they concentrated their attention on the dietary regimes of the healthy and how to maintain good health through diet. Hart lamented that the diet of sick people had been passed over, making possible the truism that "a small error in diet much prejudiceth the patient." He intended to lessen the chance for mistakes by creating a compendium of advice aimed at those laid low by illness. Hart, a Basle M.D. proud of "our Paracelsus," used common sense expounding what regimens were best for the sick, what meat and drink to consume, and how air and other elements affect them. As to the nature of the "excrementitous humor," urine, he argued, should not be overlooked in sickness or in health, but should be monitored by the attending doctor for changes in color and content. Excess urine, "as in that disease called diabete…or pot-dropsie," passed through the body without much alteration, making diagnosis difficult. Although he noted the rarity of diabetes, Hart asserted that the site of the disease lay in the stomach, "being a defect of concoction in the stomacke and guts."[25] Hart eschewed prescribing drugs for urinary problems in *Klinikë* and in his two earlier treatises on urines, both dedicated to Charles I when Prince of Wales.

As Mary J. Dobson has shown for the southeastern part of England, physicians sometimes attributed cases of fever to improper diet including a lack of fresh fruit and vegetables. The populace of the Kentish marshlands ate dried or salted fish and meat but few green vegetables, when, if compounded with large quantities of alcohol, could damage overall health. Moreover, she has discovered that early modern mortality levels "in parishes with large herds of livestock tended to be

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[24] James Hart, *Klinikë or the Diet of the Diseased* (London: J. Beale for Robert Allot, 1633), 1. Hart's *The Arraignment of Urines* (London: G. Eld, 1623) and *The Anatomie of Urines* (London: Richard Field, 1624) are noted in Chapter 2.

[25] Ibid., 310.

slightly higher than those based on grain or market gardening."[26] Over-reliance on a high-sodium, high fat diet could easily have exacerbated any hereditary tendency towards adult-onset diabetes. While doctors listed diabetes in parish registers as a chronic disease responsible for deaths like cancer or scurvy, they also registered certain symptoms like fever, lethargy and decline as actual causes of death; these could have been diabetic symptoms, as could the leg ulcers, abscesses, and violent pains in the legs and feet of which their patients complained.[27] Likewise, the London Bills of Mortality record more than 150 types of deadly diseases including diabetes in the early modern era, but make no useful distinction between patient symptoms and fatal sickness.[28] Attention to the diet and nutrition of the sick and dying fell upon the shoulders of both physicians and patient families.

Among the first published works in England that focused more than just a paragraph or two on diabetes are those of Nicholas Culpeper, an anti-elitist apothecary whose popular medical publications in the vernacular encouraged laymen to take charge of their own health. In the pre-Civil War era, various projects for improving medicine, inspired by Paracelsian emphasis on Christian altruism, dovetailed with demands for political reform. The absence of new hospitals after the Reformation and the dissolution of the monasteries, except for temporary plague structures usually pulled down after crises passed, had weighed heavily on the minds of medicos. Only two general hospitals in London survived the destruction: St. Bartholomew's in Spitalfields and St. Thomas's in Southwark. High mortality rates and an influx of immigrants swelled the city to overflowing, guaranteeing the inadequacy of these institutions. Things were no better in the countryside. During the Civil War the sick and wounded were sometimes treated in buildings seized for the sick and wounded or quartered on local citizens, but with the closure of alms houses there was no place for old soldiers and the Poor Laws did nothing for sick paupers.[29] Given the paucity of institutional facilities, most sick people were treated at home. Therefore,

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[26] Mary J. Dobson, *Contours of Death and Disease in Early Modern England* (Cambridge: Cambridge University Press, 1995), 246, 337, 528.

[27] Ibid., 237, 247–248.

[28] Patrick R. Galloway, "Annual Variations in Deaths by Age, Death by Cause, Price and Weather in London, 1670–1830," *Population Studies* 39 (1985): 487–505.

[29] R.M.S. McConaghey, "The Evolution of the Cottage Hospital," *Medical History* 11 (1967): 128–129. See also Nicholas Orme and Margaret Webster, *The English Hospital 1070–1570* (New Haven, Conn.: Yale University Press, 1995).

it made sense to reformers and exemplified their concept of brotherhood to put medical knowledge in the hands of laymen and unlicensed care-givers, a direct challenge to the learned physicians in London and elsewhere throughout the realm.

Nicholas Culpeper embraced political and medical rebellion as a young college student. Compelled to leave Cambridge University early because of a restricted patrimony, Culpeper apprenticed himself to three London apothecaries and by 1640 had his own shop in Spitalfields. He was no armchair revolutionary, but fought on Parliament's side in the Civil War and was wounded. After the war, still true to his principles, Culpeper saw sick people at the rate of about forty per day who could not afford to consult university-trained physicians.[30] Aroused by the poverty of his customers, he began to write, railing against the monopoly and lack of charity of the College of Physicians and aiming his books at ordinary Londoners while arousing the ire of the medical establishment. He fumed that in Italy all physicians, whatever their reputation, had to administer to everyone, rich or poor, and that their fees were strictly limited. Culpeper's *Complete Herbal*, published in 1649, used the common names of plants; moreover, he often told his readers where in the nearby countryside they could collect the appropriate vegetation. Preferring simples to compound medicines, he never recommended more than one plant medicine if only one was needed. That same year, Culpeper's publisher, Peter Cole, commissioned him to translate the College of Physicians' *London Pharmacopoeia* into English, making a doctor's Latin unnecessary for concocting medicaments and creating "one of the publishing sensations" of the century.[31] The intent of *A Physicall Directory or Translation of the London Dispensatory* was clear: Culpeper wanted to subvert the physicians' claims to a monopoly of practice.

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[30] Culpeper's latest biographer is Benjamin Woolley, *The Herbalist* (London: Harper Collins, 2004). His oeuvre is best accounted for by Mary Rhinelander McCarl, "Publishing the Works of Nicholas Culpeper," *Canadian Bulletin for the History of Medicine* 13 (1996): 225–276. See also Jonathan Sanderson, "Nicholas Culpeper and the Book Trade: Print and Promotion of Vernacular Medical Knowledge, 1649–1665," unpublished Ph.D. thesis, University of Leeds, 1999.

[31] Woolley, *The Herbalist*, 285; Nicholas Culpeper, *A Physicall Directory or Translation of the London Dispensatory* (London: Peter Cole, 1649). Peter Cole published sixty-four of the 158 separate editions of Culpeper's work between 1649 and 1700. For more on Cole, see Elizabeth Lane Furdell, "'Reported To Be Distracted': The Suicide of Puritan Entrepreneur Peter Cole," *The Historian* 66 (2004) 772–792, and my entry of his life in the *Oxford DNB*.

In 1652 appeared *The English Physitian or An Astrologo-physical Discourse of the Vulgar Herbs of This Nation*, Culpeper's star turn, costing three pence and spawning over one hundred subsequent editions. By its own advertisement *The English Physician Enlarged* contained 369 medicines made with English herbs, "a complete method of physic whereby a man may preserve his body in health, or cure himself, being sick."[32] Like many healers of his day, Culpeper did not find astrology incompatible with Christianity. He would have concurred with the judgment of his contemporary Thomas Tryon, author of several self-help manuals, that astrology, "not the fraudulent way of telling fortunes …but the method of God's government in nature and administration of the world." That definition encompassed "the scheme of any person's nativity," as useful and lawful a study as the art of medicine.[33] Knowing when the signs were right for dispensing a medicine or performing a surgery added odds to the patient's chances. Moreover, the stars could play a role in assessing a particular food. Tudor-Stuart era herbalists usually prescribed cures with a plant's astral powers in mind and whenever a food's properties could not be explained by its humoral makeup, writers often referred to a food's "occult" qualities. Though no one could explain how, astrological healers insisted that cabbage could prevent inebriation and fennel made the eyes sharper.[34]

Nicholas Culpeper's connecting astrology and medicine continued an established tradition of authors in Britain. Printed astrological almanacs in the vernacular, translated from other European tongues, could be found by the 1470s, containing astronomical events, predictions, factual information in calendar form, and other miscellaneous advice including guidance on health, but Andrew Boorde gets probable credit for both writing and producing the first almanac in England around 1537.[35] Some almanac writers, such as John Partridge and Culpepper's son Nathaniel, flatly claimed that medicine was the prin-

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[32] Nicholas Culpeper, *The English Physitian Enlarged* (London: Peter Cole, 1653), frontispiece. Subsequent editions appeared in 1653, 1656, 1666, 1669, 1671, 1674, 1681 and 1684, all under Culpeper's name.

[33] Thomas Tryon, *Some Memoirs of the Life of Mr. Thomas Tryon, Written by Himself* (London: T. Sowle, 1705), 22–23.

[34] Ken Albala, *Food in Early Modern Europe* (Westport, Conn.: Greenwood Press, 2003.), 222.

[35] The Boorde almanac was *The Pynciples of Astronomye* (London: Robert Copeland, 1547). See Louise Hill Curth, "The Medical Content of English Almanacs," *Journal of the History of Medicine* 60 (2005): 259; Eustace F. Bosanquet, *Early English Almanacks and Prognostications* (London: Bibliographical Society, 1917), 2–4.

cipal business of astrology, citing Hippocrates' and Galen's undoubted approval of the traditional "physick" found in their texts. Nathaniel Culpeper cautioned that the most important thing to consider when a person fell ill should be "the position of the heavens."[36] The simplest of these works depicted a figure called "Zodiac Man," a drawing illustrating the signs of the zodiac to associated parts of the human body, often displayed as a baby; other content proffered advice on preventing illness or, if prevention was no longer possible, an astral calendar of propitious times for administering healing therapies. Timothy Gadbury, who targeted a sea-going clientele, included a blank table readers could fill in with the twelve houses of the zodiac, using a chart he put at the front of his almanac detailing the positioning of the planets when someone got sick.[37] If all else failed, one could consult Richard Saunders' *Astrological Judgment of Diseases* for a diagnosis based on the heavens the moment illness struck.[38] Some almanacs gave attention to patient urine taken when symptoms first appeared. Uroscopy persisted throughout the 1600s, despite its growing association with quack doctors, and medical almanacs described the various colors of urine in explaining the humoral imbalance that needed redressing. Intended for laymen, Robert Morton and William Dade advised readers how to diagnose their own health problems by gauging the look and smell of their urine. Nicholas Culpeper himself associated healing plants with signs of the zodiac and Galenic categories, referring to certain herbs that could cure colds as plants of the sun in Aries.[39]

By the end of Culpeper's century the annual sale of almanacs totaled close to 400,000 copies, enjoying the widest currency of any printed books except the Bible. Though generally inexpensive, beginning at about a penny or two in cost in the sixteenth-century, almanacs with

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[36] John Partridge, *Mercurius Coelestis* (London: J.D. for the Company of Stationers, 1681) and Nathaniel Culpeper, *Culpeper Revived: 1680–1687* (Cambridge: John Hayes, 1682). See also Nancy Siraisi "Anatomizing the Past: Physicians and History in Renaissance Culture," *Renaissance Quarterly* 53 (2000): 1–30.

[37] Many people filled in the blank pages that were bound into their almanacs to make a note of pertinent information: Curth, "Medical Content of English Almanacs," 261.

[38] Timothy Gadbury, *The Young Seamans or Mariners Almanac* (London: F. Cossinet, 1660); Richard Saunders, *Astrological Judgment of Diseases* (London: Thomas Sawbridge, 1677).

[39] Robert Morton, *An Ephemeris for the Year of Our Lord 1662* (London: Simon Dover, 1662); William Dade, *A New Almanac and Prognostication* (London: R.O. for the company of Stationers, 1686–1687); Nicholas Culpeper, *An Ephemeris* (London: Peter Cole, 1655).

medical content appealed across class lines; by the mid-seventeenth century, Culpeper's larger almanacs sold for sixpence. Between 1550 and 1700 about 160 separate series of almanacs contained medical information, many authored by men with astrological rather than medical credentials.[40] The audience for these booklets, clearly conversant in astrology, was no doubt even larger than one might at first surmise. Besides those who read the pieces to themselves, many early modern people were read to; moreover, the aurally-informed included literate family members from the upper and middle classes who enjoyed listening to others in the household read aloud, not merely the illiterate who would otherwise have missed out on the practical advice in almanacs. Indeed, varieties of literacy, including "utilitarian" or functional literacy, co-existed throughout the early modern era.[41] Some almanacs, such as those from "Edward Pond" from 1655 to 1669, contained medical recipes and others, particularly after 1650, endorsed through advertisements commercial remedies available at bookstores and apothecary shops; custom-made medications based on patient uniqueness had become a thing of the past.[42] Given the low cost and year-long shelf life of an almanac, placing promotional material between its covers made good business sense to the medical entrepreneur. Ads for Robert Bateman's Scurvy Grass appeared over 150 times in seventeenth-century almanacs; it was touted as being available at twenty-six outlets in London including bookshops, a cheesemonger's and a haberdashery. William Salmon, a post-Restoration quack who was part of the cacophonous medical scene in early modern England, used his own *London Almanack* to publicize his Paracelsian-style medicines and to complain about rival almanac writers like Joseph Blagrave who were "imposters in physic" and about shopkeepers who sold counterfeit pills attributed to him. Salmon, claiming to have cured a long list of ailments like

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[40] Louise Hill Curth, *English Almanacs, Astrology and Popular Medicine: 1550–1700* (Manchester: Manchester University Press, 2007), 59–60, 84; Bernard Capp, *Astrology and the Popular Press: English Almanacs 1500–1800* (Ithaca, N.Y.: Cornell University Press, 1979), 23.

[41] Joyce Coleman, *Public Reading and the Reading Public in Late Medieval England and France* (Cambridge: Cambridge University Press, 1999), 2; Helen M. Jewell, *Education in Early Modern England* (Basingstoke, U.K.: Palgrave Macmillan, 1998), 147–148.

[42] Edward Pond, *An Almanack* (Cambridge: Roger Daniel, 1655). Almanacs written by Edward Pond began appearing in 1602, making it obvious that the pieces under his name seventy years or more later came from one or more ghost-writers: Curth, "Medical Content of English Almanacs," 263.

insanity and consumption, also provided "physical recipes" in his almanac for each month's featured ailment, perhaps vomiting, gout or melancholy.[43]

Given the recurring references to diabetes in Culpeper's books, one can assume the condition was not exceptional in the mid-seventeenth century, though he makes no distinction between juvenile and adult sufferers. Like many unlicensed healers, he mixed alchemy, astrology and folk medicine with the traditional teachings of classical doctors, a blending evident in the advice he dispensed for diabetes. While practicing alchemists proudly insisted that Culpeper was exclusively Paracelsian in outlook, Peter Cole reported that illness had mellowed his former anti-Galenic medical views and caused him to rethink the question of equilibrium in healthy lives.[44] In the short posthumous biography of Culpeper at the beginning of *Culpeper's School of Physick*, readers were informed that "he was not only for Gallen and Hypocrates, but he knew how to correct and moderate the tyrannies of Paracelsus."[45] So, though avowedly Paracelsian in his medical politics, Culpeper quietly counseled his diabetic patients to seek the humoral balance that Galenic adherents insisted was the key to wellness; besides, Paracelsians did not construct a new dietary system nor did they suggest new ways of assessing food that might have inspired Culpeper in aiding sufferers with a fatal thirst. Since the diabetes "distemper" caused a great dryness and fever in the afflicted because of the wasted moisture they lost in "involuntary pissing," Culpeper stipulated that diabetics should live in cold, moist air and consume a dry diet that would not "provoke urine." Because they were already sick and drawing blood from people unfit for venesection would only have exacerbated their illness, he would not have bled these diabetic sufferers, either the lean, youthful

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[43] Furdell, *Publishing and Medicine in Early Modern England*, 28, 151; Curth, *English Almanacs, Astrology and Popular Medicine*, 169–170, 190; and William Salmon, *London Almanack* (London: s.n., 1691). See also Elizabeth Lane Furdell, "Grub Street Commerce: Advertising and Politics in the Early Modern Press," *The Historian* 63 (2000): 35–52.

[44] See Peter Cole's anonymous pamphlet, *Mr. Culpeper's Ghost* (London: Peter Cole, 1656) and F.N.L. Poynter, "Culpeper and the Paracelsians," in *Science, Medicine and Society in the Renaissance*, ed. Allen G. Debus, 2 vols. (New York: Science History Publications, 1972) 1: 202, 219. Poynter agrees with Cole that Culpeper did temper his truculent anti-Galenic views, if not his anti-elitism.

[45] Nicholas Culpeper, *Culpeper's School of Physick* (London: N. Brook, 1659), n.p.; Furdell, "'Reported to be Distracted,'" 784. Andrew Wear suggests that this claim may have been made to guarantee acceptability by a wider population of readers: Wear, *Knowledge and Practice*, 356, n. 7.

victims or the fat, older ones. While more healers emphasized exercise as necessary to good health, Culpeper ordered rest for his diabetic patients, because tranquility "stays the motion of the humors."[46] At the same time, even if urinalysis remained critical to Culpeper in diagnosing diseases, he disdained using only uroscopy to find out what ailed a patient. Echoing Paracelus, Culpeper insisted that nothing surpassed seeing the sufferer in person. He wrote that "out of question viewing the patient is a better way to find the disease than viewing the piss, though a man should view as much as the Thames will hold."[47]

The English Physitian, enlarged in 1653, neatly synthesized received astrological lore and proclaimed that diseases change with the heavens, hence only therapeutic herbs with the appropriate zodiacal qualities should be used. Those herbs should be collected under their correct "sign" to guarantee efficacy. Culpeper specifically advised those who suffered from diabetes to use locally available plants such as bistort or snake-weed in any decoction, darnel leaves boiled in wine with pigeons' dung, and powdered tormentil root in plantain juice to treat their condition. Each of those plants had astrological associations for Culpeper and his contemporaries. Bistort and darnel were deemed plants of Saturn and therefore cold and dry, the right antidote to the symptoms of diabetes; tormentil, an herb of the sun, was thought to stop all kinds of fluxes or humors. He also recommended the fruit and leaves of the medlar tree, "old Saturn's," to stay the humors in man or woman.[48] Though widely criticized by elite physicians and competing herbalists alike, Culpeper did make an effort to integrate Galenic medicine with Paracelsian theories in his *New Method of Physick* (1654), perhaps to convert adherents of both schools to his way of thinking. Culpeper's philosophy flourished and influenced other writers, such as Joseph Blagrave, Salmon's nemesis. In 1674 Blagrave penned an appendix to Culpeper's *English Physician*, as well as an essay three years

[46] Wear, *Knowledge and Practice*, 361. For the perceived benefits of physical exertion on wellness, see Alessandro Arcangeli, *Recreation in the Renaissance* (Basingstoke, U.K.: Palgrave Macmillan, 2003), 30–42.

[47] Nicholas Culpeper, *A Physicall Directory* (London: Peter Cole, 1649), A2. *The Arraignment of Urines* (London: G. Eld, 1623), a translation of Pieter van Foreest by James Hart, had argued similarly that relying on uroscopy alone guaranteed medical misdiagnosis.

[48] Culpeper, *English Physitian Enlarged*, 137. For more on these medicinal plants and others, see *Culpeper's Color Herbal*, ed. David Potterson (New York: Sterling, 1983), 29, 56–57, 193.

earlier on astrological medicine, both of which refined the correlation between planetary power and drugs.[49]

Culpeper repeated "aphorisms" in *Culpeper's School of Physick*, like one to help those "such as cannot hold their water or that have diabetes," urinary conditions he usually referred to synonymously. The recommendation entailed beating into a powder a "fleaed mouse dried" and taking it for three days in a row.[50] While Culpeper admitted that he did not know whether the disease was caused by the "immoderate attraction of the reins [kidneys], or the weakness of the sphincter muscle of the bladder, or both of them," he nonetheless prescribed a powder made of the bladder of a goat, sheep or bull, half a dram of which could be drunk at bedtime in any "convenient liquor." In the same tome, Culpeper made clear his astrological penchant, calling the dried bladder of a goat the best choice for diabetes, "because it is a beast of Saturn."[51] As an afterthought, Culpeper noted that just the sphincter muscle of the bladder of any of these creatures was probably sufficient, and that it might prove difficult to pulverize a whole bladder. He counted that he completely cured one "great lubber" who could not make it through the night "without pissing a bed," by insisting the patient drink only "what had been tied up twelve hours in a sheep's bladder."[52] Culpeper also recommended the bladder of a fresh-water fish (given for three days in the wane of the moon), the brain (or "pizzle") of a mummified hare, and galangal, all taken inwardly. External remedies included binding the lungs of a kid under the patient's navel and applying chopped unwashed alehoof in vinegar to the wrists; Culpeper claimed that he cured his own child of diabetes with alehoof astringent and prickly holly leaves boiled in her drink, both medications credited to an Italian.[53]

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[49] Joseph Blagrave, *Blagrave's Supplement or Enlargement to Mr. Nicholas Culpepers English Physitian* (1674) and *Blagrave's Astrological Practice* (London: S.G. and B.G. for Obadiah Blagrave, 1671). Allan Chapman traces common reference to astrological rules to Elizabethan John Case, an Oxford physician, and to Albertus Magnus's 1560 *Boke of Secretes*; see his "Astrological Medicine" in *Health, Medicine and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 298–299.

[50] Culpeper, *English Physitian Enlarged*, 30–31, 72–73, 223–224; *Culpeper's School of Physick*, 89.

[51] *Culpeper's School of Physick*, 132. He wrote that patients should be given a dram of this powder in the morning and at night.

[52] Ibid., 242.

[53] Ibid., 243. Alehoof, known as ground ivy by modern herbalists, is still used for kidney disease: *Culpeper's Color Herbal*, 13.

Long after his death in 1654, Culpeper's oeuvre raked in profits for his publisher, Peter Cole, who regarded himself as the sole owner of all rights and wanted to protect his investment of more than twenty years. Cole had encouraged Culpeper's output and handled seventeen posthumous manuscripts that had been prepared by the apothecary for publication. Culpeper's widow Alice invited Cole to produce seventy-nine more, such as multiple editions of his herbals and anatomies, and Cole advertised Culpeper's titles in other printed works. As noted, when practicing alchemists challenged Culpeper as overly wedded to Paracelsianism, Cole argued in *Mr. Culpeper's Ghost* that the author had mellowed toward Galenism in his final illness. Cole personally found himself on the defensive when a rival bookseller and former friend of Culpeper's, Nathaniel Brook, expropriated some of the manuscripts that Culpeper's widow intended for Cole. Alice Culpeper denounced Brook, calling his purported Culpeper documents "forgeries and gallimaufries," but Brook was undeterred by her anger or by the witnesses she and Cole mustered to prove their case.[54] Clearly, there was money to be made from books like *The English Physitian* and *Culpeper's School of Physick* that included, among other remedies, cures for diabetes.

Moreover, other writers began to weigh in on the disease, a sign of its increasing incidence and interest among lay readers. In *The Method of Chemical Philosophie and Physick* (1664), its author unnamed, one can find a definition for diabetes, a flux of urine, and an explanation for it:

> Diabetes (a disease of the bladder) is caused from the tartar of the reins, when the reins are all together obstructed with tartar, that tartar or coagulated matter desires moisture, which, when it hath attracted it, the mechanical spirits of things are inquinated and corrupted with tartarous and styptical tinctures; so that they cannot separate pure things from impure things, but they transmit crude matter unto the bladder, and expel urine as an excrement.[55]

Many of the recipes for diabetes included in this general survey of medicine use a base of salt and parsley water, but one unusual remedy stands out. "Take a march hare, dip it in Rhenish wine until she be suffocated and dye. Then burn the whole substance in a pipkin. Give

[54] For more on these controversies surrounding Culpeper, see Furdell, *Publishing and Medicine in Early Modern England*, 43–44.

[55] Anonymous, *The Method of Chemical Philosophie and Physick* (London: J[ohn] G[rismond] for Nathaniel Brook, 1664), 223.

the powder with therica to the patient before his bath."[56] Presumably this concoction would prove luckier for the diabetic than for the rabbit.

Not to be outdone by an impertinent "irregular" like Culpeper or an anonymous quack, Fellows of the College of Physicians themselves began to hold forth in print on diabetes, unwilling to cede ground to popular healers or miss out on the profits of printed remedies. Thomas Willis (see Chapter 4) claimed he was among the first in Britain to substantiate the sweetish taste of diabetic urine and his contemporary Richard Morton confirmed that observation. Morton also emphasized the role of heredity in diabetes, a fact that would prove useful to doctors treating young patients with wasting diseases.[57] But during the golden age of pseudo-science in England, astrology and chemistry could often be found coming together in the printed works of the licensed and unlicensed alike. In 1677 Richard Saunders, a Warwickshire almanac-maker and medical practitioner, friend to both astrologer William Lilly and antiquarian Elias Ashmole, published *The Astrological Judgment and Practice of Physick*, deduced, he asserted, from the "position of the heavens at the decumbiture of a sick person." Saunders explained his astrological therapeutics through an examination of, among other excretions, a patient's urine by horoscopical methods, though he appears to have been a baker by training. His books on palmistry and "signal moles" went through several editions. Saunders post-Restoration apocalyptic speculations that a "messianic emperor" would come to end the erosion of public morality he saw about him were keyed to astrological medicine and must have frightened some of his clientele.[58] Moreover, his work was hardly original, borrowing heavily from Michael Scot and Paracelsus among many others. Nonetheless, Saunders enjoyed a significant reputation as a physician; indeed, he ministered to Lilly and Ashmole.

One is struck by the pronounced factions among late Stuart-era astrologers and medicos, a development created out of personal alliances and occupational resentment. Henry Coley, the adopted son and amanuensis of court favorite Lilly, praised Saunders as a "counterquack" for his celestial readings, but others condemned him as a mere star-gazer and palm-reader. Like Lilly, who edited or introduced

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[56] Ibid., 224. Therica or treacle was a molasses-like medicinal common to household usage.

[57] See R.R. Trail, "Richard Morton," *Medical History* 14 (1970): 166–174.

[58] Capp, *English Almanacs*, 329.

several of their tomes, Saunders and Coley criticized the London medical establishment and counterfeit doctors equally, never imagining they might be included on a list of charlatans themselves. Lilly, in turn, felt the wrath of John Heydon, an astrologer and lawyer who happened to have married Alice Culpeper in 1656. Elias Ashmole for his part referred to Heydon as an "ignoramus and a cheat." The sick who relied on these men for advice may have been confused by such public rancor, particularly since, according to sociologist Jurgen Habermas, English interiority and preference for privacy mitigated against such overt discord.[59] As the decades passed, other commentators on diabetes emerged despite a growing concern over privacy relationships between doctor and patient.[60] William Cheselden, an eighteenth-century surgeon and anatomist best known for his classic 1713 textbook on the human body, commented that diabetics often present boils and carbuncles to the examiner.

Consulting unlicensed physicians for diabetes continued to be commonplace in the eighteenth century. As Roy Porter and others remind us, evidence abounds about how people in the early modern age managed their own health, even those with diabetes, information to be found in formal and informal documents and in material issued from the popular press. In 1748 *The Gentleman's Magazine* carried a list of nostrums and empirics its audience might consult for a wide variety of ailments.[61] Electuaries for diabetes made by Dr. Henry could be purchased for ten shillings a pot at his establishment in Holborn. This list did not satisfy all subscribers, however, who often asked for more medical advice about their particular maladies; other readers responded with colorful, albeit often intriguing "home" remedies. For instance, one correspondent suggested that applying a live toad to the kidneys alleviated excessive water retention, though he knew not why. Clearly, he had accepted advice from someone else about curing with amphibians or devised the treatment through his own interpretation of a self-

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[59] Jurgen Habermas, *The Structural Transformation of the Public Sphere*, trans. T. Berger (Cambridge: Polity Press, 1989), 11–12. See also Brian Vickers, "Public and Private Life in Seventeenth-Century England," in *Arbeit, Musse, Meditation*, ed. Brian Vickers (Zurich: Centre for Renaissance Studies, 1985), 257–278.

[60] See Steve Sturdy, ed., *Medicine, Health and the Public Sphere in Britain, 1600–2000* (London: Routledge, 2002).

[61] *Gentleman's Magazine* 18 (1748): 348–350, cited in Roy Porter, "Lay Medical Knowledge in the Eighteenth Century: The Evidence of the *Gentleman's Magazine*," *Medical History* 29 (1985): appendix, 166.

help manual. As late as 1800 one correspondent, H. Mugg, wrote to the periodical extolling the virtues of medicines gleaned from his reading of Culpeper, medicines he had taken himself and given to his family.[62] Culpeper's name continued to be associated with herbalism and astrology, much to the embarrassment of twentieth-century herbalists. By 1920 modern herbalists discarded the astrological implications of "Culpeperism" in an effort to dispel any negative stereotypes and attain greater professional status, but it is Culpeper whose reputation and intentions have trumped all efforts to dismiss him.

[62] Ibid., 19 (1749): 550; 70 (1800): 329, cited in Porter, "Lay Medical Knowledge," 149–150; P.S. Brown, "The Vicissitudes of Herbalism in Late Nineteenth- and Early Twentieth-Century Britain," *Medical History* 29 (1985): 81.

CHAPTER FOUR

DIABETES AND SEVENTEENTH-CENTURY MEDICAL CONTROVERSY

Diabetes drew the attention of ever more English doctors, notably the Civil War-era medical titans, Thomas Willis and Thomas Sydenham. These politically diverse physicians, the royalist Willis and the Puritan Sydenham, made major contributions to the study of diabetes. Their antagonistic judgments about this particular disease mirrored the theoretical and jurisdictional schism in English medicine and, while physicians like Willis and Sydenham feigned abhorrence of personal quarrels, their professional disputes offer glimpses of their private values.[1] Though both were illustrious doctors, Willis championed academic medicine, "conserving many of the traditional Galenic practices" while adapting them "to the new medical environment;" Sydenham, an empiricist, had "strong anti-academic sentiments, believing that medicine ought to be taught by apprenticeship, not by books."[2] As politics and religion were key components of the turbulent medical struggle, the methods and remedies of these giants of the profession will help illuminate early modern health care.[3]

Thomas Willis was a product of orthodox Galenists at Oxford University, though he made a name for himself as a clinician and chemiatrist.[4] Continental critics of English universities disparaged what they

[1] David Harley, "Honor and Property: The Structure of Professional Disputes in Eighteenth-Century English Medicine," in *The Medical Enlightenment of the Eighteenth Century*, edited by Andrew Cunningham and Roger French (Cambridge: Cambridge University Press, 1990), 138–140.

[2] Harold J. Cook, *The Decline of the Old Medical Regime in Stuart London* (Ithaca, N.Y.: Cornell University Press, 1986), 184–185, 224. In his influential portrait of the Royal College of Physicians, Cook spotlights Willis and Sydenham as philosophical rivals although they were not leaders of medical factions. Andrew Wear compares the two in his *Knowledge and Practice in English Medicine, 1550–1680* (Cambridge: Cambridge University Press, 2000), 434–473.

[3] For a lively investigation of the politics of medical ethics and etiquette, see David Harley, "Ethics and Dispute Behavior in the Career of Henry Bracken of Lancaster," in *The Codification of Medical Morality*, edited by R. Baker, Dorothy Porter and Roy Porter (Dordrecht: Kluwer, 1993), 47–71.

[4] Fielding Garrison called him "the leading English exponent of chemiatry:" see

perceived as a lack of science in the degree requirements at Oxford and Cambridge. Such reproach may have been motivated by institutional self-promotion as much as methodological friction and smacks of disingenuousness. Oxford certainly offered science in its arts curriculum from the 1620s, long before Willis matriculated there.[5] Taking his B.A. in 1639 at Christ Church College, Willis, whose father died in the siege of Oxford in 1646, himself served in the university legion while studying medicine. Willis began to practice in Oxford immediately after obtaining his M.B. in 1646 and by 1650 had joined a group led by William Petty investigating chemistry and anatomy. The many scientific booksellers in Oxford stimulated the experimental bent of this group and published their findings.[6]

Willis straddled the evolution of medicine and science from its roots in Galenism across Renaissance interests in natural magic to therapies involving demonstrated standards of evidence. More recent scholarship has disputed the long-held premise that the Scientific Revolution signaled the immediate victory of experimentalism and observation over rigid humoralism. Willis' career supports the thesis that a more variable medical creed persisted among doctors and natural philosophers. As a transitional figure, he supported the use of fashionable folk remedies founded in Galen, such as the medical application of amulets.[7] Galen had sanctioned the use of specific amulets hung around the neck to ward off particular diseases like epilepsy. Like other physicians of his day, Willis accepted the idea that an amulet could exert "occult and sympathetic action" on a diseased part of the body in a variety of illnesses. In his 1659 publication, *De Febribus*, Willis repeated a widely-held conviction that an amulet could ward off the toxin of disease. His contemporary Robert Boyle was even more explicit, asserting that amulets

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Introduction to the History of Medicine, 4th ed. (Philadelphia: W.B. Saunders, 1929), 262. Kenneth Dewhurst, conversely, describes Willis' book *Pharmaceutice Rationalis* as "neither rational nor scientific," containing "a mixture of Galenic, chemical and 'vulgar' medicines:" Dewhurst, *Thomas Willis's Oxford Lectures* (Oxford: Sandford Publications, 1980), 24.

[5] Robert G. Frank, Jr., "Science Medicine and the Universities of Early Modern England: Background and Sources, Part I," *History of Science* 11 (1973): 204. Frank says that evidence for science teaching at Cambridge can be traced to the 1660s.

[6] Robert G. Frank, Jr., "Science, Medicine and the Universities of Early Modern England: Background and Sources, Part II," *History of Science* 11 (1973): 247.

[7] Steven Shapin, ""The House of Experiment in Seventeenth-Century England," *Isis* 79 (1988): 373–404. For the use of amulets in Stuart medicine, see Keith Thomas, *Religion and the Decline of Magic* (New York: Scribner's Sons, 1971), 275–276, 189–190, 368.

made of powdered toad alleviated the urinary incontinence associated with diabetes.[8] For a patient in the throes of sickness, amulets must have seemed preferable to exuberant bleeding and purging.

The Restoration of the Stuarts boosted Willis' fortunes and he was appointed the fourth Sedleian professor of natural philosophy at his alma mater. His assignment according to the university statutes involved reading from Aristotle twice weekly, but Willis ignored these archaic regulations and lectured on subjects that interested him.[9] Iatric traditionalists generally disdained disclosure of medicine's arcana and, though coaxed by international correspondents who felt he had much of medical value to impart, Willis was reluctant to reveal the precise details of his personal methods. When he did publish, it was in Latin, thereby keeping the profession's secrets. Many physicians felt that only Latin texts protected the integrity of medicine and the exclusivity of medical knowledge. Far worse from their imperious perspective, printing health-related information in the vernacular deliberately undermined the elitist, Latinate, and Galenist College of Physicians. Salisbury physician John Securis, pupil of a staunch Galenist at the University of Paris, scornfully speculated in 1566 that "if Englyshs bookes could make men cunnying physitions, then pouchemakers, threshers, ploughmen and coblers mought be physitions."[10]

Books in the vernacular, it was argued, abetted the unscrupulous to prey on the public, and entrusted the unskilled to cure themselves; if Securis was correct, then anyone could practice medicine. The distinguished physician John Caius frankly scorned the medical acumen of the masses, whereas Galenist James Primrose, grandson of James I's royal surgeon, feared that sick people would employ treatments and

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[8] Martha R. Baldwin, "Toads and Plague: Amulet Therapy in Seventeenth-Century Medicine," *Bulletin of the History of Medicine* 67 (1993): 227–247. An Englished *De Febribus* came out in 1684 as *Dr. Willis's Practice of Physick: Being the Whole Works of that Renowned and Famous Physician*…, trans. Samuel Pordage (London: T. Dring, C. Harper, and J. Leigh, 1684); Boyle's claims can be found in "Of the Usefulness of Natural Philosophy," in *The Works of the Honourable Robert Boyle*, ed. Thomas Birch, 2nd ed., 6 vols. (London: J and F. Rivington, 1772), 2: 160.

[9] Kenneth Dewhurst, *Thomas Willis as Physician* (Los Angeles: University of California Press, 1964), 9. Details have come down to us in the notebooks of Willis' student, John Locke.

[10] John Securis, *A Detection and Querimonie of the Daily Enormities and Abuses Commited in Physick* (London: Thomas Marsh, 1655), quoted in Andrew Wear, "The Popularization of Medicine in Early Modern England," in *The Popularization of Medicine 1650–1850*, edited by Roy Porter (London: Routledge, 1992), 23.

recipes not designed specifically for them or that they would ignore well-known astrological prohibitions. Lamentably, several of Primrose's published Latin recommendations could have benefited everyone, particularly his admonition to change the linen of the unwell and his denial that gold boiled in broth cured consumption.[11] University-trained medicos additionally thought that natural philosophy, a subject impossible to probe in a vulgar tongue, was the bedrock of their study, "the true foundation of physick."[12] Objections by physicians to medical publishing in the vernacular displayed real apprehension for the ultimate public value of professional care. English-language books undercut a degreed doctor's practice, cheapened his investment in his own education, and diminished his potential earnings. And those who fretted even over the publication of Latin medical tomes could point to what happened to Thomas Willis's oeuvre; all his works were translated into English within a few years of his death in 1675, most by Samuel Pordage, a bad poet and virulent anti-papist who styled himself a student of medicine. Nonetheless, many physicians, even Fellows of the Royal College of Physicians, brought English-language medical books into print because of their profitability. Sometimes they did so anonymously, like the author of *The Method of Chemical Philosophie and Physicke* who in 1664 signed his preface with the Greek characters "Philagathou."[13] Others, like Willis, published attributable works to increase knowledge among the community of medical scientists and to enhance their status in that community.

In 1664 Willis published *Cerebri anatome*, illustrated by Christopher Wren; it contained the first full description of the seventh cranial nerve, the so-called "nerve of Willis." A devout member of the Church of England, Willis dedicated his book to the Archbishop of Canterbury, his close friend Gilbert Sheldon.[14] Willis is still associated with the anastomosis at the base of the brain, the eponymous "circle of Willis."

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[11] James Primrose, *Popular Errours* (London: W. Wilson, 1651). Not all of Primrose's assertions were valid; he contradicted William Harvey's circulation of the blood.

[12] Securis, quoted in Wear, *Knowledge and Practice*, 42.

[13] Anonymous, *The Method of Chemical Philosophie and Physick* (London: J[ohn] G[rismond] for Nathaniel Brook, 1664). Anonymous may have been Humphrey Blunden, according to the original copy at the Folger Shakespeare Library, Washington, D.C.; Blunden was a well-known London printer, but he died in 1654. For more on the nexus between print and pills, see Elizabeth Lane Furdell, *Publishing and Medicine in Early Modern England* (Rochester, N.Y.: University of Rochester Press/Boydell and Brewer, 2002).

[14] Willis was well-connected; he married Mary Fell, daughter and sister of successive

He developed a large, fashionable practice in London, helped to form the Royal Society, and consulted regularly on the health of the family of James, Duke of York. Evidently, however, he insulted the duke, who evinced open sympathy to Roman Catholicism, and was dropped from the royal list of medical specialists.[15]

Thomas Willis' colleagues at Oxford openly disdained uroscopy as the practice of charlatans and "piss prophets" like Paracelsus. One Restoration-era advertising quack, "the Famous High German, Turkish and Imperial Physician," claimed to "cast all sorts of human urine."[16] But as Roy Porter pointed out, medicine practiced in the marketplace by the unlicensed fringe was hardly alternative medicine; indeed, "their notions of health and disease, and therapeutic orientation were remarkably convergent."[17] Galenic medicine had sanctioned uroscopy for centuries and classically trained doctors routinely examined their patients' urine, an analysis they called "water-casting". Willis praised the classical heritage of urine examination and the common sense of seeking the body's judgment in its own "infused liquor."[18] But echoing Paracelsus in his criticism of uroscopists who only looked at the visible features of urine, Willis criticized the "Medicasters and Quacks for the most part behold the urine sent in a Glass, shake it a little, and presently give Judgment."[19] He wrote a treatise on urine that was assembled posthumously into a volume with four other essays and first published in 1681 by a consortium of bookmen. In it Willis anatomized urine, seeking through "spagirick (chemical) analysis" to describe its parts "beyond the vulgar and plainly empirical manner of philosophising," and proffered the "rules and the certitude of uromancy." He noted that sick people often produce profuse amounts of urine, "twice or thrice as much water as the liquids they have taken in," but that the causes and significance of this phenomenon are "very divers."[20]

Oxford Vice-Chancellors. He did splendidly at Oxford, enjoying an enormous income of £300 per annum: Dewhurst, *Willis as Physician*, 12.

[15] Willis, with his customary frankness, opined that the early deaths of several of the Yorks's children could be due to the hereditary taint of congenital syphilis. See Dewhurst, *Willis's Lectures*, 23.

[16] Collection of Medical Advertisements, BL C112, f. 9 (77), British Library.

[17] Roy Porter, *Quacks: Fakers and Charlatans in English Medicine* (Stroud, England: Tempus, 2000), 118.

[18] Thomas Willis, *Five Treatises* (London: Thomas Dring, Charles Harper, John Leigh and Simon Martin, 1681), "Author's Epistle to Dr. Bathurst," B.

[19] Thomas Willis, "Of Urines," in *Practice of Physick*, 17.

[20] Willis, *Five Treatises*, "Author's Epistle," C.

Like Paracelsus, Willis suggested evaporation, distillation, and precipitation of urine to evaluate changes in the body's elements caused by disease. He subjected urine to heat and cold, strained it through brown paper, and let it evaporate so that crystals and coagulations might be better studied. Willis illustrated his advice with the case "of a Gentleman, grievously subject to convulsive motions and painful stretchings out of the Muscles." Evaporating his patient's urine, Willis found "a quantity of salt and tartarous matter, exceeding the weight of half the liquor." From this residue one could discern the "proportion of the saline Principle in the blood and homours: but whether this Salt be volatile, or becomes fixed beyond measure, the distillation of the urine will presently shew."[21] He construed from cases like this that the urine of the ill contrasted with that of the healthy in two noteworthy respects. First, insalubrious urine either lacked sufficient color, consistency, content, and quantity to a noticeable degree or displayed these properties extravagantly. Second, the urine of the unwell "is sometimes wholly altered from the natural state," allowing the physician to "observe the state and progress of every disease," chronic or acute. Willis warned, however, that the taking of certain medicines influenced urine hue and might similarly tint a doctor's diagnosis. Saffron, for instance, produced bright yellow urine that could mimic a symptom of jaundice; cassia darkened urine and might lead to attributing such a symptom to a "melancholick tumor." Likewise, certain medications can convert the odor of urine into something smelling like violets or "stinking grievously."[22]

Differentiating among kinds of diabetes unlike his contemporaries, Willis actually sampled diabetic urine and found that it was not salty, but "so wonderfully sweet [with] a honeyed taste."[23] Moreover, Willis maintained that the disease was no longer rare, but had been escalating in incidence since Galen's era. He blamed this surge in sickness on the exorbitant consumption of food and wine among his contemporaries,

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[21] Willis, "Of Urines," 18.

[22] Ibid., D2. Willis mentions asparagus, garlic, balsam of sulphur, and Rhenish wine causing strong stench in the urine.

[23] Although some historians point to a rediscovery of Suśruta's works before 1675, Willis would likely not have known that Chinese and Indian medical writings of the second to sixth centuries already referenced the sweetness of diabetic urine; these texts, however, exerted little or no impact on the development of early modern western medicine. See B.L. Gordon, *Medieval and Renaissance Medicine* (New York: Philosophical Library, 1959), 542.

the "first consumer society" devoted to affluence and leisure.[24] "In our age, given to good fellowship and guzzling down chiefly unallayed wine, we meet with examples and instances enough, I may say daily, of the disease."[25]

Although a range of populations has acquired different dietary conditions and foodstuffs have mutated over the years, making it difficult to evaluate historical nutrition according to modern standards, many consistent physiological effects transcend time and culture. According to food historian Ken Albala, "a clear causal connection between food and sickness must have had clear biological meaning" to past medical writers, whether confirming an ancient authority or challenging past iatric doctrine.[26] Those connections abound even in the fractious seventeenth century. Earlier Galenic advice printed in Jacobean England presaged Thomas Willis' admonitions against gluttony and overindulgence by two generations. *The Englishmans Doctor* (1608) chided its readers in verse:

> Great suppers do the stomach much offend,
> Sup light if quiet you to sleep intend.
>
> To keep good diet, you should never feed
> Until you find your stomach clean and void
> Of former eaten meat, for they do breed
> Repletion, and will cause you soon be cloyed.[27]

Shorter printed pieces courted and counseled a specialized audience, such as those Hugh Plat attempted to reach in 1607 with the broadside publication of *Certain Philosophical Preparations of Food*. In it he instructed in basic humoral language those who might prepare the meals of sea-

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[24] For British sugar consumption as a possible explanation for a diabetic wave, see James Walvin, *Fruits of Empire: Exotic Produce and British Taste, 1600–1800* (New York: New York University Press, 1997), 117–131. The flood of imported port and other fortified wines promoted health problems including diabetes; Roy Porter and G.S. Rousseau, *Gout* (New Haven, Conn.: Yale University Press, 1998), 49.

[25] Thomas Willis, *Pharmaceutice Rationalis or An Exercitation of the Operations of Medicines in Humane Bodies*, 2nd ed., trans. Samuel Pordage, 2 parts (London: Printed for Thomas Dring, Charles Harper, and John Leigh, 1684), 71. Pordage crafted an alphabetical table from Willis' opus and prefaced it with a two-page verse hinting at the intricacies of nature: Frank N. Allan, "The Writings of Thomas Willis, M.D.," *Diabetes* 2/1 (1953): 77–78.

[26] Ken Albala, *Eating Right in the Renaissance* (Berkeley: University of California Press, 2002), 10.

[27] John Herington, trans., *The Englishmans Doctor or The School of Salerno* (London: John Helme and John Busby, Jr., 1608), verses 79 and 80.

men or need to tend to them on long voyages. Plat recommended macaroni as a safe and fresh victual, broths of all sorts, beverages such fresh or distilled water, lemon and orange juice to stave off scurvy, wine, beer and vinegar, and "Hermetical medicines and antidotes" for ague, headaches, piles and constipation. Following his advice, he asserted, would prepare and sustain sailors for their difficult journeys away from home.[28]Although not the first to do so, Willis accurately assessed the diet of the wealthy, who ate "vast amounts of meat, prepared in increasingly elaborate ways and served with growing ostentation." They washed down their hearty portions of beef or lamb with beer and wine, slathered their bread with butter, and plopped a large dollop in the center of their Cambridge puddings; they also cooked food in butter, always frying fish in it. Calorie-laden sauces for meat only exacerbated the unhealthy nature of their main courses; chawdon was composed of liver, entrails, blood, bread and ginger.[29] Even as some variety seeped into English cuisine, the well-to-do consumed too many animal fats, perhaps to dangerously high levels.[30] However, fresh-butchered meat was too dear for most of the middling kind. In 1651 Charles II's reasonably comfortable hosts, the Pendrills, sheltering him after the Battle of Worcester, asked him what he would like for dinner; he requested mutton, a commodity they did not have in the house nor would have except for some extraordinary event. Buying mutton would call attention to the fact that they were doing something or feeding someone great.[31]

While calculating the diet of those lower on the economic pyramid remains problematic, food historians believe they often ate healthier during times of plenty than their social betters, consuming whole grains and vegetables that the aristocracy thought vulgar.[32] The rural poor ate

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[28] Hugh Plat, *Certain Philosophical Preparations of Food* (London: H.P. Miles, 1607). Plat also penned early seventeenth-century guidance on distillations and husbandry.

[29] Ken Albala, *Food in Early Modern Europe* (Westport, Conn.: Greenwood Press, 2003), 166, 170. A recipe for chawdon is recorded in *Boke of Kervynge* in Frederick J. Furnivall, ed., *Early English Meals and Manners* (London: Early English Text Society, 1836), 36. A Cambridge Pudding appears in John Murrell's *New Book of Cookery* in 1615. Albala notes an increased use of butter in the seventeenth century.

[30] Andrew B. Appleby, "Diet in Sixteenth-Century England," in Charles Webster, ed., *Health, Medicine and Mortality in the Sixteenth Century* (Cambridge: Cambridge University Press, 1979), 97–103.

[31] Mary Abbott, *Life Cycles in England, 1560–1720* (London: Routledge, 1996), 12. The Pendrills obtained a stolen lamb to provide the king with the meal he wanted.

[32] Appleby notes that the protein content of the grain grown in Tudor-Stuart Eng-

nutritious peas and beans, usually deemed animal food, during years of bad harvests, though even they resisted a supplement they considered inferior when conditions improved. City-dwellers likely fared worse, subject to dietary deterioration even more marked when crop failed. Surely, Londoners and other urbanites would have been more vulnerable to epidemic diseases of the era, given their variable food intake.[33] Likewise, would not the nobility have been susceptible to a disease like Type 2 diabetes, given that class's proclivity to devour in superfluous quantities the very foods which contribute to high blood pressure, high cholesterol and diabetes? No wonder that Willis noted an increasing number of his aristocratic patients exhibiting signs of diabetic polyuria.

In 1674 Willis devoted a section of a chapter in his *Pharmaceutice Rationalis* to "the pissing evil," inquiring into the theory and method of curing it. Writing from Guy's Hospital in London, he presented the cardinal symptoms of the disease, marveling at the "swift passing of potulent matter and the great flux of urine." Skilled at close, clinical observation, Willis evidently recognized diabetic neuropathy in patients, recounting their complaints of "stinging and other…frequent contractions or convulsions, twinging of the tendons and other disturbances…."[34] He related a case study, that of "a certain noble earl, renowned not only for the splendor of his birth, but for the extraordinary qualifications and endowments of his mind." Willis described his patient in Galenic terms; he had a sanguine temper, a florid complexion. But "in the very vigor of his age (nobody knows upon what occasion) became much inclined to excessive pissing … [and] … in the space of twenty-four hours, he voided almost a gallon and a half of limpid, clear, and wonderful sweet water, that tasted as if it has been mixed with honey."[35] By rediscovering for European medicine the sweet taste of diabetic urine, Willis

land remains unknown as does the caloric intake of early modern Englishmen and women: "Diet in Sixteenth-Century England," 108, 116.

[33] Andrew B. Appleby, "Nutrition and Disease: The Case of London, 1559–1750," *Journal of Interdisciplinary History* 6 (1971): 1–22.

[34] Willis, *Pharmaceutice Rationalis*, 73. Dewhurst asserts that Willis' classical description of diabetes "redeems to some extent" the faults of *Pharmaceutice Rationalis*: Dewhurst, *Willis's Lectures*, 24.

[35] Willis, *Pharmaceutice Rationalis*, 76. Though Willis never identified the nobleman, he enjoyed "a golden core" practice among the rich and famous, owing to his powerful patron, the Archbishop of Canterbury. Among his clients were Lord Robert Brook, the Duchess of Somerset, and Lord Ashley. He owed some success to a marriage that made John Fell, University Vice-Chancellor and Bishop of Oxford, his brother-in-law: Dewhurst, *Willis's Lectures*, 23, 26.

inadvertently contributed to the science of endocrinology.[36] Moreover, he inspired other scientists to engage in experiments on the physiology of the digestive system, including the Swiss anatomist Johann Conrad Brunner who met Willis while visiting London. Dr. Brunner's excisions of the pancreases of dogs in 1683 led him to observe extreme thirst and polyuria in the animals. Through his investigations, Brunner became the true discoverer of pancreatic diabetes.[37]

Willis perceived that diabetes was a complex disease. Unlike his iatric counterparts, he was reluctant to announce a cure for every ailment that he studied and diabetes truly perplexed him. "It seems a most hard thing in this disease to draw propositions for curing, for that its cause lies so deeply hid, and hath its origin so deep and remote."[38] He theorized that a "thickening and moderately cooling diet and cordials" should prove good for this ailment; specifically, he mentioned rice, white starch, slimy vegetables, as well as gums and resinous bodies to mediate the drastic production of urine. And, of course, he administered particular medicines, employed on his noble patient after consultation with Doctors John Micklethwaite and Thomas Witherly, physicians to Charles II. Willis proffered a milk drink distilled with cypress tops and egg whites, two powders—one a mixture of gum arabic and gum dragant—the other pulverized rhubarb and cinnamon, and a potion of various waters to be taken nightly. For a month the sick man ate only bread boiled in milk and seemed to improve, even expelling less urine than what liquids he drank, but "recovering his usual tenure of spirits and strength, he returned to his former diet."

Willis soon assumed that "disorders in his diet and perhaps irregularities in the seasons of the year" contributed to his patient's subsequent relapse, for soon the earl was making "water in great quantities …clear and sweet with thirstiness, feverishness and languishment of his

[36] Hans H. Simmer, "The Beginning of Endocrinology," in *Medicine in Seventeenth Century England*, edited by Allen G. Debus (Berkeley: University of California Press, 1974), 234.

[37] For more, see Ralph H. Major, "Johann Conrad Brunner and His Experiments on the Pancreas," *Annals of Medical History*, Third Series, 3/2 (March 1941): 91–100; and Ole Christian Zimmermann, "The First Description of the Symptoms of Experimental Pancreatic Diabetes by the Swiss Johann Conrad Brunner," in *Diabetes: Its Medical and Cultural History*, edited by Dietrich von Engelhardt (Berlin: Springer-Verlag, 1989), 209–228. John Dallas prepared a leaflet for the Royal College of Physicians of Edinburgh's exhibition on "Diabetes, Doctors and Dogs" for its St. Andrew's Day Festival Symposium in 2006.

[38] Willis, *Pharmceutice Rationalis*, 75.

spirits." On several occasions, when the patient used the appropriate medicines and partook of abstemious nourishment, he got better; eventually, however, more symptoms appeared, including "sudden convulsions in his limbs [and] twinges of the tendons." This time, his doctors added "water of flaked lime" to be imbibed thrice daily, and he again waxed "as well as ever he had been."[39] Willis seems to have made a clear connection between undernutrition and the temporary relief of diabetic symptoms, but he did not associate the presence or absence of certain foodstuffs with patient relief.[40]

Willis inspired copycat healers to claim they understood diabetes and could cure it. John Pechey published *The Storehouse of Physical Practice* in 1695, plagiarizing Willis, his remedies, and the case of the afflicted aristocrat. Pechey wrote: "I have prescribed in this disease the tincture of antimony with good success, and lime water, with the seeds of anise, raisins and licorice, is much commended by some." Implying that the nobleman was his patient, Pechey continued, he "was cured in a short time by the following medicines: eight handfuls of the tops of cypress, one quart of egg whites, and one-half ounce of cinnamon, stirred together in four quarts of new milk; the mixture should then be distilled in a cold still and given to the patient six ounces at a time, three times daily." Pechey claimed that he "cured another of a deplorable diabetes by the same method, especially with lime water." The patient, after the lime water treatment, voided urine "somewhat salt."[41]

While Willis' clinical observations were fairly accurate and diabetes came to be known in England as Willis' Disease, his analysis of the etiology of the disease, however, was no better than the speculation of others like Pechey. The common assumption among Willis' colleagues held that the malady originated solely in the kidneys (the reins), but Willis propounded that the trouble lay mainly in the blood, where naturally occurring salts are contaminated by "nervous juice" or "acid humors"

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[39] Ibid., 76.

[40] An early variation of the low carbohydrate diet was tried on a diabetic patient of Irish physician George Alley to great effect in 1806; Dr. Alley prescribed boiled beef, soup, and quinine for the emaciated man. See George Alley, "History of a Case of Diabetes Mellitus, Successfully Treated by Animal Diet and the Use of Cinchona," *Edinburgh Medical and Surgical Journal*, Third Series 4 (1808): 35–41.

[41] John Pechey, *The Store-house of Physical Practice* (London: Henry Bonwicke, 1695), 302–303. An advertisement on page 545 of the Pechey book trumpets the virtues of Purging Pills, sold by bookseller Bonwicke at the Red Lyon in St. Paul's churchyard for one shilling, sixpence per box.

from the nerves. "Watery particles" in the blood "cannot be kept in by the thicker ones, but flying quickly out of their embraces, … [are] impregnated with salt ones…."[42] Willis employed the fundamentals of iatromechanics (or iatrophysics), a school of seventeenth-century medical thought he promoted, which asserted that all phenomena of disease were based on the laws of physics. Willis postulated that a distemper of the blood caused it to melt into serum, separated by a sort of percolation, and manifested in the great quantity of urine. Sometimes however, he conceded, the kidneys amplify the disease by "excessive vitiation of their ferment," but he repeated that the origins of the disease remained unexplained.[43] Indeed, seventeenth-century doctors evinced little passion towards finding the origins of any disease, perhaps because physicians like Willis remained unaware of the delineation between treating the symptoms of a disease and its causes or because they assumed that the roots of the disorder were effectively recognized. But why did a certain patient have "distempered" blood? Why did the kidneys of some people amplify that "excessive vitiation of their ferment?" If there were distinctions among men in their temperaments and constitutions, as humoral traditions emphasized, might there not also be differences in their physiology?[44]

Medicine in early modern England was riddled with dissension and strife, evident even among credentialed Oxbridge-educated colleagues. Learned doctors contradicted one another in person and in print, advancing theoretical and personal rancor. Serving opposite sides in the Civil War further exacerbated the already existing medical turmoil and led to inflammatory disagreements over the body politic. Thomas Sydenham, who fought in the Parliamentary army and whose mother was a civilian casualty of the war, matriculated at Wadham College, Oxford, in 1647, taking the place of a royalist Fellow at All Souls' College the following year. He received an unusual M.B. in 1648 by command of the university chancellor, the Earl of Pembroke, without having first completed the requisite arts degree.[45] Despite this favor, Sydenham found the curriculum at Oxford seriously lacking in clin-

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[42] Willis, *Pharmaceutice Rationalis*, 76.

[43] Simmer, "Beginning of Endocrinology," 234. See also T.M. Brown, "The College of Physicians and the Acceptance of Iatromechanics in England, 1665–1695," *Bulletin of the History of Medicine* 44 (1970): 12–30.

[44] A. Rupert Hall, "English Medicine in the Royal Society's Correspondence," *Medical History* 15 (1971): 119.

[45] Sydenham's partisan and fellow doctor, John Locke, would have disapproved;

ical studies. After developing a successful practice in Westminster in the mid 1650s, Sydenham left England when the Commonwealth disintegrated and, although not all scholars concur, likely enrolled at the University of Montpellier in France in 1659.[46] There, he found medical studies more to his philosophical liking and a faculty independent of the Galenists who dominated other French faculties. Its more liberal climate enabled doctors and surgeons to work cooperatively in teaching anatomy and its pedagogues were among the first to adopt the circulation of the blood. Not only did Montpellier offer Sydenham an alternative to the outmoded Oxbridge methods of learning medicine by listening to professors lecture on classical commentaries, but also its reputation was deservedly prestigious due to the severity of its examinations and the stature of its faculty.[47]

Sydenham returned to England in 1663 but he remained on the periphery of the medical aristocracy, never rising any higher than licentiate of the Royal College of Physicians and never joining the Royal Society, probably because his French medical studies were not "incorporated" into a native doctorate until 1676 by Cambridge.[48] Sydenham subscribed to the populist view of some medical reformers that keeping iatric secrets was inexcusable, withholding vital therapeutic information from other healers and basic wellness regimes from the public. He published extensively, but his essays were not written in esoteric Latin; in fact, Gilbert Havers and John Mapletoft translated some from the vernacular into Latin, presumably to give these works more cred-

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he prescribed the traditional curriculum at Oxford while a tutor for undergraduate students: Frank, "Science, Medicine and the Universities: Part II," 253.

[46] R.G. Latham, editor of Sydenham's works, thinks Sydenham likely visited Montpellier between 1649 and 1651: Latham, ed., *The Works of Thomas Sydenham*, 2 vols. (London: Sydenham Society, 1848–1850) 1: xxiii–xxiv. However, F.N.L. Poynter thought it odd that Sydenham, supposedly schooled in France, could not read or speak French; he named Locke and not Sydenham as the Montpellier student who brought back its curricular messages: F.N.L. Poynter, "Sydenham's Influence Abroad," *Medical History* 17 (1973): 225.

[47] Charles Coury, "The Teaching of Medicine in France from the Beginning of the Seventeenth Century," in *The History of Medical Education*, edited by Charles D. O'Malley (Berkeley: University of California Press, 1970), 124, 133, 143; Laurence W. Brockliss, *French Higher Education in the Seventeenth and Eighteenth Centuries* (Oxford: Clarendon Press, 1987), 74–75, 392.

[48] A. Rupert Hall maintains that while Sydenham may not have been openly hostile to the Royal Society, he "must have regarded its pursuits as quite vain, if not indeed damaging to the advance of medicine by clinical observation:" Hall, "English Medicine in the Royal Society's Correspondence," 111.

ibility within the medical establishment. Historian Andrew Cunningham points out that while handwritten English manuscripts by Sydenham exist, his books were published in Latin and should be treated as "original" texts. However, R.G. Latham, Victorian-era editor of Sydenham's works, lamented that the "merits of the Latinity, if not Sydenham's, should … have been attributed … or disclaimed," but were not, thereby giving the impression that Sydenham appeared "a better Latinist than he is."[49] In 1666 Sydenham produced his major publication, *Methodus Curandi Febres, Propriis Observationibus Superstructa (Method of Curing Fevers, Based upon My Own Observations)*. Dealing with the epidemic fevers of 1661–1664, his theories and methodologies proclaimed him "out of harmony with the chemical school, represented by Willis."[50] Additionally, Sydenham did not openly espouse, as did Willis, the Harveian circulation of the blood.[51]

Sydenham built his practice among the poor, partly because of his ethical convictions and partly because political circumstance determined his clientele.[52] Though he had been close to famed natural philosopher Robert Boyle and dedicated his book on epidemic fevers to him, their political aims diverged after the Restoration. While the more moderate Boyle hoped to temper the Stuart regime through experimental philosophy, Sydenham "never gave up his political ideals" and made his medicine "the focus and expression of his politics."[53] Moreover, Sydenham split with Boyle and others over the appropriateness of laboratory-centered medical research. Andrew Cunningham finds it ironic that Sydenham came to be called "the English Hippocrates;" indeed, most of Sydenham's scientifically oriented contem-

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[49] Andrew Cunningham, "Thomas Sydenham and the 'Good Old Cause,'" *The Medical Revolution of the Seventeenth Century*, edited by Roger French and Andrew Wear (Cambridge: Cambridge University Press, 1989), 165; Latham, *Works of Sydenham*, 1: lxiv. For rumors about translators, see Joseph Francis Payne, *Thomas Sydenham* (London: T.F. Unwin, 1900), Ch. 13.

[50] Payne, *Sydenham*, 229.

[51] L.J. Rather, "Pathology at Mid-Century: A Reassessment of Thomas Willis and Thomas Sydenham," in *Medicine in Seventeenth Century England*, edited by Allen G. Debus (Berkeley: University of California Press, 1974), 76–77. Nonetheless, Rather thinks that Sydenham "probably accepted the Harveian account of the circulation."

[52] Cunningham, "Thomas Sydenham and the 'Good Old Cause,'" 176. Cunningham asserts that Sydenham would not have "researched" epidemic fevers as he did were it not for the vast numbers of patients he treated.

[53] Ibid., 173. David E. Wolfe doubts that Sydenham and Boyle were close friends: Wolfe, "Sydenham and Locke on the Limits of Anatomy," *Bulletin of the History of Medicine* 35 (1961): 194.

poraries derided him.[54] Sydenham did not concern himself with the causes of disease because he insisted that looking for the origins of ailments was pointless. His purported method of finding cures, his *experimenta*, amounted to little more than trial and error at the bedside.[55]

Practical experience with sick patients and not scientific experiments in the laboratory mattered most to Thomas Sydenham. The physician's duty self-constrains to "the outer husk of things," which is all his poor intellectual ability allows anyway: "No speculations deduced from the contemplation of the human frame will ever be able to discover and exhibit" the divine essence at the base of most diseases.[56] To avoid prideful sinning against God, the doctor must refrain anatomizing with instruments. Moreover, Oxonians and Cantabrigians who had been taught anatomy by reading ancient classics in Sydenham's view lacked the professional preparation that clinical experience provided and he missed no opportunity to question the findings of his iatric, partisan antagonists. Additionally, Sydenham came to reject Galenism when he found that certain specific medicines like quinine did not fit the humoral mold. He eventually abandoned humoral pathology altogether and urged his colleagues to follow suit.[57]

Furthermore, Sydenham recoiled from anatomical dissections, microscopic analysis, and post-mortem observations. Others, he wrote, "have more pompously and speciously prosecuted the promotion of this art by searching into the bowels of dead and living creatures, as well sound as diseased, to find out the seeds of discharging them, but with how little success such endeavours appear."[58] Boyle, Willis' collaborator Wren, and other associates of Sydenham embraced animal experiments, chemical analyses of body fluids, and anatomical studies, believing that any new knowledge might lead to better understanding of the causes of disease. Boyle wrote that anatomical discoveries "in the

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[54] One who praised him was Herman Boerhaave, from 1701 professor of medicine, botany and chemistry at the University of Leiden. In his inaugural lecture as chair of medicine, Boerhaave called Sydenham "the shining light of England, that Apollo of the Art:" quoted in Poynter, "Sydenham's Influence Abroad," 226.

[55] Cunningham, "Thomas Sydenham and the 'Good Old Cause,'" 184–189. Cunningham asserts that Boerhaave bolstered Sydenham's reputation as a hero of sensible bedside medicine.

[56] Latham, *Works of Sydenham* 1: 102; 2: 171.

[57] Kenneth Dewhurst, *Dr. Thomas Sydenham: His Life and Original Writings* (Berkeley: University of California Press, 1966), 63.

[58] Quoted in H.R. Fox Bourne, *The Life of John Locke*, 2 vols. (London: King, 1876) 1: 228.

process of time (when the *historia facti* shall be fully and indisputably made out, and the theories thereby suggested clearly established) highly conduce to the improvement of the therapeutical part of physick.…"[59] Willis himself performed several autopsies on patients including a complete post-mortem on a noblewoman in 1667. Indeed, the Anglican elite generally sanctioned autopsy, sharing that view that whatever was determined aided science and supported learned medicine.[60]

By virtue of political and philosophical differences aggravated by dissimilar levels of professional success and esteem, Thomas Willis and Thomas Sydenham epitomized the combative nature of seventeenth-century English medicine. Hence, Willis' identification of "sugar diabetes" inevitably ignited a negative response, sparked by Sydenham but through the pen of Frederick Slare, like Willis a Fellow of both the Royal College of Physicians and the Royal Society. Slare, acknowledging in another publication that he was "under the influence of Sydenham," repudiated Willis' attack on sugar as part of a general rejection of all his experiments.[61] *A Vindication of Sugars against the Charge of Dr. Willis* was printed by Tim Goodwin and bundled together with some of Slare's other writings. In it Slare takes pains to decipher Willis' Latin "impeachment of sugar" for the reader and to note that the good physician, though he condemned sugar as "a sharp and corrosive salt…a little touched with sulphur," used plenty of the sweetener in his own electuaries and syrups. Moreover, Slare blamed Willis for the subsequent censure of sugar by famed botanist John Ray, a condemnation that could easily "frighten the credulous, especially those not used to make experiments from its use."[62]

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[59] Robert Boyle, "On the Usefulness of Natural Philosophy," *The Works of the Honorable Robert Boyle*, edited by Thomas Birch, 6 vols., (London: Rivington, 1772) 2: 163–164. See also Barbara Kaplan, *'Divulging of Useful Truths in Physick': The Medical Agenda of Robert Boyle* (Baltimore, Md.: Johns Hopkins University Press, 1993).

[60] Robert L. Martensen, "'Habit of Reason': Anatomy and Anglicanism in Restoration England," *Bulletin of the History of Medicine* 66 (1992): 521–523. For Sydenham's outlook on basic medical science, see David E. Wolfe, "Sydenham and Locke on the Limits of Anatomy," *Bulletin of the History of Medicine* 35 (1961): 193–220.

[61] Frederick Slare, *An Account of the Nature and Excellent Properties of Pyrmont Waters* (London: Joseph Downing, 1717), 17.

[62] Frederick Slare, *Experiments and Observations upon Oriental and Other Bezoar-Stones …to which is annexed A Vindication of Sugars against the Charge of Dr. Willis* (London: Tim Goodwin, 1715), 22–23. Slare dedicated his Vindication "to the ladies…patronesses of the fair sugar." See also Charlotte Sussman, *Consuming Anxieties* (Stanford, Cal.: Stanford University Press, 2000), 111.

Sydenham had his critics, too. London practitioner Gideon Harvey called him a quack, devoid of rational remedies and lacking any coherent system of treatment.[63] Robert Brady, a physician-in-ordinary to Charles II and Regius Professor of Medicine at Cambridge, wrote a courteous, but faultfinding letter to Sydenham in December 1670 questioning some of his methods. In particular, Brady challenged Sydenham to make known any observations that might add to or refute Brady's findings concerning environmental influences on epidemic fevers or about his recommended dosage of Jesuits' Bark for ague. Additionally, Brady spurned Sydenham's "prodigal" spilling of blood in the treatment of rheumatism.[64] Walter Charlton, doctor to Charles II and President of the Royal College of Physicians, publicly disagreed with Sydenham's contempt for "the pathologic part of medicine, …the useful art of anatomy," which Charlton believed would "more certainly and easily cure the infirmities of men's bodies."[65] And zoologist-Fellow of the Royal Society Martin Lister, M.D., excoriated Sydenham, a mere "follower," for his inept administration of cinchona. Though Lister was a medical conservative, he asserted that he himself was among the first to use cinchona as an antidote for ague and resented Sydenham's claim to have perfected application of the "Peruvian cortex." Lister wrote that Genoese physician Sebastiano Bado had demonstrated more insight into the bark's efficacy a generation earlier.[66] In the years following Sydenham's death, Scottish physician James Keill criticized him for "rejecting all knowledge of the animal oeconomy" and displaying a "sort of discourse [that is] the refuge of idleness and ignorance."[67] Willis himself likely fumed over Sydenham's tactics, especially the latter's pla-

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[63] Gideon Harvey, *The Conclave of Physicians* (London: James Partridge, 1683), 96–100. Harvey was something of a fraud himself; he falsely refers to himself as "physician-in-ordinary to His Majesty" on the frontispiece of this anti-College of Physicians book.

[64] Brady's letter is included in Sydenham's *Epistolae Responsoriae Duae* (London: Walter Kettilby, 1680); see Latham, *Works of Sydenham*, 2: 4.

[65] The Charlton statement is from Walter Charlton, *Enquiries into Human Nature* (London: Boulton, 1680), preface.

[66] Martin Lister, *Sex Exercitationes Medicinales de Quibusdam Morbid Chronicis* (London: Smith and Walford, 1694). Part Two of this work is on diabetes. Bado, associated with the Jesuits (and Jesuits' Bark, another name for cinchona), wrote *Anastasis Corticis Peruviae* in 1663. I thank Brian Striar for help in deciphering Lister's fragmentary Latin comments. For a biographical sketch of Lister see Martin Lister, *A Journey to Paris in the Year 1698*, edited by R.P. Stearns (Urbana: University of Illinois Press, 1967).

[67] James Keill, *Essays on Several Parts of the Animal Oeconomy*, 4th ed. (London: G. Strahan, 1738), xxii. Keill's attack first appeared in 1708 under a different title.

giarism of the former on the subject of hysteria. Sydenham borrowed not only Willis' ideas but his language as well, both uncredited.[68]

Given their history of iatric antagonism, it should not be surprising that Sydenham insinuated that he found diabetes easier to cure than did Willis. Sydenham avowed that the disease was systemic, emanating from the incomplete digestion of chyle, the milky fluid of lymph and emulsified triglyceride fat formed in the small intestine. Chyle passes into the veins by the thoracic duct, becoming mixed with the blood.[69] As he described diabetes in *Progressus Integri*:

> the juices of the blood make a way out through the urinary passages, in an unconnected form. Hence the strength gradually lessens, and the body weakens, its substance being, as it were, pumped out through the common sink of the bladder.

Sydenham declared that the diabetic's symptom of inordinate urination was related to excretion of non-absorbable chyle and led to another manifestation of the disease, unquenchable dehydration. "Then there are thirst, heat of the viscera, swelling of the legs and hips, and the frequent expectoration of a viscid and frothy saliva."[70]

For diabetics he confidently prescribed the treatment outlined for "fluor albus" (leukorrhea), but without the considerable bleeding and purging he usually urged. Sydenham truly feared that diabetes could be brought on in old men by improper bleeding and purging, when "their blood is so far weakened as to be incompetent to the assimilation of the juices of the ingesta, so that these seek an outlet in a crude and unconcocted form by the urinary ducts."[71] Sydenham maintained that restoration and invigoration of the blood should be a top priority in all types of diabetes. Among the medicines he stipulated for diabetics were pills made of castor and balsam of Peru, juleps concocted from rue-water and bryony, nutmeg-sized electuaries of Venice treacle, candied rinds, and gum arabic washed down with a cold infusion of herbs

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[68] Rather, "Pathology at Mid-Century," 109; see also Hansruedi Isler, *Thomas Willis 1621–1675* (New York: Hafner, 1968), 138–139.

[69] For more on seventeenth-century descriptions of chyle, see Thomas Bartholin, *The Anatomical History of Thomas Bartholinus* (London: Francis Le, 1653), chs. 1–2.

[70] Latham, *Works of Sydenham* 2: 282–283. For suppression of urine, Sydenham cured the earl of Salisbury by giving him a "quieting medicine at night and purging him the next day." Sydenham thought "bleeding would have been good, too, but [his patient had] an abhorency of it:" John Locke's journal, quoted in Dewhurst, *Dr. Thomas Sydenham*, 49.

[71] Latham, *Works of Sydenham*, 2: 17.

steeped in Canary wine. Sydenham advocated a diet of "digestible meats, without fruit and vegetables, [but with] sherry wine at dinner."[72]

Sydenham's emphasis on clinical observation struck a resonant chord with other physicians. Richard Morton, erstwhile doctor to William of Orange, followed his example of reliance on patient symptoms and explanations about how they felt without much reference to the medical literature of the day. In his book *Phthisiologia*, Morton discussed the various instances of wasting he had seen in his practice, concluding that conditions like gout, jaundice and diabetes underlay the phenomenon. Based on his own scrutiny, Morton believed some hereditary connection could be established for many diabetes cases.[73] Many contemporaries apparently also agreed with Sydenham's advice to refrain from an immoderate lifestyle in order to avoid health troubles. For instance, Thomas Cocke published *Kitchen-physick or, Advice to the Poor* in 1675, stressing the importance of a prudent diet in the prevention and cure of disease; he disdained overmedication as the product of greedy physicians and apothecaries.[74] And some surely made specific connections between diabetes and diet after Willis and Sydenham. Elias Ashmole, who had a bishop's license to practice medicine, recorded in his diary on 26 March 1686: "This night I pist so much, that I feared a Diabetes, notwithstanding I had kept my self very temperate all the Springtime." Of course, Ashmole, a lover of astrology and alchemy, also claimed that he had cured himself of an ague by hanging three spiders around his neck, demonstrating once again the transitional nature of seventeenth-century medicine.[75]

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[72] Ibid., 2: 282–283.

[73] Richard Morton, *Phthisiologia* (London: S. Smith and B. Walford, 1689); Joseph A. Silverman, "Richard Morton's Second Case of Anorexia Nervosa," *International Journal of Eating Disorders* 7 (2006): 439–441; and Bernard Dixon, "Diabetes and Tuberculosis: An Unhealthy Partnership," *The Lancet: Infectious Diseases* 7 (2007): 444.

[74] Thomas Cocke, *Kitchen-physick or, Advice to the Poor by Way of Dialogue* (London: s.n., 1675), 82–83. Doreen G. Nagy suggests that Cocke may have been inspired by the sixteenth-century physician Andrew Boorde, who wrote *Dyetary of Helth* in 1542: Nagy, *Popular Medicine in Seventeenth-Century England* (Bowling Green, Ohio: Bowling Green State University Popular Press, 1988), 92. For more on Boorde, see Elizabeth Lane Furdell, *The Royal Doctors: Medical Personnel in the Tudor and Stuart Courts* (Rochester, N.Y.: University of Rochester Press/Boydell and Brewer, 2001), 28–30.

[75] *Memoirs of the Life of That Learned Antiquary, Elias Ashmole, Esq. Drawn up by himself by way of a diary*. Published by C. Burnham (London: J. Roberts, 1717), 77. Ashmole described earlier self-treatments in *Autobiographical and Historical Notes*, 5 vols. (Oxford: Clarendon Press, 1966) 2: 393, 451, 453, 580.

Separated by political and philosophical contention, Willis and Sydenham embodied the partisan discord within early modern medicine in Britain.[76] They both, however, kept careful written records as mileposts on the road to greater knowledge about sickness and health. If any sort of collaborative medical ethic stretched across philosophical lines in their day, they might have built on the findings of one another, giving both bedside and laboratory standing in the search for scientific truths about disease in general and diabetes in particular.[77] Instead, the dueling Thomases put prejudice above probity. Despite their individual fame, they might have done more for the sick. One hundred years would pass before Matthew Dobson identified cane sugar as the sweetish white mass obtained by evaporation and based on this candied excretion argued for an improvement in digestion and assimilation. In the received dietetic tradition, however, Dobson's diabetic treatises recommended that his patients abstain from sexual activity and "gaiety of mind."[78] Given the popular meanings and mythologies associated with exceptional diseases like diabetes, however, it seems unlikely that individual sufferers in early modern England experienced much cheer during the malady's onslaught. The makeshift dietary regime, the social reaction to the more disconcerting manifestations of the disease, the patient's own erratic behavior, declining appearance, and painful sensations, all mark a life less than "wonderfully sweet."

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[76] For the impact of the Scientific Revolution on medical politics, see David S. Lux and Harold J. Cook, "Closed Circles or Open Networks? Communicating at a Distance during the Scientific Revolution," *History of Science* 36 (1998): 179–212.

[77] Margaret Pelling, taking issue with Geoffrey Holmes, argues that "professional" medical activity in the seventeenth century has been idealized and isolated among elite practitioners. See Pelling, "Medical Practice in Early Modern England: Trade or Profession," in *The Professions in Early Modern England*, edited by Wilfrid Prest (London: Croom Helm, 1987), 90–128; and Holmes, *Augustan England: Professions, State and Society, 1680–1730* (London: George Unwin and Allen, 1982), esp. chs 6–7.

[78] See Matthew Dobson, "Experiments and Observations on the Urine in a Diabetes," *Medical Observations and Inquiries* 5 (1776): 298–316; Frank N. Allan, "The History of the Treatment of Diabetes by Diet," *Essays on the History of Nutrition and Dietetics* 6 (1930): 1–9.

CHAPTER FIVE

RECONSTRUCTING DIABETIC LIFE IN EARLY MODERN ENGLAND

In 1731 Lord Hervey wrote an account of his illnesses, a testimony undertaken principally to inform his children about the nature of his ailments and to recommend ways to preserve health.[1] His published memoir is unusual in the annals of "pathography," defined by literary scholars as any narrative description of infirmity including biography, autobiography, and case histories, since it is almost exclusively a modern genre, uncommon before 1950 and rarely found before 1900.[2] Although some Victorian invalids committed their experiences to print, their accounts make little mention of the actual maladies that confined them to their sickrooms. Few literate sufferers in early modern England chose to divulge their battles with disease in public at all, especially with incessant ill health such as caused by diabetes, because past generations viewed sickness as private and interior, punishment for sin or the result of some unknown malevolence.[3] Preserved family diaries and letters can

[1] John Hervey, "An Account of My Own Constitution and Illness," in *Some Materials towards Memoirs of the Reign of King George II*, 3 vols. (New York: AMS Press, reprint 1970), 3: Appendix II. I thank the Wellcome Trust for a summer travel grant used to support research for this chapter.

[2] Anne Hunsaker Hawkins, *Reconstructing Illness*, 2nd ed. (West Lafayette, Ind.: Purdue University Press, 1999), xiv. Some recent diabetic pathographies include Mary Kay Blakely, *Wake Me When It's Over* (New York: Crown Publishing, 1989); Deb Butterfield, *Showdown with Diabetes* (New York: Norton, 1999); Denise Bradley, *What Does It Feel Like to Have Diabetes?* (Springfield, Ill.: Thomas Publishing, 1987); Mary Cooper Greene, *Living with a Broken Spring* (1987); Gloria Hightower, *Sweet Pea* (Boston: Christopher Publishing, 1994); Lawrence Pray, *Journey of a Diabetic* (New York: Simon and Schuster, 1983); Lisa Roney, *Sweet Invisible Body* (New York: Henry Holt, 1999); and James Dickey's poem "Diabetes," in *The Eye-Beaters, Blood, Victory, Madness, Buckhead and Mercy* (1971), 7–9. See also Arthur Frank, *The Wounded Storyteller* (Chicago: University of Chicago Press, 1995) and Arthur Kleinman, *The Illness Narratives* (New York: Basic Books, 1988).

[3] See Roy Porter, "The Patient in England, 1600–1800" in *Medicine in Society*, ed. Andrew Wear (Cambridge: Cambridge University Press, 1992). One who did write about his physical misery was John Donne in *Devotions upon Emergent Occasions*, composed after a typhus attack in 1623; see Anne H. Hawkins, "Two Pathographies: A Study in Illness and Literature," *Journal of Medicine and Philosophy* 9 (1984): 231–252. For Victorian era confessionals that combined truth and fictional elements in a hypochondriacal

provide some fragmented information about medicine from the recipients' view, but recovering that information from journals and correspondence about specific ailments like diabetes depends on some certainty that the writer actually had the disease, a nearly impossible task for the social historian.[4] The personal experiences and point-of-view of the illiterate diabetic went unrecorded altogether. Perhaps because of this scarcity of dependable, sustained first-person resources, published or unpublished, historians until recently tended to slight patients in their assessments of early modern medicine in general, focusing instead on the lives of physicians, elite and popular, on the theoretical and jurisdictional conflicts that beset the medical marketplace, or on sudden and catastrophic epidemics.[5] Yet chronic disease like diabetes imposed, then as now, an emotional as well as a physical toll on its victims, in addition to the economic and personal quandaries that families and society had to sort out when dealing with the deep-seated, lasting problems created by such a malady.[6] The stories of individual diabetics in early modern

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matrix, see Maria Frawley, *Invalidism and Identity in Nineteenth-Century Britain* (Chicago: University of Chicago Press, 2004).

[4] Even verbose diarist John Evelyn skimped on the telling of six-week fever that felled him in 1660: *Diary of John Evelyn*, ed. E.S. de Beer, 6 vols. (Oxford: Clarendon Press, 1955), 3: 243. For more on the problematic nature of mining diaries and letters for health details, see Joan Lane, "'The Doctor Scolds Me': The Diaries and Correspondence of Patients in Eighteenth Century England," in *Patients and Practitioners: Lay Perceptions of Medicine in Pre-industrial Society*, ed. Roy Porter (Cambridge: Cambridge University Press, 1985), 205–248.

[5] Recent scholarship relating to pre-modern English patients includes Roy Porter, *Patients and Practitioners* (Cambridge: Cambridge University Press, 1985), Lucinda M. Beier, *Sufferers and Healers: The Experience of Illness in Seventeenth-Century England* (London: Routledge and Kegan Paul, 1987), Mary Fissell, *Patients, Power and the Poor in Eighteenth-Century Bristol* (Cambridge: Cambridge University Press, 1991), Margaret Pelling, *The Common Lot: Sickness, Medical Occupations and the Urban Poor in Early Modern England* (London: Longman, 1998), and Joan Lane, *The Making of the English Patient* (Stroud, U.K.: Sutton, 2000). Prior to this burst of patient-oriented literature, many cultural theorists followed the lead of Michel Foucault, analyzing the authoritarian ideology of professional practitioners and the institutions of medicine; see his *Birth of the Clinic* (New York: Pantheon, 1973).

[6] Charles E. Rosenberg, "Framing Disease: Illness, Society and History," in *Framing Disease: Studies in Cultural History*, eds. Charles Rosenberg and Janet Golden (New Brunswick, N.J.: Rutgers University Press, 1992), xx. For more on the emotions of diabetics, Harold Geist, *The Psychological Aspects of Diabetes* (Springfield, Ill.: Charles Thomas, 1964); J. David Schnatz, ed., *Diabetes Mellitus: Problems in Management* (Menlo Park, Cal.: Addison-Wesley, 1982); Clarissa Holmes, ed., *Neuropsychological and Behavioral Aspects of Diabetes* (New York: Springer-Verlag, 1990); Richard Rubin, *Psyching Out Diabetes*, 3rd ed. (Los Angeles: Lowell, 1999); and Frank Snook, ed., *Psychology in Diabetes Care* (New York: John Wiley, 2000).

England and the treatments they endured are memorable, often inspiring, and always tragic.

Luckily for those interested in diabetic life, reckoned sixteenth-century Swiss doctor Paracelsus, "as God sends the illness, so He sends the physician."[7] In the absence of sufficient patient narratives, when trying to reconstruct what it was like to have diabetes long before scientists discovered the locus of the disease, we must derive much essential information from physicians. We can consult the published and unpublished manuals and casebooks kept by doctors and other caregivers who treated those afflicted with both Type 1 and Type 2 diabetes. From these resources, we can ascertain what medications diabetics consumed, what dietary and physical regimens they followed, where they were treated, and how they dealt with their treatment. Healers advised sufferers in early modern England to consume all kinds of alleged medicines: corn, wheat, balsam, candied nutmeg, gum Arabic, opium and its alkaloids, and mineral salts like lithium, arsenic and uranium. The afflicted were bled, blistered, purged, doped, sweated, belted tightly around the waist, submerged in various liquids, and rubbed with disgusting ointments. None of these remedies proved of value to patients, most of whom succumbed to coma or pulmonary tuberculosis, and any improvement in a diabetic's condition, even temporary, was due to a dietetic regime that accompanied those therapies.[8] While most sufferers were treated at home, hospitals provided care for the very poor, often away from home and lonely in their misery. From physicians' records we can also garner specifics about the lives of individual victims of a disease that offered no real cure and that hint at suffering past and present in family bloodlines.

Only sketchy information about diabetic life in England can be gleaned from the traditional historical record before the seventeenth century.[9] Some renowned physicians, like Jacobean royal doctor Theodore Mayerne, gave the details about a diabetes case or two, but their descriptions were often based on hearsay rather than first-hand experience. Many Stuart-era laymen knew of diabetes because of a burgeoning public fascination with science and medicine. In February 1662,

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[7] J.M. Stillman, *Paracelsus* (Chicago: Open Court Press, 1920), 56.

[8] S. Francis Marwood, "Notes on the History of Diabetes Mellitus," *History of Medicine* 6/2 (Summer 1975): 18–24.

[9] As Roy Porter described medical encounters of any kind in history: "The historical record is like the night sky…what is chiefly visible is the darkness." Porter, *The Greatest Benefit to Mankind* (New York: Norton, 1999), 13.

diarist John Evelyn, active in the Philosophical Society, an association that became the Royal Society later that year and that assigned its members experiments and presentations, recounted news of "a little woman at Rome who pissed about 200 weight of water every 24 hours and dranke nothing, upon which were divers discourses and conjectures of the resolution of aire." While observing medical cases at the Royal Society in 1682, Evelyn took note that millipedes prescribed for urine suppression passed through a man's body, "*per penum*, giving a most intolerable itching to the patient."[10] Some had a rudimentary idea about diabetes and its symptoms, even "diagnosing" it and stipulating sensible remedies for themselves and others. Famed antiquarian Elias Ashmole recorded in his diary on 26 March 1686: "This night I pist so much, that I feared a Diabetes, notwithstanding I had kept myself temperate all the springtime."[11] The *Dictionary of National Biography* enumerates a few well-known diabetics from the early modern era, such as Thomas Carte, historian and Jacobite who died in 1754; Samuel Ireland, author and engraver (1800); and the founder of Methodism, preacher John Wesley, whose likely diabetes killed him in 1791. Some commentators on the health of Queen Anne attribute the end of the Stuart dynasty to diabetes.[12] The *Oxford DNB* lists a few more sufferers.

Controversial physician John Pechey's remedy was severe and punishing in nature, since he believed diabetes to be a hysterical disease that "invades those that are of a lax and crude habit of body" or "those that have suffered much in bringing forth great children."[13] In 1692 he prescribed frequent bleeding and purging for several days in a row and a beverage laced with steel filings, to be accompanied by a liniment rub made of leaves and herbs mixed with lard, sheep suet, and claret wine, then cooked and strained. The resulting malodorous ointment should be applied on the belly and armpits for thirty days, morning and

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[10] Evelyn, *Diary*, 3: 316; 4: 290.

[11] Elias Ashmole, *Memoirs of the Life of That Learned Antiquary, Elias Ashmole, Esq.* (London: J. Roberts, 1717), 77.

[12] See Nicholas Azinge's letter in *The Journal of the Royal Society of Medicine* 90 (1997): 415. Azinge writes that Anne's obstetric history is "pathognomonic of diabetes and pregnancy … where yearly pregnancies are common."

[13] John Pechey, *Collection of Chronical Diseases* (London: Bonwicke, 1692), 35. Pechey, though a licentiate, was censured and fined by the College of Physicians on two occasions for advertising, pursued because he was regarded as a troublemaker for the institution. See Harold J. Cook, *The Decline of the Old Medical Regime in Stuart London* (Ithaca, N.Y.: Cornell University Press, 1986), 224–225.

evening.[14] Two years later, in a letter to the President of the Royal College of Physicians, Pechey changed course, lamenting that most physicians "jogg on the old road of vomiting, purging, bleeding, blistering, sweating and urinating…rather let(ting) their patients dye than prescribe a specifick." That specific was the herb perugia, imported from the Indies, the tincture of which he reported cured a traveling merchant, an old man, and a middle-aged man who pissed "like a brook in summer" of their "sad and deplorable distemper."[15]

Among early eighteenth-century physicians who dealt with diabetic patients and prescribed specific regimens for them is Richard Blackmore. In *Dissertations on a Dropsy, A Tympany, the Jaundice, the Stone, and a Diabetes*, he accepted the notion that diabetes was a disease of the blood, made immoderately watery and prevented by closed glands or intestines "drawn too much together" from achieving its natural outlets.[16] Commenting on the lack of odor in diabetic urine, Blackmore compared what happens in the kidneys of sufferers to "an Alpine thaw," when a torrent of watery humors rushes through and carries off the smelly "lixivial salts that always lodge in that bowel in a healthful state."[17] Blackmore took issue with Thomas Willis's opposition to prescribing astringents in diabetes, arguing that his objections were both surprising and contradictory since Willis himself recommended syrup of meconium (white poppy), a "most astringent internal medicine." In order to restore the vitiated constitution of diabetics, Blackmore used a complex arsenal of medical weapons. He prescribed purgatives like rhubarb, vomitories (to arrest the "exorbitant profluvium of the urine"), and every night a "pacific draught of barley water with poppy or laudanum."[18] Blackmore distinguished between acute and chronic diabetes, or hasty and slow, a distinction noted increasingly by other doctors.

Drinking large quantities of mineral waters, especially those with lime, seemed to many early modern physicians a logical cure for dia-

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[14] Pechey, *Collection*, 56. Pechey acknowledged that laudanum and milk diets sometimes helped diabetics.

[15] John Pechey, *Some Observations Made upon the Herb Called Perigua…in Curing the Diabetes* (London: s.n., 1694), 3–6. Pechey reported that he was trying to procure the herb from a Mr. Box in London "at any tolerable rates."

[16] Richard Blackmore, *Dissertations on a Dropsy, a Tympany, the Jaundice, the Stone, and a Diabetes* (London: Knapton, 1727), 209–210.

[17] Ibid., 215–216.

[18] Ibid., 229.

betes since lime "strongly attracts ruinous salts."[19] The founding Fellows of the Royal Society engaged in lively debate about the composition of spa waters and speculated about chemical properties, such as "acid alkali dualism," that made some waters more effective cures. Local boosterism often entered the equation as proponents for hometown waters touted their favorite remedies, regaling their readers with the reasons why one spring outperformed another.[20] In 1740, John Shebbeare trumpeted Bristol water for bathing and drinking, and supported his claims with an analysis of diabetes. He denied that diabetics produced too much urine; he said they produced "no urine at all [but] serum or chyle instead." The lime in Bristol water, gently and over time, does exactly what a medicine must do to cure diabetes "which is to extricate and prepare an easy secretion for the more fixed muriatic salts sticking in the blood."[21] Dr. George Randolph also espoused the use of Bristol water for his diabetic patients, as did a contemporary anonymous writer who, citing Randolph, penned an echoing tribute to its virtues, but there were also proponents for chalybeate water from a spring rich in iron salts discovered in 1606 at Tunbridge Wells.[22] A third entry in the spa sweepstakes was Matlock water from a source in Derbyshire, recommended as a drink for a diabetic patient by Liverpool physician Matthew Dobson in the 1770s and relentlessly promoted by John Smedley in the nineteenth century as the ideal health resort for diabetics and others who required "practical hydropathy."[23]

Water of another, more synthetic sort was the cure put forth by the *Pharmacopoeia Bateana*, a "dispensatory" based on the prescriptions of George Bate and compiled by William Salmon. Aqua benedicta, the blessed water, could be imbibed in two varieties, simple and complex, both deemed efficacious for diabetes. The simple aqua benedicta was just that: manufactured limewater given in four ounces doses, three times daily. Salmon added that one could infuse cloves or pepper in the drink "to give it relish." Aqua benedicta composita proved even more

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[19] James Keill, *An Account of Animal Secretion* (London: G. Strahan, 1708), 74.

[20] Hall, "English Medicine in the Royal Society's Correspondence," 116.

[21] John Shebbeare, *An Analysis of the Bristol Waters* (London: Cox, 1740), 28.

[22] See George Randolph, *An Enquiry into the Medicinal Virtues of Bristol Water* (Oxford: s.n., 1745); Anonymous, *A Mechanical Enquiry into the Nature, Causes, Seat and Cure of the Diabetes* (Oxford: J. Fletcher, 1745); and John Latham, *Facts and Opinions concerning Diabetes* (London: J. Murray, 1811).

[23] Macfarlane, "Matthew Dobson and Diabetes," 20; and John Smedley, *Practical Hydropathy*, 3rd ed. (London: J. Blackwood, 1858).

effective; it consisted of fresh licorice, sassafras bark, raisins and nutmeg added to simple aqua benedicta and infused for two days. Strained, taken by the dram, two or three times a day, this composita was also useful when given a few days before a purge or a vomit.[24]

John Wesley, purportedly a diabetic (though he lived to be nearly ninety), waded into the controversy about salubrious waters (he favored Bristol) and other medical matters in his book on curing disease, *Primitive Physick*, first published in 1746 and reissued regularly until the 1840s. Calling himself a follower of Sydenham, physician-vegetarian George Cheyne, and Sydenham's protégé Thomas Dover, the "quicksilver doctor," Wesley argued against the elitism he associated with learned physicians, including their knowledge of anatomy, in favor of more natural, simpler healing using water, milk, whey, honey, and ordinary English herbs.[25] He accused university-trained doctors of deliberately confusing "plain men" with unintelligible technical terms and derided the expense of unnecessarily complex medications, encouraging his followers to use single-ingredient cures. "Experience shows, that one thing will cure most disorders, at least as well as twenty put together."[26] In 1747 Wesley set up a free dispensary from which the poor could obtain these simple remedies as well as electric shock treatments, a singular therapy of "uncommon virtue." In the preface to the 1760 edition of *Primitive Physick*, Wesley praised electricity as "superior to all the other medicines I have known, nearest a universal medicine, of any yet known in the world."[27]

Primitive Physick comprises hundreds of cures for a multiplicity of specific ailments, ranging from preventing miscarriages through the green sickness to pain in the testicles. For diabetes Wesley listed three "receipts" or recipes: 1) drink wine boiled with ginger, as much and as often as your strength will bear, plus water and milk; 2) drink three or four times a day a quarter pint of alum posset, made from three drams of alum to four pints of milk; 3) infuse half an ounce of cantharides

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[24] William Salmon, *Pharmacopoeia Bateana or Bate's Dispensatory* (London: Smith and Walford, 1694), 4–5.

[25] Underscoring Dover's influence, Wesley called quicksilver, "in its native form, as innocent as bread or water," although he did acknowledge that the so-called Herculean medicines (antimony, opium, the bark, steel, and quicksilver) are "far too strong for common men to grapple with." John Wesley, *Primitive Physick*, 16th ed., (London: R. Hawes, 1774), xxiv.

[26] Ibid, xiv.

[27] Ibid., xxvi.

in a pound of elixir of vitriol and give from fifteen to thirty or even forty drops in Bristol water twice or three times a day. For the extreme thirst diabetics evince, Wesley proffered spring water in which a little sal prunella (an astringent tonic made from refined niter and soda) is dissolved.[28]

As if he understood the specific connection between lifestyle and diabetes, Wesley outlined a regimen totally appropriate to sufferers. "Abstain from all mixed, high-seasoned food. Use plain diet, easy of digestions, and this as sparingly as you can, consistent with ease and strength. Drink only water; use as much exercise daily in the open air. Sup at six or seven on the lightest food and go to bed early." He also advocated brisk exercise, especially for sedentary scholars: "Walking is the best exercise…. The studious ought to have stated times for exercise, at least two or three hours a day, half before dinner, the other before going to bed." And he admonished, "above all, add to the rest that old unfashionable medicine, prayer."[29] Given his own longevity, it seems likely that Wesley followed those recommendations for a healthy life in *Primitive Physick*.

Though Wesley urged his readers in or near London to buy their medicines at the Apothecaries' Hall, many sick people sought remedies from unlicensed, unauthorized medical entrepreneurs. Promoting products or one's self as a healer occupied the attention of many irregular practitioners in early modern London including a few who revived the old Paracelsian devotion to the urine flask. Urine-casting also still made sense to recalcitrant devotees of Galen, and even the cosmopolitan residents of the capital thought uroscopy an essential part of diagnosis. That persistence of belief in "piss prophets," especially among sufferers of kidney disease, gout, and diabetes, brought patients to the door of one Georgian quack. Theodor Myersbach, a Bavarian charlatan who took up residence in London in the mid-1770s, advertised himself as "Dr. von Mayersbach" and claimed in a handbill that he could diagnose any illness from scrutinizing urine. No physical exami-

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[28] Ibid., 64, 139. Wesley attributed the posset recipe to Dr. Richard Mead (1673–1754), Whig physician to St. Thomas's Hospital and Vice-President of the Royal Society. It is not surprising that Wesley found Mead's medicine palatable. While on the Board of Governors of the London Foundling Hospital, Mead advocated a national health council for sanitary reforms and pharmaceutical dispensaries in hospitals.

[29] Ibid., xvi, xix. Wesley credited Dr. Cheyne (1671–1743), author of a popular essay on health and long life, with the rules for maintaining good physical condition, including vigorous, lengthy walking for exercise.

nation of the patient was necessary, so it was possible for the uroscopist to see over 200 patients daily while earning 1000 guineas a month. He prescribed both harmless anodynes and dangerous pain-killers made of opium and lead acetate, which dulled the agony of diabetes temporarily. Myersbach built up an extensive and diverse clientele, despite ineffective protestations from the College of Physicians and the relentless public disparagement of the "water doctor" by Dr. John Coakley Lettsom.[30]

Though Lettsom publicized his disdain for unlicensed practitioners like Myersbach in newspapers and inadvertently demystified his own professional cachet, credentialed doctors usually mused in private about the causes and cure of diabetes, leaving their hand-written notes for us to acknowledge as part of the evolution toward more efficacious treatment. Professor of Medicine at Edinburgh and President of the College of Physicians there, Robert Whytt attributed "long diabetes" to such conditions as an inability to sweat sufficiently, to a kidney "weaker" than the intestine, to fevers that make the urine suddenly limpid, and to stomachs overloaded with meat and drink. Hand-written notes from his lectures in the mid-1700s itemize eight cures for the disease: 1) lime water with 1/3 boiled milk; 2) sweat; 3) blisters and warm fomentations of redulurium; 4) a diet of boiled milk with soaked bread or rice; 5) vomiting followed by some form of tincture of rhubarb; 6) thirty drops of linseed with fifteen grams of castor; 7) diuretic squills or sea onion; and 8) opium.[31]

William Cullen's unpublished lectures from 1770 demonstrate his conviction that physicians had proclaimed a number of false facts about the disease as well as about its purported cures. He scoffed at accounts that twenty pounds of urine could be voided in one day while asserting that the quantity of urine may be "preternaturally increased by unusual dilatations of the excratories of the kidnies." Cullen, who alternated with Whytt as lecturer at Edinburgh, attributed diabetes to drinking too much, especially overindulging in mineral water, "for the vulgar conceive their efficacy to arise from the quantity taken in and therefore drink excessive quantities of them."[32] He tied diabetes to alonic gout

[30] Roy Porter, "'I Think Ye both Be Quacks': The Controversy between Dr. Theodor Myersbach and Dr. John Coakley Lettsom," in *Medical Fringe and Medical Orthodoxy*, ed. W.F. Bynum and Roy Porter (London: Croom Helm, 1987), 56–78.

[31] Robert Whytt, "Miscellaneous Notes on Diabetes," MS 6878/4, Wellcome Library, London.

[32] William Cullen in "Lectures," Vol. 3. MS.MSL/63c, f. 204, Wellcome Library.

and accused sufferers of relying on diuretics, which irritated the kidneys and brought on diabetes. Cullen also thought that obstructed perspiration would increase the quantity of urine and he associated languid circulation, evident in the cold, dry skin of diabetics, with the chillier climates of northern Europe.[33] Hence, he prescribed internal and external astringents: the former, such as saline, alum whey and vitriolic water, to restore the tone of the urinary passages and the latter, including warm bathing, friction and exercise in a heated place, to stimulate the circulation.[34]

If all these efforts failed to alleviate the sufferer's anguish, Cullen averred that nerves might be at the root of the patient's complaints. Cullen introduced the term "neurosis" into medicine, for which he best remembered and often cited. Although the word has become assimilated into psychiatry and general culture, for Cullen a neurosis was any disorder of sense or motion in which there was no fever or local disease, illness that incorporated eighteenth-century categories of insanity like melancholy, mania, and dementia, but also diabetes, convulsions, apoplexy (stroke), asthma, colic, diarrhea, rabies, and other physical disorders. Cullen argued that the nervous system played a fundamental role in producing disease and its symptoms, including diabetes on his list of corollary conditions. "In a certain view, almost the whole of the diseases of the human body might be called nervous."[35]

In 1772 Matthew Dobson, physician to the Liverpool Infirmary, admitted his patient Peter Dickonson, age thirty-three, to the hospital suffering from classic diabetes symptoms: severe thirst, polyuria, hunger, weight loss, dry skin and fever. According to Dobson's meticulous records, Dickonson passed up to twenty-eight pints of urine every twenty-four hours. Theorizing that his patient contracted diabetes either from an ague or from his army service, Dobson experimented with Dickonson's urine and blood, finding a white cake-like sugar when the former

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Though Dobson wrote in 1775 that the sweet taste of diabetic urine was due to sugar, Cullen is credited with adding "mellitus" to the name of the disease. See Elliott P. Joslin, "The Development of the Present Treatment of Diabetes," in *Essays on the History of Nutrition and Dietetics* (Chicago: American Dietetic Organization, 1967), 231–234.

[33] Cullen, "Lectures," ff. 205–207. Cullen recounted the case of a patient from Gibraltar who came to England in a cold season and developed diabetes; Cullen sent him back home and the patient was cured. Ibid., f. 211.

[34] Ibid., f. 208.

[35] William Cullen, *The Works of William Cullen, M.D.*, ed. John Thomson, 2 vols. (Edinburgh: Blackwood, 1827), 2: 330.

evaporated and a sweet stickiness to the latter upon letting it stand. He tried several treatments, aiming to insure "that the body was kept constantly open, either with rhubarb or the infusion of senna joined with rhubarb."[36] Dobson also employed Jesuits' Bark or cinchona in a decoction with the acid elixir of vitriol, Dover's powder, alum whey and limewater; Dover's powder, used to produce sweat, contained a mixture of ten grains each of opium, ipecacuanha, and sulphate of potash.[37] Dobson wrote up his findings from nine cases and five experiments in 1776 in *Medical Observations and Inquiries*, the London journal of a medical society that met fortnightly in the Mitre Tavern in Fleet Street. Though Dickonson stayed in the hospital for several months, his fate is unknown.

Dobson remarked on the urgency of finding a cure for the ailment, noting that he had seen diabetes terminate fatally in less than five weeks, although other patients lived with the disease as a chronic condition. Hastened by pressure to help the acutely afflicted, he sometimes used his laboratory assistants as guinea pigs in his treatment schemes. Believing that diabetes was the result of "imperfect digestion and assimilation" and that the body's ability to incorporate food was "plastic," he tried to "strengthen digestive powers to promote a due sanguification and establish a perfect assimilation through the whole economy."[38] Thinking that vigorous sweat might aid digestion, he persuaded his helper Henry Park to remain in a sweating room long enough for three eggs to be cooked. Park emerged unscathed, ate the eggs and walked home in a hard frost.[39]

At the end of the century, acknowledging Dobson's work, John Rollo, Surgeon General of the Royal Artillery, weighed in on the debate, citing two cases and concluding that diabetes is a disease of the stom-

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[36] Matthew Dobson, "Experiments and Observations in the Urine in Diabetes," *Medical Observations and Inquiries*, 6 vols. (London: William Johnston, 1757–1784), 5 (1776): 298–316. A. Rupert Hall reminds us that many fine doctors outside of the capital never joined the Royal College of Physicians, including eighteen charter Fellows of the Royal Society: Hall, "English Medicine in the Royal Society's Correspondence," 113.

[37] Thomas Dover's original diaphoretic recipe appeared in the first edition of *The Ancient Physician's Legacy to His Country* (London: printed for the author, 1732) and contained one grain each of opium, ipecacuahna and liquorice added to four ounces each of saltpeter and tartar vitriolated, but by the seventh edition (London: Henry Kent, 1762) the ingredients and proportions had been altered. For Dover's life see *DNB*.

[38] Ibid., 308, 312.

[39] John A. Shepherd, *A History of the Liverpool Medical Institution* (Liverpool: Liverpool Medical Institution, 1979), 11.

ach that secondarily affects the kidneys and skin.[40] He connected corpulence and diabetes, as earlier doctors had done, but he also found that starchy foods elevated sugar levels while fatty meats did not. Rollo therefore recommended treatment for diabetics that comprised what we now refer to as a low carbohydrate, high fat and protein diet.[41] His first patient, 34 year-old Captain Meredith, came to him out of desperation, having submitted to a physician at Yarmouth who had given him sugar, treacle and spruce beer for gout. Instead of feeling better, the patient had developed additional ailments. He had lost weight, complained of frequent urination, great thirst, and equally great appetite; an examination revealed loose teeth, a sore penis, and urine so sweet it reminded Rollo of molasses. The doctor initially blamed "too great an action of the morbid kind of the muscular fibres of the stomach with secretion of too great a quantity of gastric fluid."[42] After discussing the case with "an ingenious anatomist" and with a chemist to the ordnance, Rollo ordered Meredith to keep a diary recording the color, amount, and smell of his own urine. He put Meredith on a meat diet, complemented with emetics. He also prescribed hepatised ammonia, available for 7s. 6d. from Mr. Blades, a glass manufacturer on Ludgate Hill, that sometimes gave Meredith a headache. Whenever the patient deviated from his daily task, Rollo chastised him but soon the doctor reported that Meredith was allowed to eat some cabbage, tea without sugar and a little brandy. The patient gained a little weight, his symptoms disappeared, and Rollo pronounced him cured.

Rollo's second patient was an anonymous general officer, aged fifty-seven, whose symptoms echoed Meredith's but were more intense. He displayed greater weakness and had badly swollen feet. Rollo immediately put him on the meat diet and created menus that included

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[40] John Rollo, *An Account of Two Cases of the Diabetes Mellitus*, 2 vols. (London: T. Gillet, 1797), 1: 173.

[41] German professor Justus Liebig first discerned in the 1830s that there are three categories of food: carbohydrates, proteins and fats. He argued that fat formed in animals from eating foods other than meat: "All food which is not flesh—all food rich in carbon and hydrogen—must have a tendency to produce fat." Quoted in Gary Taubes, *Good Calories, Bad Calories* (New York: Knopf, 2007).

[42] Ibid., 25. Before seeing Rollo, Captain Meredith was treated by Thomas Girdlestone, who was somewhat miffed at Rollo's failure to mention that Meredith ignored his professional advice and self-medicated with purging salts and calomel. Moreover, Girdlestone felt Rollo should have referred to his letters to Rollo about the Meredith case in Rollo's published account. See Thomas Girdlestone, *A Case of Diabetes with an Historical Sketch of the Disease* (Yarmouth: I.D. Downes, 1799), iv–vii.

unseasoned milk-and-meat broths, eggs, oysters, and sausages. He also insisted that the patient get "as little exercise as possible" and keep his windows and doors closed at all times. In addition, Rollo prescribed three drops, three times daily, of hepatised ammonia. Despite some slight improvement after eighteen days, the patient worsened and Rollo concluded he had been "too sanguine" in his expectations. Nonetheless, Rollo felt a cure could be accomplished by a dietary regimen and medicines that prevented the formation of sugar.[43] Both Captain Meredith and the unnamed officer were supervised away from their homes; both voiced the desire to return to their families. They were not alone.

Doctors generally oversaw their poorer diabetic patients in the hospital to better monitor the intake and outflow of fluids, but even then physicians lamented that they resisted total observation.[44] John Ferriar had the additional responsibility of running the Manchester Infirmary's home-patient service. Senior physician at the hospital and a leading advocate for local public health programs, Ferriar published information about eleven diabetes cases. Though some patients were released after a few weeks treatment, he ordered others to remain under his care in the infirmary for several months. Ferriar claimed he cured John Fletcher, who had "uneasy sensations in the testicles," in less than a month by giving him cinchona, opium, and limewater and by insisting Fletcher maintain an "animal food" diet. Castor oil remedied the constipation that ensued. Likewise, Ferriar declared six other cases of the ten recorded cured with his combination of tonics and animal diet. Samuel Barnes, however, presented a more stubborn condition: emaciated, weak, and with ulcerated gums. Ferriar prescribed the same medicines and diet as for Fletcher, but Barnes stayed in the hospital from the end of September (1811) until the first of March (1812). Upon cure and release, he relapsed, according to Ferriar, "from inability to procure animal food."[45] Ferriar acknowledged little success in 1812 with "Miss P….n," a young lady debilitated by the sudden onslaught of diabetic symptoms (though lacking hysteria). Soon "attacked by ileus," she died "almost as the surgeon could arrive." Joseph Tomlinson, whose

[43] Rollo, *An Account of Two Cases*, 117, 174.

[44] Latham, *Facts and Opinions*, 155.

[45] John Ferriar, *Medical Histories and Reflections*, 4 vols. (London: Cadell and Davies, 1810–1813), 4 (1813): 47–51. The first edition of volume one appeared in 1792, a revised edition of the first three volumes in 1810.

father succumbed to diabetes, died in 1813 "with every symptom of exhaustion" despite Ferriar's usual course of action. Nonetheless, Ferriar reasserted his belief that his system worked more often than not.[46]

Richard Bright, physician at Guy's Hospital and lecturer at its medical school, had his diabetic patients keep a log of how much they drank and urinated. James Barnes, 49, a clerk with sober and regular habits but "by no means a thin man," came to Bright in 1827 complaining of immoderate thirst and appetite. Bright prescribed a hydragogue of taraxacum (dandelion), a diet of animal food with lettuce and ordered Barnes to avoid bread, roots, fruits and sugars, but the jaundiced patient began to pass "fatty matter much resembling butter," his feet swelled, and his sleep was disturbed. Though the amount of drink and urine gradually diminished and despite vigorous cupping and a powerful opiate astringent, Barnes died, "worn out with emaciation, debility and want of rest." In the final stages of life, diabetics smell like rotten apples, a condition known as ketoacidosis, with victims like Barnes gasping for air as they expel carbonic acid before lapsing into coma. An autopsy by Bright revealed a hard, bright yellow and ulcerated pancreas.[47] Discouraging results as in the Barnes case and the extraordinary mortality rate among patients led some physicians to bleak prognoses for diabetics; even optimists accepted that few diabetics could be cured. John Latham consulted on forty-one cases, only four of which recovered to reasonable health on a stringent meat diet; all four of his own cases terminated fatally.[48] Some blamed factors beyond anyone's control. As late as 1879 Hugh Campbell thought that diabetes prevailed among men with red hair and sanguine temperament.[49]

Many regimens for diabetes included sugary potions, candied electuaries, or carbohydrate-laden foods that exacerbated patient conditions. One reported "cure" consisted of river crabs and mastic, sweetened for a common drink. Matthew Dobson argued that since the diabetic body

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[46] Ibid., 4: 66, 83. Ferriar usually, though not always, recorded the full names and ages of his patients.

[47] Richard Bright, "Cases and Observations connected with Disease of the Pancreas and Duodenum," *Medico-Chirurgical Transactions* 18 (1833): 4–11. Bright, who imparted his name to Bright's disease, a former term for kidney disease, also reported on the cases of two women with pancreatic and liver cancer. In the former, he observed alteration of blood sugar levels.

[48] Girdlestone, citing William Cullen, *A Case of Diabetes*, 45; H. Bell, *Essay on Diabetes* (London: A. Pigott, 1842), 36–38.

[49] Hugh Campbell, *The Salicylic Treatment of Gout, Rheumatic Gout, Neuralgia and Diabetes*, 2nd ed. (London: Renshaw, 1879), 87.

lost sugar, it ought to be replaced by sugar fed to patients.[50] A teenage patient of Edward Latham Omerod quaffed sarsaparilla upon the doctor's recommendation, enjoying it so much he deliberately underestimated his urine output so he could continue the sweet drink instead of Omerod's previous concoction of creosote and vinegar. Omerod complained that the likes and dislikes of patients troubled him.[51] Preserves made of Jambolan or Java plum numbered among the tastier dietary recommendations and the potato diet enjoyed fashion along with the cereal diet.[52] On the eve of the discovery of insulin in 1922, a "thunderbolt" that prolonged diabetic life, some physicians were still prescribing extra sugar for their patients with diabetes despite long-standing tests that confirmed glycosuria, the presence of sugar in the urine.[53]

Not surprisingly, diabetic patients often refused to follow the plans formulated by their physicians, ignoring medical advice and lapsing back into old habits. Thomas Willis complained that his noble patient began to feel better after adhering to a dietary regimen, but reverted to a carefree lifestyle and suffered for it. Many patients were probably insulted by the insinuations of their doctors who routinely pronounced diabetes, when not imagined, linked to excessive food, alcohol, and sex. John Pechey wrote that a country gentleman he treated drank a bottle every night when in London and "brought himself into this disease;" he also doubtless put off a few of his patients by referring to them as hysterics and hypochondriacs. According to one 1779 Edinburgh doctoral thesis, "almost all writers" attributed diabetes to "immoderate

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[50] Frank N. Allan, "The History of the Treatment of Diabetes by Diet," in *Essays on the History of Nutrition and Dietetics* (Chicago: American Dietetics Organization, 1967), 235.

[51] Girdlestone, *A Case of Diabetes*, 61; Edward Latham Omerod, "Cases of Diabetes," *Edinburgh Medical and Surgical Journal*, 67 (1847): 97, 130.

[52] Hans Schadewaldt, "History of Diabetes Mellitus," in von Engelhardt, *Diabetes, Its Medical and Cultural History*, 84. English enthusiasm for the Java plum, the seeds of which act as a diuretic, was spawned by pre-Linnaean Dutch botanist Hendrik van Reede, whose book *Hortus Malabaricus* was reviewed in the Royal *Society's Philosophical Transactions* in 1694: Marian Fournier, "Hortus Malabaricus of Hendrik Adriaan van Reede tot Drakestein," in *Botany and History of Hortus Malabaricus*, ed. K.S. Manilal (Rotterdam: A.A. Balkema, 1980), 10.

[53] Michael Bliss, *The Discovery of Insulin*, 3rd ed. (Toronto: University of Toronto Press, 2000), 23–24. Bliss has significantly altered his 1984 thesis about the specific contributions of Frederick Banting and Charles Best; see also Bliss, "Rewriting Medical History: Charles Best and the Banting and Best Myth," *Journal of the History of Medicine and Allied Sciences* 48 (1993): 253–274.

intercourse."[54] William Prout reported in his book on diabetes that several of his middle-aged patients "confessed they had been addicted to masturbation from early youth."[55] While doctors kept the names and the intimate symptoms of their elite clientele under wraps, referring to patients as "a lady of rank" or "a person belonging to one of the great retail houses in Holborn," many publishing physicians identified sufferers with graphic details and identifying descriptions.[56]

Thomas Girdlestone of Yarmouth published information about cases involving female diabetics, some his own patients and others treated by a surgeon in Northwalsham. These women experienced "great itching around the meatus urinarius," which was enlarged and discharging mucus, a characteristic symptom in eight of nine cases seen in the region. He noted that Captain Meredith had been able to "denude his glans penis" before contracting diabetes. Robert Watt's cases included Thomas Henderson, 66, a laborer whose scrotum was swollen "to the bulk of a child's head." George Allen wrote about the case of John Cronin, in ordinance on Spike Island in Cork Harbor, whose scurfy skin and copious urine are recounted in detail. Likewise, Edward Ormerod identified nine of his diabetic patients at St. Bartholomew's Hospital by name, age, and occupation; John Osborn, age 21, passed daily eleven pints of urine, "stiffening his clothes when it falls upon them."[57] Surely, even illiterate sufferers would not want such intimate particulars of their cases discussed so openly and in print. And death did not diminish their indignities. Daniel Rutherford chronicled the

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[54] Pechey, *Collections*, 35–37, and *Some Observations*, 7. Joseph Hart Myers' Edinburgh dissertation (*Dissertatio medica inauguralis, de diabete*) is quoted in Hightower, *Sweet Pea*, 19. Women were hysterics, men hypochondriacs, according to Pechey and echoed by the anonymous writer of *A Mechanical Enquiry into the Nature, Causes, Seat and Cure of the Diabetes*, 18. As for Myers, he argued that "too frequent intercourse effects the flow of the fluids to the genital organs, and consequently to the kidneys which lie close to them."

[55] William Prout, *An Inquiry into the Nature and Treatment of Diabetes* (London: Baldwin, Cradock and Joy, 1825), 53.

[56] Campbell, *The Salicylic Treatment of Gout*, 86; Latham, *Facts and Opinions*, 140. For a discussion of physician behavior, see Andrew Wear, "Medical Ethics in Early Modern England," in *Doctors and Ethics: The Earlier Historical Setting of Professional Ethics*, eds. Andrew Wear, Johanna Geyer-Kordesch, and Roger French (Amsterdam: Rodopi, 1993), 98–130.

[57] Girdlestone, *A Case of Diabetes*, xvii, 98; Watt, *Cases of Diabetes, Consumption, Etc. with Observations* (Paisley, U.K.: s.n., 1808), 173; George Alley, "History of a Case of Diabetes Mellitus, Successfully Treated by Animal Diet and the Use of Cinchona with Remarks." *Edinburgh Medical and Surgical Journal* 4 (1808): 36; Ormerod, "Cases of Diabetes," 91.

dissection of two named diabetics in 1805, noting the hideous amounts of fat in the body of forty year-old John Robinson and the feces-filled colon of Ann Laidlaw, age ten.[58]

John Rollo recorded that patient compliance with his food management strategy was poor and others afflicted likely shied away from harsh medicines that made them feel even sicker.[59] John Latham lamented that many of his patients resisted total observation of his regimen and recorded that he chastised them for their laxity.[60] One of Ferriar's patients, Thomas Wainwright, admitted to the hospital in November 1811, was discharged in March 1812 and readmitted almost immediately when he became worse. As there was "no prospect of any change for the better," despite massive doses of "arsenical liquor," Ferriar released him again in April.[61] John Camplin, a physician who was himself a diabetic sufferer, brought on, he averred, by "the wear and tear of a laborious profession," promoted a diet of bran cakes; he acknowledged, however, that a young female patient of his stuck to the bran cake diet but died anyway.[62] Bran must have seemed much more appetizing, nonetheless, than other remedies shoved down the throats of reluctant diabetics, including arsenic and ergot, mercury, copper, lead and manganese compounds, cobalt and nickel salts, and even carbolic acid.[63]

Patient lack of enthusiasm for these cures and for their own futures likely emanated from depression over the progress of the disease as well as from the unpalatable requirements of their physicians. Inexorably, diabetes weakened eyes and limbs, kept wounds from healing, roughened and pimpled skin, made its sufferers impotent, and lowered their resistance to other diseases. Meanwhile, physicians plied them with oatmeal, bananas, acids and alkalis, locked them up, and gave them opium to dull their despair. Though he acknowledged that he had "no hypoth-

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[58] Daniel Rutherford, "An Account of the Morbid Appearances Observed in Two Cases of Diabetes Mellitus," *Edinburgh Medical and Surgical Journal* 1 (1805): 314–316.

[59] These reactions presage the fury with which twentieth-century diabetic poet James Dickey complained of his sensible diet and insulin shots: "I had just as soon crush this doomed syringe between two mountain rocks, and bury this needle in needles of trees. Companion, open that beer." Dickey, "Diabetes," 9.

[60] Latham, *Facts and Opinions*, 189.

[61] Ferriar, *Medical Histories*, 4: 62.

[62] John Camplin, *Diabetes*, 2nd ed. (London: Churchill, 1860), 6, 16. Camplin gave the formula for the cakes in an appendix and mentioned the names of three bakers who would prepare the biscuits or allow the use of a small mill. Ibid., 86, 88.

[63] Schadewaldt, "History of Diabetes Mellitus," 87.

esis on the subject," William Prout surmised that diabetes was probably an inherited condition, dormant until inevitably something aroused it, at which time he "had no doubt about the propriety of bloodletting."[64]

Diabetics received conflicting advice from their physicians about diet and exercise, especially as the diagnostic definition of the malady changed in the nineteenth century. Experts in diabetes began to associate onset of the disease later in life with obesity, and calls came forth to eat sparingly and lose weight. Many, like Arthur William Moore and John Harvey, advocated meaty, starch-free regimens in published mid-century manuals. In 1850 Thomas King Chambers advised his patients to eat "very light meals of substances that can be easily digested" and to spend "many hours daily walking or riding."[65] Other diabetics were told not to exercise or to exert themselves mentally either; as late as 1866 Edinburgh M.D. George Harley, who identified two distinct types of diabetes mellitus, advised that excessive brain work brought on diabetes because "mental labor increases the sugar" in urine.[66] He also blamed falls and frights for triggering the disorder, citing an "accidental diabetes" with accompanying paralysis, though decreased urine.[67] In an extensive recitation of patients he treated or about whom he was consulted while residing in Paris, Berlin and Vienna, Harley wondered if a diet *too rich* in animal fat might be the problem many diabetics faced. Since diabetes occurred more frequently in spirit-drinking countries than elsewhere, alcohol or some other stimulant could be the ignition for the disease. What explained the complex affliction, "since time immemorial, of emaciation accompanied by the inordinate thirst and voracious appetite" of diabetics? Why did some people develop diabetes at a young age while others did not experience the symptoms until their dotage? "We now arrive," he wrote after settling in London, "at an entirely new phase in which the sick chamber gave place to

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[64] Prout, *An Inquiry*, 73. Prout had some efficacious suggestions as well: that his patients eat regularly at periods of four to six hours, drink Bristol Hotwell, and avoid stress.

[65] Arthur William Moore, *Corpulency*, 3rd ed. (London: F.W. Ruston, 1857); John Harvey, *Corpulence*, 3rd ed. (London: L. Smith, 1864); Thomas King Chambers, *Corpulence* (London: Longman, Brown, Green and Longmans, 1850).

[66] George Harley, *Diabetes* (London: Walton and Maberly, 1866), 42. Harley, whose name is now associated with London's most fashionable address, and Claude Bernard (see Chapter Six) did research together on the effects that nerve stimulation had on the production of sugar by the liver.

[67] George Harley, *The Urine and Its Derangements* (Philadelphia: Lindsay and Blakiston, 1872), 51.

those of the lab," and conducted numerous experiments on animals at University College, hoping to identify abnormal production of sugar by the liver.[68] He argued that all people, "like sugar canes, possess within themselves a saccharine manufactory," so sugar can be found normally in all human blood. Harley also noticed that the amount of blood sugar fluctuated greatly during the day. But diabetics always had too much sugar, so much that Harley's colleague Dr. McGregor of Glasgow found sugar even in the vomited matter of his diabetic patients. Diabetics must not be able to assimilate sugar in the way that healthy bodies can. Harley knew of a family of diabetics—father, mother, two daughters and a fifteen-year old son—and thought the disease might be traceable to some "hereditary constitutional peculiarity." He reasoned that experimentation with different diets was needed and proceeded to treat several patients with varying regimens.

Accordingly, he cited the case of a diabetic young man, aged nineteen, brought to Harley by the patient's brother, himself an M.D. The healthy-looking young man had been on an animal diet with small doses of chlorodyne, a powerful anodyne composed of morphine, hydrochloric acid, chloroform and Indian hemp, but wanted to replace the drug, so Harley tried a variety of different combinations of therapies including cannabis by itself. Similarly, he prescribed a diabetic female tired of her gluten routine an animal diet with cannabis; when she abandoned the meat regimen, however, she relapsed. Frederick F., a sixteen year-old patient with no family history of diabetes, presented alarming weight loss when Harley treated him in the hospital. The boy had dropped from 105 to 75 pounds, but when cannabis and laudanum, three times daily, were added to his treatment, he gained fifteen pounds and was released. Likewise, Sarah F., twenty-seven, who had suffered a "great mental shock," saw her weight plummet from nine stone (126 pounds) to six (84 pounds); she had "not enough moisture in her mouth to swallow." Harley prescribed a vegetarian diet supplemented with tincture of cannabis and she revived. He recognized that the wasting symptoms of these relatively young diabetics differed from the intermittent diabetes of the elderly he treated, including a seventy-two year old female patient with an intolerable thirst. Harley, endorsing the connection between carbohydrates and diabetes, banned all starchy foods from her diet.[69]

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[68] Ibid., 212, 256.
[69] Ibid., 260–270.

Frederick William Pavy, who had a huge diabetic practice in mid-nineteenth century London, insisted his patients avoid legumes, pasta, all farinaceous foods, potatoes, carrots, beets, and turnips; he permitted greens and almonds but turned thumbs down on lemonade, wines, milk and all desserts. Even so, he wrote, "you still cannot permanently diminish the sugar in diabetics."[70] Thomas Tanner in his popular *The Practice of Medicine*, which went through five editions by 1866, went further: "Farinaceous and vegetable foods are fattening, and saccharine matters are especially so." He went on to explain why "negroes and cattle employed on (sugar) plantations grow remarkably stout while the cane is being gathered," but "when the season is over, the superabundant adipose tissue is gradually lost." Deprived of various foods by differing doctors, patients craved whatever they were denied. Dr. Harley, who compared the threat of relapse in diabetes to insanity, recorded that his patients missed their daily bread.[71] The majority of those with severe diabetes received plenty of help but little relief from the strategies of their physicians, most of whom felt helpless in the face of the relentless deterioration of their patients.[72]

The emotional component of diabetes and the diabetic personality has been delineated since the 1920s. The most common mental state discerned is simple depression as diabetics grapple, even after the discovery of insulin, with the overwhelming belief that they suffer from a disorder for which there is no permanent cure. Ironically, some physicians argued that sadness and depression caused the diabetes rather than the other way around; an Elizabethan era collection of chemical receipts attributed "disuria" to sadness.[73] Untreated diabetics, past and present, experience diminished alertness with an increase in toxicity along with memory defects and delayed responses.[74] Loss of vision,

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[70] F.W. Pavy, *On the Nature and Treatment of Diabetes* (London: Churchill, 1862), 165. Pavy is considered the first specialist diabetologist; he modified the urine test then in use and created a pellet for identifying sugar in urine: Beck, "Sweetness and Light," 62.

[71] Harley, *Diabetes*, 69.

[72] Frank N. Allan, "Diabetes before and after Insulin," *Medical History* 16 (1972): 268. Allan posits that credit was given to drugs and practices that had little practical effect on diabetes, so that patients might receive some psychological stimulus from the courses of therapy and submit untreated cases for medical management.

[73] Sloane MSS 3428, f. 33, British Library. These Latin medical recipes were "collected by a citizen" in 1576. Thomas Willis thought convulsive affection, as well as sadness and depression, precipitated diabetes: see Lee J. Sanders, *The Philatelic History of Diabetes* (Alexandria, Va.: American Diabetic Association, 2001), 25.

[74] Geist, *Psychological Aspects of Diabetes*, 10, 16, 21.

mobility, and dignity even among those taking medication compound the terrors of the disorder. For Type 1 diabetics who work hard their entire lives to control all the risk factors, the disease acts "like a sponge, soaking up the personal" in their existence.[75] For Type 2 sufferers, sickness disrupts the self, alters experience and disturbs time. One's self-respect is based on a life plan, a plan worth carrying out, but as Howard Brody suggests, a chronic illness like diabetes puts that life plan "on hold," a fact as true for the pre-insulin era as for our own.[76] Sick, isolated in their misery, egocentric in their conversation, dysfunctional in their personal habits, and unwelcome among strangers and friends alike, diabetics of the past caused serious consternation in their families and incurred social judgments about who or what was to blame. As John Donne remarked after his own health crisis in 1623: "the greatest misery of sickness is solitude."[77] Diabetics in early modern England, enduring painful treatments and symptoms simultaneously, with little or no hope of survival, felt the sting of that solitude more than most.

[75] See the case study of Alice Alcott, who "lost all confidence in [her] body," in Kleinman, *Illness Narratives*, 32.

[76] Howard Brody, *Stories of Sickness* (Oxford: Oxford University Press, 2003), 76.

[77] From John Donne's *Devotions upon Emergent Occasions* and quoted in Hawkins, "Two Pathographies," 235.

CHAPTER SIX

DIABETIC SPECIALISTS AND THEIR PATIENTS IN THE LONG NINETEENTH CENTURY: COMPETITION FOR A CURE

The London general bill of christenings and burials for 1784, printed for the edification of readers of *The Gentleman's Magazine*, indicates that no one died of diabetes that year.[1] Nonetheless, interest in the wasting disease and its sufferers escalated throughout the British Isles as physicians and others in the healing arts sought answers to the riddle of diabetes. The number of publications dealing with diabetes, by and for professionals and amateurs alike, significantly increased, telling of cases and cures sure to inspire and fascinate. For instance, in 1820 John Elliotson penned a book that recounted *Numerous Cases*, one of which supported the use of opium in diabetes.[2] There was nothing new to Elliotson's prescription: Thomas Willis had recommended "syrup of poppies" for diabetes 150 years earlier. Similarly, Victorian-era claims about methods of diagnosis echoed assertions made by doctors in previous generations. Even before the end of the eighteenth century, John Abernethy, eminent surgeon-anatomist at St. Bartholomew's Hospital, Fellow of the Royal Society, and head of the Royal College of Surgeons, had hailed tongue assessment for ascertaining specific diseased states. In 1843, in a paper read before the Senior Physical Society of Guy's Hospital, Benjamin Ridge pronounced examination of the central lateral portions of the tongue as an easy means of diagnosing diabetes. Ridge subsequently published his work as *Glossology* in which he asserted that an irritable, clean, cracked, and red tongue clearly signaled diabetes. *The Lancet* and *British Medical Journal*, the latter printing W.H. Dickinson's Lumleian Lectures, followed up with articles of their own endorsing the tongue as the best element for establishing what ailed a patient.[3] Why bother with messy urine tests when sticking out

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[1] Joan Lane, *The Making of the English Patient* (Stroud, U.K.: Sutton, 2000), 67.

[2] John Elliotson, *Numerous Cases Illustrative of the Efficacy of the Hydrocyanic or Prussic Acid in Affections of the Stomach … and the Use of Opium in Diabetes* (London: Longman, 1820).

[3] John S. Haller, Jr., "The Foul Tongue: A 19th Century Index of Disease," *Western*

one's tongue would tell the doctor all he needed to know? The fierce rivalry between medical entrepreneurs and serious researchers reached new heights and began to blur, as all manner of diabetologists touted their latest diagnostic methods and breakthroughs towards a cure.

Institutions throughout Britain showed a competitive spirit, too, as they encouraged research into diabetes, promoted those who came up with innovative techniques in the treatment of diabetics, and published findings under the imprimatur of the health care facility. As noted in Chapter Five, the Liverpool Infirmary made an unlikely splash into print through the work of Matthew Dobson. Dobson matriculated at Glasgow University where he assisted William Cullen (before Cullen moved on to Edinburgh) with evaporation experiments and likely picked up an interest in diabetes. A graduate of Edinburgh medical school, he joined the staff at Liverpool in 1770 and became part of a physicians' "study group" in the northwest of England that met quarterly to discuss iatric subjects. By 1779 Dobson was president of the Liverpool Medical Library. His membership in that study group, his acclaimed knowledge of published health care materials, and his supervision of nine diabetes patients at the Infirmary enhanced Dobson's ability to do research on diabetic blood and urine, research he reported in *Medical Observations and Inquiries*.[4] In the end, Dobson took issue with his former mentor Cullen's supposition that diabetes was a disease of the kidneys and contended that it was a form of imperfect digestion that affected the entire body. However, because he believed that sugar lost by the body ought to be replaced, he fed sugar to his diabetic patients.[5]

The Manchester Royal Infirmary also encouraged the work of its diabetes specialists. John Ferriar, as noted in Chapter Five, practiced medicine in Manchester from 1785, where he became active in the reform movement at the infirmary. His principal duties there involved

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Journal of Medicine 137 (1982): 258–260, 264. See Benjamin Ridge, *Glossology* (London: John Churchill, 1844); T. Newham, "On the Tongue as a Means of Diagnosis," *Lancet* 1 (1854): 661; and W.H. Dickinson, "The Lumleian Lectures on the Tongue as an Indication of Disease," *British Medical Journal* 1 (1888): 627–632, 677–680, 730.

[4] O.T. Williams, "Matthew Dobson, Physician to the Liverpool Infirmary," *Liverpool Medico-Chirurgical Journal* (1912): 245–254.

[5] Frank N. Allan, "The History of the Treatment of Diabetes by Diet," *Essays on the History of Nutrition and Dietetics* (Chicago: American Dietetics Organization, 1967), 235. In 1815 Frenchman Michel Chevreul identified the sugar in diabetic urine as glucose, the first step in recognizing diabetes as a disease of sugar metabolism.

attending to the infirmary's home-patient service, and his contact with the wretched condition of the working classes galvanized his campaign to awaken public knowledge of Manchester's unsanitary conditions and to establish a board of health in the city. Ferriar became the senior physician at the infirmary and crafted a scholarly, albeit conventional reputation for himself, in part based on his treatment of poor diabetic patients like John Fletcher. But like many traditional thinkers, Ferriar could not "imagine possible alternatives" to conservative hypotheses about diabetes. Indeed, even more scientific thinkers than Ferriar might have been overly protective of established theories.[6]

James Lomax Bardsley, at 22 the youngest person ever elected to the staff of the hospital, composed a monograph in 1832 based on an entry he wrote for the *Cyclopaedia of Practical Medicine*. In his "Essay on Diabetes," clearly recognizing Types 1 and 2 of the disorder, he described both juvenile and adult-onset diabetes mellitus, suggesting that rapid onset of the disease occurred early in life while the more insidious form affected the more mature in years.[7] Bardsley expected to find evidence of a hereditary trait in the case histories that he examined, but he did not. Nor did he find sugar in the blood of sufferers, but he reported seeing a "thick, buffy coating" on the surface of diabetic blood, an indicator of an excess of fat in the blood now known as lipemia or hypercholesterolemia. Bardsley recommended diabetic patients eat only animal food, excluding anything sugary, though he later added vegetables to their diet. He also prescribed the usual nineteenth-century trio of cupping, leaches and opium for his diabetic patients.[8] Bardsley's considerable reputation won him a knighthood in 1853, the first Manchester physician to receive such an honor.

Another famed Manchester physician, Julius Dreschfeld, concentrated on diabetic coma, demonstrating in lectures and in papers his powers of clinical observation and his wide reading in many languages on the subject. A Bavarian by birth and a pathologist by training, he

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[6] See Tina Posner, "Magical Elements in Orthodox Medicine: Diabetes as a Medical Thought System," *Health Care and Health Knowledge*, ed. R. Dingwall et al (London: Croom Helm, 1977), 141–158.

[7] See *The Cyclopaedia of Practical Medicine* (London: Sherwood, Gilbert and Paper, 1835).

[8] Samuel Oleesky, "Diabetes in the Early Days of the Manchester Royal Infirmary," *Manchester Memories* 2 (1981–1982): 58–59. See also E.M. Brockbank, *Sketches of the Lives and Work of the Honorary Medical Staff of the Manchester Infirmary* (Manchester: Manchester University Press, 1904).

urged his students to look beyond the superficial manifestations of disease and to explain the symptoms of their patients in terms of the underlying pathology. His published works covered an array of medical subjects. Widely sought after for his opinions, Dreschfeld delivered the 1887 Bradshawe lecture at the Royal College of Physicians, where he was a Fellow. In it, he described coma in both young and older diabetics, noting that his youthful subjects tended to be very thin, displayed labored breathing and appeared undernourished while the adults looked generally plump and did not show signs of breathing difficulty. Most astutely, Dreschfeld found acetone in patient urine, especially in the urine of young diabetics, and using alkalis to neutralize its acidity he measured the level of acetone bodies. Dreschfeld deduced that some toxic substance, perhaps produced by the body's failure to oxidize sugar properly, might be responsible for diabetes and experimented on himself and others by ingesting acetone and sugar. Other than temporary drowsiness, acetone on the breath and in the urine, none of his non-diabetic guinea pigs were harmed by his trials; diabetics, on the other hand, had longer bouts of acetonuria, convincing Dreschfeld that acetone did not cause diabetic coma, though diabetics must have a reduced ability to metabolize or eliminate acetone.[9]

The Manchester Royal Infirmary also boasted R.T. Williamson, a neurologist who developed a passion for diabetes research while assisting Professor Dreschfeld. He published on diabetic neuritis and on pancreatic disease in diabetics; his book *Diabetes Mellitus and Its Treatment* (1898) followed and preceded groundbreaking papers in *The Lancet* (1894 and 1905).[10] In the latter report, he first detailed disturbances in vibration perception among diabetics. Williamson insisted heredity was a factor to be checked in diagnosing diabetes; he found that 13% of his patients had a positive family history. He also commented on the rising incidence of diabetes in Great Britain, particularly among the rich, and in Europe in general among the Jews, but he specifically excluded the

[9] Ibid., 60. Another physician had tried unsuccessfully to treat diabetes with bicarbonate of soda. A bibliography of Dreschfeld's works can be found in E.M. Brockbank, *Dreschfeld Memorial Volume* (Manchester: Manchester University Press, 1908).

[10] R.T. Williamson, *Diabetes Mellitus and Its Treatment* (Edinburgh: Young J. Pentland, 1898); "The Condition of the Pancreas in Fourteen Consecutive Cases of Diabetes Mellitus," *The Lancet*, 143 (1894): 927–929; and "The Vibration Sensation in Affections of the Nervous System and in Diabetes," *The Lancet* 165 (1905): 855–856.

poor from the phenomenon, including poor Jews he saw at the Infirmary. In all, Williamson authored ten articles in *The Lancet* between 1894 and 1920 on phenomena in diabetes, such as knee-jerks, loss of the Achilles tendon reflex, and its relationship to Graves' disease.

Long a leader in medicine in the northern kingdom, Edinburgh continued to show the way in diabetes research. William Cullen, disappointed with his private practice while teaching at Glasgow, moved to Edinburgh in 1755 as chair in chemistry at the university; he also gave clinical lectures at the Edinburgh Royal Infirmary, launching that institution's reputation for excellent scientific instruction. In 1766 Cullen accepted the chair in medical theory that had become vacant on the death of Robert Whytt and in 1773 he took over the more prestigious appointment as chair of medicine. He helped to establish Edinburgh as one of the leading medical schools, perhaps the best, in the world. A successful teacher inspired by the Scottish Enlightenment, Cullen brought his pedagogical skills to the laboratory, organizing and categorizing illnesses, medicines and plants; as a physician he established a significant clientele, regularly saw patients at the Edinburgh Royal Infirmary, and corresponded as a consultant on as many as 200 cases a year. Given this broad career path, it is not surprising that diabetes came to intrigue Cullen and, through him, his students. However, his emphasis on the primacy of the nervous system led Cullen and his followers away from other causes of the disease.

Thomas Willis had experimented, it will be recalled, with the idea of undernutrition as a means of living with diabetes, but found his "noble earl" resisted cutting down on his victuals and lacked the will power to sustain abstemiousness over time. Similarly, John Rollo had tried an animal food diet parceled out in small portions five times a day for Captain Meredith. Starvation of sorts remained an option, even after the discovery of insulin, as a way of temporarily keeping sugars lower, but more and more doctors put their patients on an inflexible diet of meat and dairy products long before that historic event. On both sides of the English Channel influential physicians identified bread, rice and potatoes as problem foods for diabetics, urging abstinence from everything starchy or floury. They argued that eating meats exclusively would also reduce obesity, a condition many associated with adult-onset diabetes. Some noted that carnivores are never fat, whereas herbivores, living exclusively on plants, often are. One French doctor whose campaign to cure excessive corpulence was later adopted by British healers, pointed to the hippopotamus as an example of inappropriate eating,

rendering the animal "so uncouth in form from its immense amount of fat, feeds wholly upon vegetable matter" including rice, millet and sugar cane.[11]

Another early variation of the low carbohydrate diet was tried on a diabetic patient of Irish physician George Alley to great effect in 1806. As he subsequently reported in the prestigious *Edinburgh Medical and Surgical Journal*, Alley prescribed boiled beef, soup, and quinine for the emaciated man.[12] His patient, John Cronin, in ordnance at Cork harbor, appeared flushed, with dry and "scurfy skin, thirst and a great hunger." Cronin drank cold water when he became heated and seemed to urinate frequently. Even more urine resulted, Alley recorded, when the patient drank milk. This phenomenon should not have puzzled Alley, since milk of various sorts had long been considered a purgative in English households, royal and otherwise. Samuel Pepys, who drank a dish of cream on occasion, recorded in May 1667 that he and others in the company of Sir John Mennes had to stop at the Devil's Tavern for their Naval Board colleague "to shit, he having drunk whey, and his belly wrought."[13] Under the care of her physician James Welwood in 1694, Queen Mary II submitted to a regimen of asses' milk, the fashionable tonic of her day for weak constitutions. The *London Pharmacopoeia* had long extolled the salubrious effects of asses' milk as a nourisher and cleanser of the kidneys, recommendations that endured into Alley's time. Alley's contemporary, John Latham, advocated asses' milk for diabetes.[14] Nevertheless, Alley chose a different path for his patient. He eliminated vegetables completely from Cronin's diet, and had him take a drachm of pulverized cinchona, a common name for a Peruvian

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[11] Jean-François Dancel, *Obesity or Excessive Corpulence*, translated by M. Barrett (Toronto: W.C. Chewett, 1864) quoted in Gary Taubes, *Good Calories, Bad Calories* (New York: Knopf, 2007), xi. Dancel was influenced by Justus von Liebig's contention that adipose tissue formed from ingested starches, sugars and fats.

[12] George Alley, "History of a Case of Diabetes Mellitus, Successfully Treated by Animal Diet and the Use of Cinchona," *Edinburgh Medical and Surgical Journal*, Third Series 4 (1808): 35–41.

[13] Pepys' *Diary* 15 May 1667. Then 68 years old, Sir John Mennes (Minnes in Pepys), whom Pepys affectionately called "an old fool," had medical interests and likely knew of the purging effects of dairy.

[14] Elizabeth Lane Furdell, *The Royal Doctors: Medical Personnel at the Tudor and Stuart Courts* (Rochester, N.Y.: Rochester University Press/Boydell and Brewer, 2001), 202; William Salmon, *Pharmacopoeia Londinesis or New London Dispensary*, 5th ed. (London: J. Dawk, 1696), 198–199; John Latham, *Facts and Opinions concerning Diabetes* (London: J. Murray, 1811), 184.

anti-malarial tree bark. Cronin's urine started to diminish, but Alley reckoned that it was the diet not the quinine that made the patient better.

Quinine often figured in early modern medical equations, though its side effects were just beginning to be fully understood. Long associated with relief for remittent fevers, cinchona found its way into the English pharmacopoeia in the seventeenth century as Jesuits' Bark and became a favorite remedy for many common ailments including stimulating the weak appetites of diabetics. Robert Talbor held a monopoly on the bark under Charles II and wrote the book on how to administer it. Physicians prescribed it to prevent hemorrhage and diarrhea, for which it is completely unsuited. Moreover, taken over prolonged periods of time, the bark may produce cinchonism, a systemic poisoning, and can induce uterine contractions leading to spontaneous abortion in pregnant patients. Doctors nonetheless doled it out enthusiastically to those who could best afford it, unwittingly contributing to a higher incidence of miscarriage among aristocratic women. Talbor's directions for dosages to be given to gravid patients indicate stronger concentrations of cinchona powder in lemon syrup; ironically, the remedy was not to be used by women "during their courses," the one time during their monthly cycles when there was no danger of inducing miscarriage.[15]

Cinchona was still in vogue when George William Balfour inherited the mantle of Edinburgh medicine and carried on the work of treating diabetes. Despite Dr. Alley's pronouncement that drinking milk caused his diabetic patient to urinate excessively, in a clinical lecture delivered to the Royal Infirmary in 1870 Balfour proposed employing a milk diet for diabetics as a therapeutic. Though not ruling out "bromide of potassium, full doses of opium, 14 grs. per day, and an alkaline treatment, the basis of which is citrate of ammonia," Balfour argued for a diet consisting of milk alone. He asserted that maintaining such a diet would be easier for patients, even "hospital patients with their limited intelligence [who] cannot be relied upon" to faithfully carry out a more complicated diet. Patients released to home care could hardly afford the expense of a meat and gluten regimen. Milk offered affordable nourishment, "procurable by the poorest." Balfour claimed to have significantly reduced the urine output of an emaciated fifty-one year old woman by limiting her to six pints of skim-milk for her

[15] Robert Talbor, *The English Remedy* (London: J. Wallis, 1682), 40, 63.

sole diet. Had she stayed in the hospital, Balfour insisted, she might have eventually been cured of diabetes altogether.[16] Given Balfour's status and reputation in Edinburgh medical circles, his lecture provoked serious discussion among diabetologists throughout Britain. *The Lancet* published a series of pieces by Dr. Arthur Scott Donkin, lecturer at the University of Durham, before and after Balfour's paean to milk that dovetailed with his thesis. Donkin conveyed the details of several of his diabetes cases while physician to the Sunderland Infirmary, cases that resulted in "complete and permanent recovery" in fifteen days using a systematically applied diet of skim-milk.[17]

At the opposite end of the dairy spectrum and hardly a specialist in health care, sixty-six year old retired London funeral director William Banting promulgated a restricted diet in 1863 based on his own weight-loss success following twenty years of frustration. Though maybe not a diabetic, Banting's pre-diet girth of over two hundred pounds (at five-feet, five inches tall) rendered him unable to tie his shoes or walk upstairs. Exercise, he found, only stimulated his hunger and "gallons of physic" did not help either. He suffered an umbilical rupture, started losing his sight (a symptom of Type 2 diabetes), and became nearly deaf. To treat Banting's deafness, which his aural surgeon, William Harvey, attributed to obesity, Banting was advised to cut out fat, starch and sugar, and to consume only meat, fish and dry toast. When he lost forty-six pounds and felt better than ever, Banting published a sixteen-page pamphlet at his own expense, *A Letter on Corpulence, Addressed to the Public*, that captured widespread attention in Great Britain and on the continent. Banting admonished his readers "to avoid any starchy or saccharine matter which tends to the disease of corpulence;" root crops like carrots and beets should be avoided, but fruit is less likely to increase weight if cooked without sugar. Banting's regimen allowed him ample alcohol: four or five glasses of whiskey each day, a cordial every morning, and an evening tumbler of gin, whiskey or brandy. In his *Letter*, Banting also commented that different people show differing degrees of tolerance for foods which fuel obesity, but never mentioned

[16] George W. Balfour, "On the Treatment of Diabetes by Milk," *Edinburgh Medical Journal* 15 (1870): 708–710. Balfour served as librarian at the Royal College of Physicians in Edinburgh for nearly a quarter of a century, and as its president from 1882–1884; he was also an honorary physician to King Edward VII.

[17] Arthur Scott Donkin, "Further Observations on the Skim-Milk Treatment of Diabetes," *Lancet* 101 (Jan. 11 and 18, 1873): 45–46, 86–87, reprint (London: Spottiswoode, 1873).

exercise as being relevant to weight loss. After losing the weight desired, Banting suggested a second dieting phase that allowed some experimentation with all food types. Four editions of his booklet were issued by 1869. The verb "to bant" entered the English language and other European tongues to mean weight reduction through dieting and the American Diabetes Association honors him annually with its eponymous Memorial Lecture.[18] Banting, who lived to be eighty-one, donated the profits of his publication to charity.

Thousands embraced Banting's low-carbohydrate program, but doctors worried over the absence of any milk products in the regimen and the editors of *The Lancet* excoriated Banting for merely repeating what was already well-established in the medical community. *The Lancet* also chastised him for meddling in health-related literature and urged him to mind his own business.[19] Nevertheless, one result of the Banting phenomenon that aided diabetics was the greater attention paid to food chemistry and to diet. And since he insisted that his "other bodily ailments have become mere matters of history," his regimen spawned countless variations over the next hundred years. Laymen like Banting, mirroring the experimentations of their professional counterparts, were willing to try anything to lose weight and feel fitter; diabetics had to find a way to survive their condition.

But none of these foregoing therapies, however efficacious, indicate a certainty on the part of their promoters about the locus of the disorder. Lost to Victorian Britons was the discovery by Thomas Cawley in a 1788 autopsy that the shriveled pancreas of a patient who had died of diabetes showed stones and signs of tissue damage; he suspected the pancreas might be the site of the disease. The implication of this crucial clue remained obscure for over a hundred years. Debate continued on both sides of the Atlantic among the next generations of specialists and generalists alike over what organ precisely was responsible for diabetes. At mid-century some still favored the kidneys as the location of the problem, but others ruled them out, calling the kidneys "only one of the excretory outlets by which useless saccharine is eliminated from the system, (while acknowledging that) its true pathology and …

[18] William Banting, *Letter on Corpulence* (London: 1864: New York: Cosimo Publishing, 2005 reprint). See also Barry Groves, "William Banting: Father of the Low-Carbohydrate Diet," *Petits Propos Culinaires* 72 (2003): 69–82.

[19] See John Harvey, "Bantingism," *Lancet* 83 (1864): 571. Harvey himself published recommendations in 1861 for meaty, starch-free diets.

etiology are still unknown."[20] Robert Bentley Todd, the first dean of King's College medical unit and a founder of King's College Hospital, weighed in on the pathology of the illness in 1848. Writing in *The Provincial Medical and Surgical Journal*, Dr. Todd asserted

> That it is primarily a disease of the mucous membrane of the stomach, whereby an abnormal diastase is formed, which readily converts into sugar such aliments as admit of that conversion; the mucous membrane probably likewise secretes sugar; the sugar thus formed passes into the blood, and is rapidly eliminated by the kidneys, causing, at the same time, the attraction to those organs of the elements of a very large quantity of water.[21]

Nearly simultaneous to Dr. Todd's analysis came the contention of Napoleon III's pharmacist Louis Mialhe, voiced in an address to his fellow professors at the Academy of Medicine in Paris and reprinted in 1849 in *The Lancet* that diabetes springs from insufficient alkalinity in the fluids of the body. All animals, he had noted earlier, produce a diastatic agent in their saliva (which he named ptyalin) that is converted into sugar. "But what becomes of this sugar?" Mialhe asserted that the cause of the affliction "may be traced to a defective assimilation of the sugar, through a want of alkalinity in the animal economy."[22]

The international flavor of diabetes research should be clearly apparent and the measured successes of researchers commended. Influenced by continental scientists like Joseph Gay-Lussac and Antoine Lavoisier, Londoner William Prout obtained a pure sample of urea in 1814, carefully describing its chemical and physical properties to the Medico-Chirurgical Society three years later; he also reported on its analysis. Focusing on the relation between urea and sugar, Prout explained diabetes as "a depraved secretion of urea."[23] Most diabetic diagnosing, however, was still being done by taste. Hence, doctors surely applauded in 1841 when chemical tests became prevalent after a German chemist, Karl Trommer, developed a qualitative check for sugar in diabetic urine. Nine years later another German, Hermann von Fehling, per-

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[20] See Austin Flint, "Cases at the Medical Dispensary," *Buffalo Medical Journal* 4/2 (1848): 86–103, quoted in "Pathology of Diabetes," *Transactions of the American Medical Association* 2 (1849): 90.

[21] R.B. Todd, *Provincial Medical and Surgical Journal*, April 1848, quoted in ibid.

[22] Louis Mialhe, *The Lancet* (London: Jan. 1849), quoted as M. Miable [sic], in ibid., 91.

[23] Quoted in W.H. Brock, "The Life and Work of William Prout," *Medical History* 9 (1965): 108.

fected a quantitative test still used in elementary chemistry classes.[24] Claude Bernard, famed contemporary and countryman of Mialhe, insisted that diabetes was due to an over-secretion of glucose by the liver. Moving from the belief that the nervous system controlled the secretory organs, Bernard probed the brain stem in a conscious animal and produced temporary diabetes that he attributed to stimulating the vagus nerve. Cutting the vagus, however, did not ameliorate the diabetes. In the end, Bernard recalled Galen's classic insistence on balance in life and urged everyone seeking wellness to maintain stability of their body temperature and blood sugar levels, what he referred to as the *milieu intérieur*.[25] Nonetheless, Bernard's prestige as a physiologist and his identification with the scientific method in medicine swayed others to his views on diabetes, including English physicians William Withey Gull and Henry Marshall Hughes.

Dr. Gull, a renowned clinician and personal physician to the queen, echoed Bernard's assertion that the liver was the locus of diabetic disorder. According to Gull, "modern pathology points to the liver as the faulty organ in diabetes."[26] Gull learned much about diabetes from his colleagues who treated diabetics at Guy's Hospital. For instance, he mentioned a patient of Henry Marshall Hughes, admitted to Guy's in August 1848.[27] John S., a tailor of middle stature and twenty-seven years, began to urinate excessively beginning about six months before his admission. Passing unusual quantities of urine left him feeling weak and feverish with dry, harsh skin. Upon admission he seemed to present the ordinary symptoms of diabetes, voiding four and a half pints of urine daily with a specific gravity of 1050, notably higher than a healthy person's. Hughes pursued various treatments but noted no obvious improvement. By January 1849, the quantity of urine was seven and a half pints per day (sp. gr. 1042). At this time an eruption somewhat

[24] Fehling's solution is a deep-blue alkaline solution used to test for the presence of aldehydes in urine; glucose produces a positive test.

[25] See Francisco Grande and Maurice Visscher, eds. *Claude Bernard and the Experimental Method* (Cambridge, Mass.: Schenkman Publishing, 1967). Bernard's wife and daughters deserted him over their objections to his use of live animals for experiments. Anti-vivisectionists refer to Bernard as "infamous": Robert Sharpe, *Cruel Deception* (New York: Sterling Publishing, 1988).

[26] T.D. Acland, ed., *A Collection of the Published Writings of William Withey Gull*, 2 vols. (London: New Sydenham Society, 1894) 1: 559. See also Guy's Society for Clinical Reports, 1836–1874; Papers Relating to Sir William Withey Gull (Feb. 1864), King's College London Archives.

[27] Gull, 554–555.

suddenly appeared on the patient's arms, "at first apparently of a lichenous character," but in ten days it extended over his legs, trunk, both anteriorly and posteriorly, and also over his face and into his hair. The rash consisted of "scattered tubercles of various sizes, some being as large as a small pea, together with shining, colorless papules." Eventually, the rash disappeared and the patient was discharged; Gull records no outcome of the patient's diabetes.

As a polymath and focused clinician, Gull surely knew enough about diabetes to pen the entry on the malady in *The Family Physician: A Manual of Domestic Medicine*, a popular work by "Physicians and Surgeons of the Principal London Hospitals," available by subscription to health-minded Victorians.[28] In the absence, however, of apodictical evidence that he actually wrote or edited the piece, I can only credit him as a hospital physician among those who may have worked on the project. Accordingly, I will hereafter refer to the author or authors of the item as anonymous. In the end, what remains most significant is that this popular, widely disseminated health reference contained practical information and a diet for diabetes.[29] Various versions of *The Family Physician* came out between 1865 and the mid-1890s, the later series adding more illustrations to the same text and elaborate cover design. Some editions sport illustrations in pop-up form and some include a fifth tome entitled "The Ladies Physician" while still others incorporate that material into the fourth volume. The number of pages in the set varies from 1022 to 1176. Many undated copies specify that an edition was for subscribers only and not available at booksellers.

Whoever did write the diabetes section in *The Family Physician* devoted most of the material in it to diabetes mellitus, called "the commoner form" of the malady, and though both diabetes varieties produce

[28] Physicians and Surgeons of the Principal London Hospitals, *The Family Physician: A Manual of Domestic Medicine*, subscription edition (London: Cassell and Company, 1886), 217–223.

[29] Cassell and Company produced the initial set of four volumes but by 1882 acknowledgment went to Cassell, Petter, Galpin and Company for a "new and enlarged edition;" the following year, however, the Cassell Company again claimed publishing credit. I wish to thank William St. Clair for his generous advice on estimating the production of Victorian books and for sending me a chapter from his forthcoming work, *The History of the Book in Britain*. Thanks are also due to Judith Flanders, former employee of Cassell and Company, on its records.

an excessive secretion of urine, that urine is sufficiently different to warrant regarding these as two different diseases. As for diabetes mellitus, the entry makes no distinction between what we now label Types 1 and 2. *The Family Physician* noted that a healthy person urinated between one and four pints in twenty-four hours with the average around fifty ounces. A diabetic urinated between eight and fifteen pints or even more, an amount no one could overlook. Moreover, urine from a sufferer manifests sugary taste and light color. The manual admonished its readers to smell and taste the urine of the possible diabetic, testing for a "sweet hay" odor and decidedly saccharine flavor. Those who suspected diabetes in their families were encouraged to run a "simple and beautiful" urine test using a few crumbs of German yeast, available for a penny at any baker's shop; if sugar is present in the urine, fermentation will take place.

The Family Physician evinces implicit compassion for sufferers when it describes the "rude crystallization" of dried diabetic urine left on the black shoes of a girl who had the disease or the sticky, white residue on the black worsted stockings of another female patient. A male diabetic noticed with alarm that flies and wasps gravitated to his chamber pot and, while sugar in the urine should be a matter of serious import as a rule, how can one not sympathize with people who "have been known in a few months to pass their own weight of sugar"? The entry goes on to describe the intense, distressing thirst that diabetics bear, as well as their sweetish breath, parched tongue, dry skin, chronic boils, cataracts, and carbuncles. And while the appetites of diabetics appear undiminished by the disease, *The Family Physician* comments that this seeming indicator of good health might be deceptive; diabetics gradually lose strength and get thinner. Generally a chronic disorder, "creeping on at first insidiously and under judicious treatment prolonged over a course of years," the symptoms of diabetes can accelerate, and when "the lungs become infected, the patient dies from a form of consumption."

Diabetes mellitus develops twice as commonly in overweight men as in women, according to *The Family Physician*, among more young and middle-aged urbanites than rural residents, and though not hereditary "in some cases it would appear to run in families." Despite the fact that its origins remain obscure, the author(s) speculated that diabetes may arise from exposure to wet and cold, from alcoholic excess, or from violent mental emotion; comment followed about various patients who came down with diabetes after being unjustly accused of theft, after

the burning down of a place of business, after being sued in Chancery court, and after a serious fall. Bad-tempered people should control their emotions, as a case suggested itself where diabetes ensued after a violent fit of anger. Subsequent to these admonitions, the manual presented a therapy that eliminated as much as possible all carbohydrates in the diabetic diet.

Presaging the low-carbohydrate Atkins' diet by a century, *The Family Physician* insisted that substituting vegetables and meat for all sugars and starches would improve health. Unlike the starvation plan favored by some diabetologists, subsistence on an animal diet, the manual contended, could not only sustain but invigorate men. This treatment relied on a regimen of meat (except liver) and green vegetables, forbidding all fruits and any "white" vegetables like cauliflower, celery, asparagus, and cabbage. Since cutting off all breads might perturb patients, *The Family Physician* suggested biscuit-sized cakes made of washed bran and included a detailed recipe for making them; the cakes could be eaten at every meal with "a rather free allowance of butter." One could also purchase bran cakes ready-to-eat, though the author(s) opined that it is better to prepare them at home. The manual also recommended "gluten bread," made from wheat flour that has been thoroughly washed to remove starch, though acknowledging some patients felt chewing it was akin to gnawing on "India-rubber." As for beverages, *The Family Physician* ruled out sweet wines and ales, porter, and stout, but ruled in dry sherry, claret, and bitter ale, as well as coffee, tea, and cocoa, all without sugar. Milk might be consumed in moderation, but all fluids should be drunk tepid since cold drinks make one parched. A table followed with categories listing what diabetics may eat and drink and those they must avoid.

In addition to this diet, *The Family Physician* recommended warm baths and "large doses" of opium, due to the "great tolerance" for the drug in diabetics. The manual also supported giving patients phosphoric acid, bromide of potassium, nitrate of uranium, and "the liquid extract of ergot, given in thirty-drop doses in water three times a day." A skim-milk treatment, essentially a starvation regime consisting only of that drink for six weeks, might be helpful reducing the quantity of urine passed and diminishing its specific gravity. One difference between the recommendations for sufferers found in *The Family Physician* and earlier advice centers on the need to invigorate the sensitive feet and legs of patients. Our manual makes no mention of such stimulation. Suggested treatments in the past included cold baths followed by energetic mas-

saging of the lower limbs. William Osler, a Canadian contemporary of Gull's, even specified that flannel or silk clothing should be worn next to the skin by diabetics.[30]

The Family Physician distinguished diabetes insipidus from its more common saccharine cousin in polyuria, remarking on the superabundance of urine passed by the patient and on the absence of sugar in that urine. "We had at one time under our care a man who habitually passed twenty-two pints of water in the course of the day and night…. [and] on this account unable to go to church of to any place of amusement."[31] In addition to the two ordinary chamber pots provided, this patient required a slop pail kept under his bed, as did a female similarly afflicted. Moreover, these sufferers experienced frighteningly severe thirst, drinking quarts of water at a time to slake the craving. The author(s) of the entry sympathized with the plight of a patient caught without access to water while laid up alone at home and forced to imbibe his own urine. Unlike the often overweight victim of diabetes mellitus, those who faced diabetes insipidus had little appetite, lacked perspiration and were unusually vulnerable to cold. As in diabetes mellitus, it is more commonly found in men than in women, but this disease usually affects those below thirty years of age.

The Family Physician prescribed obtaining half an ounce of the liquid extract of ergot, available from a chemist and "perfectly safe." Nonetheless, the author(s) counsel against informing the chemist how much you intend to take, "as he will probably tell you the dose is excessive, so you had better say nothing about it."[32] Appearing like laudanum in its blackness, thirty drops of the remedy should be taken in a little water three times a day and ought to produce a reduction in urine and a concomitant rise in its specific gravity. Discontinue usage when the goal of only three pints of urine passed in twenty-four hours is achieved. Though ergot should be the remedy of choice for diabetes insipidus, other effective treatments include common niter or saltpeter, half an ounce shaken up in a pint of water and taken by teaspoon every hour, and valerian blisters applied to the nape of the neck or the pit of the stomach. Patients should give these remedies sufficient time to work since "chronic diseases often take a long time to get rid of." One only

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[30] William Osler, *The Principles and Practice of Medicine: Designed for the Use and Practitioners and Students of Medicine* (London: Young J. Pentland, 1892).

[31] *Family Physician* 1:223–224.

[32] *Family Physician* 1:225.

need consult a doctor if the ailment might not be diabetes or after one has tried the ergot. No dietary restrictions are needed for the insipid form of diabetes.

Even if William Withey Gull did not personally contribute the section on diabetes to *The Family Physician*, the advice given in the entry found a huge audience, making the manual the Victorian equivalent of WebMD.[33] The omnibus followed in the long tradition of printed domestic health books dating back to Andrew Boorde's *Brevarie of Helth* in the mid-sixteenth century and including Nicholas Culpeper's many titles from Commonwealth presses. John Archer's aptly titled *Every Man His Own Doctor* (1671) continued that convention. The manual's publisher, Cassell and Company, enjoyed a reputation for producing high quality works, many by subscription, with wide circulation; in its catalogue were classics by Dante, Milton and Cervantes, illustrated by Gustave Doré. Cassell surely knew the marketplace well, providing late-Victorian readers with over two dozen serial publications, eight weeklies and four monthlies. Whoever authored the guidance on diabetes mellitus shared with Gull the view that medicine should relieve physical misery, that drugs need not always be used to solve chronic health problems, and that the patient's wellbeing ought to come first.

A colleague of Gull's at Guy's, Frederick William Pavy, the last of the English physician-chemists, had studied in Paris where he came under the influence of Claude Bernard and determined to make the exploration of diabetes his life's work. Returning to London in the mid-1850s, Pavy lectured on anatomy and physiology at Guy's Hospital, eventually coming to disagree with Bernard's theory of the glycogenic function of the liver.[34] Working in the backroom laboratory of his consulting office, he developed "Pavy's test," employing copper test-pellets for the quantitative estimation of reducing sugars.[35] He also was among the first to recognize the significance of acetone and other ketones discharged in the acute stages of diabetes. His publication,

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[33] No one should underestimate the dissemination of Victorian self-help tomes; I purchased individual volumes in the set from book-sellers in England, Canada, the United States and Australia.

[34] Robert Tattersall, "Frederick Pavy and His Opposition to the Glycogenic Theory of Claude Bernard," *Annals of Science* 5 (1997): 361–374. Tattersall calls Pavy "the last of the physician-chemists," the title of another Tattersall article in *Journal of the Royal College of Physicians* 3 (1996): 238–245.

[35] F.W. Pavy, "Copper Test-Pellets for Sugar," *Lancet* 2 (1880): 57. Mr. Cooper of 26 Oxford Street, London, prepared the pellets.

Researches on the Nature and Treatment of Diabetes (1862), made him the most sought after diabetologist in London.

Pavy particularly concentrated on carbohydrate metabolism and the control of diabetes through diet. In 1873 he authored *A Treatise on Food and Dietetics* in which he proposed almonds and other nuts as bread substitutes, available at Mr. Blatchley's on Oxford Street, Mr. Van Abbot's on Prince's Street, and Mr. Bonthron's on Regent Street. Pavy insisted on a carbohydrate-free regimen. His dietary for the diabetic allowed "butcher's meat of all kinds, except liver," fish, eggs, cheese, and some vegetables like spinach and other greens. He forbade sugar in any form, pasta, potatoes, and fruits of all kinds, but he permitted dry sherry, claret, other wines and spirits that had not been sweetened. Pavy banned port, cider, all sweet ales, and milk, resurrecting the dispute among physicians about the wisdom of certain dairy products for diabetics.[36] He included recipes for preparations to be made for invalids including "panada," a paste made from pulverized meat and stale bread; beef-tea, made more flavorful with herbs and "mushroom-ketchup;" meat extracts and lozenges (available at the "dietary depots" listed above); and decoctions of Iceland moss and Carrageen moss strained through linen.[37]

Some physicians had a special interest in diabetes because they themselves suffered from the disease. Liverpool-based James Carson, M.D. from Edinburgh (1772–1843), developed diabetes later in a life filled with various interests. Something of a medical dilettante, Carson wrote on subjects that interested him, notably blood and respiration, as well as the proper way to slaughter animals for human food. Fellow of the Royal Society, he also found fascination with Newfoundland, penning a treatise or two on that place before his death. Dr. John Milner Fothergill (1841–1888), a Yorkshire Quaker also with an M.D. from Edinburgh, probably manifested some symptoms of Type 2 diabetes when he wrote his book on indigestion and biliousness. He won the Hastings gold medal from the British Medical Association in 1870 for his experiments with digitalis. Fascinated by internal metabolic disorders, Fothergill wrote extensively on gout, digestion and diet, though he apparently did not connect his own physical condition with those

[36] F.W. Pavy, *A Treatise on Food and Dietetics Physiologically and Therapeutically Considered*, 2nd ed. (New York: William Wood, 1881), 351–352.

[37] Ibid., 359–365.

ailments. Some have referred to him as gout-ridden, and contemporaries noted his enormous weight, perhaps topping 300 pounds, his large head and thin neck. Fothergill died in London at age forty-seven from the long-term effects of diabetes in 1888.[38]

Until the final decades of the nineteenth century, without agreement on the site of the disease or its cure, diabetes therapeutics remained almost totally empirical and non-specific, confined to general supportive measures backed up by the Galenic chestnuts of purges, emetics, and diuretics. William Osler's 1892 medical textbook summarizes what physicians in their formative years were taught about diabetes:

> The personal hygiene of a diabetic patient is of the first importance. Sources of worry should be avoided, and he should lead an even, quiet life, if possible in an equable climate. Flannel or silk should be worn next to the skin, and the greatest care should be taken to promote its action. A lukewarm, or, if tolerably robust, a cold bath should be taken every day. An occasional Turkish bath is useful. Systematic, moderate exercise should be taken. When this is not feasible, massage should be given.[39]

Like other Victorians, Osler also championed opium for diabetes: "Opium alone stands the test of experience as a remedy capable of limited the progress of the disease."

While these various treatments proposed for diabetes before the discovery of insulin may seem to the modern reader absurd at best and harmful at worst, medicines and therapies thought efficacious today might be mocked tomorrow. Similarly, ridiculed remedies from the past come back as innovative. In July 2005, research conducted on various studies that have appeared from 1990 to 2003 in *The Journal of the American Medical Association*, *The New England Journal of Medicine*, and *The Lancet* determined that nearly one-third of all the original conclusions did not hold up upon subsequent investigation. "Contradicted and potentially exaggerated findings are not uncommon in the most visible and most influential original clinical research," reported the inquiry's author, a reminder that chronological bias should neither blind us to the earnest efforts of past medicos to cure diabetes nor to the probable

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[38] J. Milner Fothergill, *Indigestion and Biliousness* (London: H.K. Lewis, 1872; 2nd ed. 1881). Both the *Dictionary of National Biography* and Roy Porter and G.S. Rousseau's *Gout* refer to Fothergill as gouty: *Gout*, 192.

[39] William Osler, *The Principles and Practice of Medicine: Designed for the Use and Practitioners and Students of Medicine* (London: Young J. Pentland, 1892). Osler could only identify ten diabetes cases among 35,000 patients treated at Johns Hopkins University Hospital.

obsolescence of modern practices.[40] At the other end of the spectrum, Biopharm, one of the world's largest commercial leech farms, reported sales in 2004 of 50,000 leeches, mostly to hospitals in Britain and the United States. Ironically, it was William Osler's 1892 textbook that made the germ theory the basis of medical practice and proclaimed leeches out of favor.[41] And Samuel Pepys might be amused to hear that adding whey to a high-carbohydrate meal may help people with diabetes keep their blood sugar under control. According to results in a recent issue of the *American Journal of Clinical Nutrition*, whey proteins can attenuate blood sugar surges throughout the day.[42] In medicine, many old things are new again.

By the *fin-de-siècle*, the concerted effort to find some way to control diabetes had become a truly international one involving researchers on both sides of the Atlantic. Not surprisingly, such intensive activity produced its share of conflict and professional antagonisms even among countrymen. Consider the dispute between two Germans: the renowned Cologne physiologist Eduard Pflüger and Bonn physician Oscar Minkowski. In 1889, after producing diabetes in a dog whose pancreas he had removed, Minkowski realized it was the pancreas that contained an anti-diabetic substance. He theorized that the pancreas secreted internally into the blood in addition to its well-known secretion of a digestive juice into the intestine. This anti-diabetic substance, Minkowski reasoned, likely came from the islets of Langerhans, named for a German medical student who observed that these little islands of tissue differed from the rest of the gland and probably had a different function. Since the islets had no connection to any ducts, it was reasonable to deduce that their secretion, whatever it was, went straight into the circulation. While many medical scientists supported Minkowski's thesis, Eduard Pflüger did not. Instead, he postulated that some disorder of the nervous system triggered diabetes. He argued that the disease occurred when nervous impulses from a "sugar center" in the brain caused the liver to secrete more sugar into the bloodstream than the pancreas could manage, either due to overstimulation of the sugar center or to failure of the pancreatic function. The scientific disagreement

[40] Dr. John Ioannidis, reported in *JAMA* (July 13, 2005) and on-line at www.cnn.com/2005/HEALTH/07/13/contradictory.studies.

[41] See Joel Colapinto, "Bloodsuckers," *New Yorker* (July 25, 2005), 72–81.

[42] A. Frid, "Whey Supplements May Prevent Blood Sugar Spikes," *American Journal of Clinical Nutrition* 82 (2005): 69–75.

became quite personal when Pflüger denounced Minkowski's methodology and suggested some sort of unprofessional motivation on the physician's part. Minkowski fired back by demeaning Pflüger's clinical credentials and accusing him of self-blinding conceit. The adversaries' harsh words intensified the quarrel in journals and published letters, but as evidence began to accumulate supporting Minkowski and leading to exciting new experimental therapies, Pflüger found himself in an untenable position within the scientific community. However unfair, given that research always produces hits and misses, Minkowski's work became a "discovery" and Pflüger's a "mistake."[43] But Minkowski made mistakes, too.

Minkowski himself spurred additional experimentation on diabetic patients.[44] Newly energized by George Murray's 1891 trials successfully treating myxedema (hypothyroidism) with injections of sheep thyroid extract, Minkowski and others determined to exploit the physiological suggestion that pancreas concentrate might cure diabetes. Teams of clinicians throughout Europe began treating diabetics with pancreatic extracts, although none succeeded for a generation because both the digestive enzymes and insulin were extracted from the pancreas together. When the whole pancreas was pulverized, the digestive enzyme broke down the protein hormone insulin and rendered it inactive. In 1893 Minkowski was the first to supply sufferers with pancreatic extracts administered orally, but this also proved futile until the acini cells producing the digestive enzyme could be inactivated. That same year, a physician at Bristol Royal Infirmary, P. Watson Williams, implanted three pieces of freshly slaughtered sheep's pancreas, "each the size of a Brazil nut," under the skin of a teenage diabetic. Though the boy's glycosuria was lowered, the patient died after a few days.[45] Try as they might, investigators could not find a way to withdraw the anti-diabetic substance and produce a stable extract of the pancreas that would predictably and consistently produce a fall of blood glucose in diabetics.

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[43] Thomas Schlich, "Making Mistakes in Science: Eduard Pflüger, His Scientific and Professional concept of Physiology, and His Unsuccessful Theory of Diabetes (1903–1910)," *Studies in the History and Philosophy of Science* 24 (1993): 411–441.

[44] For his historical perspective on diabetic research, see Oscar Minkowski, "Historical Development of the Theory of Pancreatic Diabetes," *Diabetes* 38 (1989): 1–6. This piece, written in 1929, is introduced and translated by Rachmiel Levine.

[45] P.W. Williams, "Notes on Diabetes Treated with Extract and by Grafts of Sheep's Pancreas," *British Medical Journal* 2 (1894): 1303.

Scotland made its contribution to this concerted effort through the work of Aberdonians John Rennie and Thomas Fraser, though it was misunderstanding their own 1906 testing that helped subsequent seekers find answers. Instead of trying to isolate an extract from the islets of Langerhans while inactivating pancreatic digestive enzymes, as other laboratories were then attempting, Rennie and Fraser conducted a test using the pancreases from certain bony fish procured fresh from the local market. Because the component parts of the monkfish pancreas were anatomically separate, unlike the human pancreas, the Scots took uncooked fish islets, minced them, and fed them to five diabetic patients.[46] After two months they happily observed a decrease in sugar in the urine, but they could not then have known, as we do now, that their patients' intestinal enzymes would destroy the fish extract or that the strict diet of the subjects caused the drop in their sugar output. In the meantime, the raw fish feeding perdured, as did other inconclusive experiments until insulin could be isolated from the pancreas.

Also ongoing was the tenacious reliance on urine testing to diagnose diabetes. Clinicians still used urine glucose and volume as markers for diabetes despite historical problems using chemistry to dissect the urine. Two categories of quantitative tests for the urine had been developed by the 1860s: tests requiring a well-furnished medical laboratory headed by a specialist in quantitative analysis and others that did not, relying on simple notations of volume, specific gravity, and the weight of the solid residue. Both tests were subject to several kinds of errors, misjudgments, and carelessness. As a result, doctors had to repeat each test twice, all the while judging which cases demanded great accuracy and which needed only an approximate quantitative estimate. Likewise, qualitative chemical tests for urine produced difficulties, as doctors complained of time-consuming procedures while lacking the theoretical and practical know-how to perform them. Evaluating urine during a house call was impossible, given the complex and corrosive nature of the testing components; moreover, five of the eleven tests available for testing urinary sugar in the last half of the

[46] M.J. Williams, "Aberdonians, Insulin and Marine Biology," *Proceedings of the Royal College of Physicians of Edinburgh* 23 (1993): 186. One subcutaneous injection was also administered. Klaus Helmut Mellinghoff, incorrectly identified as K. Millingdorf in the text of their article, is translated and quoted in John E. McQuillan and Marcia S. McQuillan, "The Discovery of Insulin and Control of Diabetes Mellitus," *Janus* 69 (1982): 106–107.

nineteenth century proved unreliable.[47] Difficulties in chemical testing of urine persisted into the next generation when experts challenged the invariability of the association between urinary sugar and diabetes. In the past when sugar turned up in patient urine insurance companies withdrew their coverage, just as they did when urinary albumin indicated kidney disease. Victorian-era British authorities in the field, like William Roberts and Daniel Hooper, argued in *The Lancet* that other urinary constituents when combined with the most commonly used glucose reagent, Fehling's solution, could produce a false sugar reading.[48] Clearly, other clinical evidence of diabetes needed to be present in patient urine to confirm a diagnosis. Measuring blood sugar also remained problematical past the turn of the century, adding to the criticism of physiologists who advocated using a better index of total metabolism. Not until 1914 did physicians have available to them dependable chemical blood tests that required only pinpricks of their patients and that made daily testing for glucose levels possible. No wonder British diabetologists greeted this advance as "perhaps the greatest … in diagnosis by chemical means."[49]

Though still lacking the diagnostic blood test that would ultimately aid doctors and diabetics alike, the concepts of discreteness in disease processes and the specificity of therapeutic agents did mature. At the end of the nineteenth century, however, old stereotypes about diabetics persisted in England and elsewhere. The case of Cornélius Herz offers a fine example about public attitudes towards the disease, its sufferers, and how it was diagnosed and treated. Herz, a principal financier of the Panama Canal Company and a French Jew, was implicated in the 1889 collapse of the corporation and in the ruin of many of its stockholders. When an inquiry jeopardized his future, Herz fled to Bournemouth. He claimed that as a diabetic he did not have long to live and should not be extradited to face French justice. Imbued with the Victorian-era notion that many hypochondriacs used their invalidism to advantage, skeptics

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[47] William Roberts, "Lectures on Certain Points in the Clinical Examination of the Urine," *Lancet* 1 (1862): 508. See also Julius Vogel, *A Guide to the Qualitative and Quantitative Analysis of Urine*, trans. William Orlando Markham (London: New Sydenham Society, 1863), 272–273, 351–378.

[48] Roberts, "Clinical Examination of the Urine," 507–510, 535–536; Daniel Hooper, "On Fehling's Test and the Significance of Sugar in the Urine," *Lancet* 101 (8 March 1873): 360. Benedict's solution is more commonly used now.

[49] Archibald Garrod, "Medicine from the Chemical Standpoint," *British Medical Journal* 2 (1914): 233.

scoffed at Herz's self-diagnosis; moreover, Herz was widely regarded as a medical charlatan, an electrician with a dubious medical diploma. In fact, Herz did suffer agonizingly from the disease. Like many French diabetics, Herz possibly tried the tonics and panaceas available to his countrymen, such as *Vin Héraclés*, a "phosphoiodé" widely advertised at the turn of the century, or he may have opted for *Thé des Vosges*, an antidiabétique equally popular at the time.[50]

Dr. Russell Reynolds and Sir Andrew Clark, a Fellow of the Royal College of Physicians, examined Herz in 1892, followed by two French physicians in early 1893, who apodictically declared him unfit for travel, and two again later in 1893, who just as forcefully concluded the opposite: "what was not possible four months ago is possible today."[51] Sir Richard Quinn also examined him in 1894. The French courts sentenced Herz to five years in prison in absentia and his name was expunged from the roll of the Legion of Honor. The French government applied persistently but unsuccessfully for his extradition and he would not co-operate with the Panama Inquiry Committee. Herz died in 1898, leaving the dual impression that he was a deceitful malingerer and that his doctors were incompetent. Building on public interest in the scandal, in 1897 the artist H.S. Robert painted a line-block vignette of the diabetic Herz, then still alive, for an illustrated journal.[52] One cartoon depicts a couple of physicians examining Herz's stool to check for diabetes. The medical men, "two princes of science," are caricatures, contrasting types rather than specific doctors: one is thin and the other plump, one is bearded and the other clean-shaven, but both wear the Legion of Honor on their left lapel, suggesting they are French rather than British physicians.

The tormented invalid and the comic hypochondriac have been standard literary types throughout history. In Victorian times, sick peo-

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[50] Lithographs of labels from both nostrums can be found in an album of color prints, J.J. Lemoine and Pharmacie A. Bouckaert, *Labels for Pharmaceutical Packaging* (Brussels: s.n., ca. 1890/1910), fos. 33r/item 572 and lv/15, Wellcome Library.

[51] Jean-Martin Charcot and Paul Brouardel made up the first French team and after Charcot's death, George Dieulafoy joined Brouardel for the second visit. R. Hierons, "Charcot and His Visits to Britain," *British Medical Journal* 307 (1992): 1589–1591; M.F. Khan and M. Bonduelle, "Charcot's Links with Britain," *British Medical Journal* 308 (1994): 1238–1239.

[52] H.S. Robert, "Deus princes de la science furent charges à leur tour de se render exactement compte de l'état de l'illustre malade," *Un diabétique*: 11 (Paris: 1897), Wellcome Library. The anti-Semitism to which the Herz incident gave rise contributed to the climate of the infamous Dreyfus Affair.

ple faced even more prejudices than their earlier counterparts and had to deal with conflicting cultural expectations. As Maria Frawley demonstrates in *Invalidism and Identity in Nineteenth-Century Britain*, as Christians, sufferers were taught that their infirmities facilitated spiritual conversion, while as Britons of an industrialized, vigorous nation, they were hardly doing their part. The sickroom was not the abode of manly, purposeful agents, but a semi-secluded reminder that science had not quite cured all ills. Frawley has examined some invalids' narratives, almost exclusively written by men, for clues about the various ways the chronically sick viewed themselves. Some spotlighted their spirituality, while others denied the stereotype of idleness and complained that overwork had brought them down; a few searched for their own cures outside of institutionalized medicine, but most accepted their condition and abided by doctor's orders.[53] Diabetics conformed to this pattern, following strange and often unpleasant regimens designed by their physicians. They held on, hoping that by the time a cure was found they would still be alive and able to benefit from whatever science and God could provide. The breakthrough came from the world of the Empire and though not a cure, the discovery of insulin enabled victims of diabetes, after much trial and error, to manage their disease.

[53] Maria H. Frawley, *Invalidism and Identity in Nineteenth-Century Britain* (Chicago: University of Chicago Press, 2004).

CHAPTER SEVEN

AFTER INSULIN: THE LINGERING EFFECTS OF AN INCURABLE DISEASE

Before the introduction of insulin the management of diabetes was bleak. In 1897, according to Elliott P. Joslin, master clinician and founder of the famed Joslin Diabetes Foundation in Boston, the average life expectancy for a ten year-old child identified with diabetes was 1.3 years; at thirty diagnosis meant 4.1 more years of life; and a fifty year-old recently detected diabetic could expect to live eight more years.[1] Diabetics had to be hospitalized for weeks on end, not much different from the treatment they received in the eighteenth century. Their diets were rigidly controlled and their inflexible caloric intake monitored, mainly by specialists in biochemistry who understood urine but not patient needs. Just as earlier physicians like John Pechey had ridiculed the personal habits of diabetics as "lax and crude," victims on the eve of discovery found themselves still subject to unjust bias and demeaning institutional supervision. By 1900, though less than two percent of the population of industrialized countries had diabetes, its victims, young and old, suffered greatly from collateral damage to their eyes and lower extremities, from lowered resistance to disease of all kinds, from unhealed wounds and boils, impotency, sterility, tuberculosis and pneumonia.[2] Becoming apparent was the connection between "civilization," meaning industrialization and westernization, and diabetes, although some who emphasized this link still blamed sufferers for their slothful ways. In a 1907 address to the British Medical Association, Sir Havelock Charles, Surgeon-General President of the Medical Board of India, depicted diabetes as a plague among "the lazy and indolent rich"

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[1] Elliott P. Joslin, "The Unknown Diabetic," *Postgraduate Medicine* 4 (1948): 302–306. The long-lived Joslin (1869–1962) was a contemporary of the discoverers of insulin and saw over 50,000 patients during his career.

[2] Michael Bliss, *The Discovery of Insulin*, rev. ed. (London: Faber and Faber, 1988), 21. Diabetes is rare, however, during times of great hardship such as Germany experienced in 1917: Erich Ebstein, "Diabetes, Sugar Consumption and Luxury through the Ages," in *Diabetes: Its Medical and Cultural History*, ed. Dietrich von Englehardt (Berlin: Springer Verlag, 1989), 105.

of the subcontinent. He asserted that ten percent of Bengali men had diabetes, due in part to a diet of rice, flour and beans, hardly, it would seem, the food of the wealthy. Other medical scientists began to associate high consumption of sugar with a rising incidence of diabetes, a correlation born out by later studies of non-western peoples, such as Maoris, Natal Indians and urbanized Zulus, who ate large amounts—90 pounds annually per person—of sugar.[3]

At the beginning of the twentieth century, following experiments with pancreatectomies on dogs that then developed fatal diabetes, physiologists focused professional and public attention on the lack of an internally secreted pancreas hormone in human diabetics. The pancreas, it was known, exuded a digestive enzyme into the gut, but medical researchers came to understand that diabetes resulted from the body's failure to metabolize food, especially carbohydrates, due to the absence of a second, internal secretion that enabled the body to use its fuel. In 1907 George Ludwig Zuelzer published the results of his attempt to treat six diabetics with alcohol extracts of pancreas he called acomatrol. Though there seemed to be initial improvement in these cases, toxic reactions in the treated patients, especially raging hypoglycemia, ended the experiments.

However, until the First World War, disagreement over the cause of the disease continued in Britain as some specialists still favored the nervous system, the thyroid, or the pituitary as the seat of diabetes. Moreover, no one had come up with a successful way to use pancreas extracts to alleviate diabetes; neither had anyone found pancreatic lesions in diabetic necropsies. Meanwhile, human sufferers died while waiting for the innovation that might save them. Diabetes rose in the ranks of fatal diseases in Europe and North America from being the twenty-eighth leading cause of death in 1900 to twelfth in 1920.[4] The American researcher Frederick M. Allen, based at the Rockefeller Institute in New York, insisted that the origin of diabetes must lie in the pancreas and, as long as attempts to reduce glycosuria and improve patients continued to fall short, prescribed starvation diets for diabetics, nutritional regimes with fewer than 1000 daily calories. One of his

[3] Gary Taubes, *Good Calories, Bad Calories* (New York: Knopf, 2007), 102–103, 110–111.

[4] J.M. Fenster, "The Conquest of Diabetes," *American Heritage of Invention and Technology* 14 (1999): 51. Despite the use of insulin, diabetes became the seventh leading fatal disease in 1940 and the third most common cause of death by the end of the century.

undernourished patients, a seventeen year-old girl who stood over five feet tall, weighed fifty-four pounds; others were equally skeletal. Allen's London counterpart, George Graham at St. Bartholomew's Hospital, likewise thought that ruthless fasting was the only available treatment for prolonging diabetic lives.[5] Following the recommendations of proponents of undernutrition, London physician Frederick Poynton used the treatment on five children between 1919 and 1922. Despite some initial optimism that the children could survive with severe dieting, Poynton had to report that all of the starved patients died within months of the start of their diets.[6] Compounding this setback with fasting, diabetes doctors in the first decades of the twentieth century could not agree on whether sufferers should exercise or not. While Allen insisted that exercise was of great benefit to the diabetic patient, Graham demurred, arguing that lying in bed would lead to a lower metabolic rate and greater comfort on reduced calories. "My practice now is to keep the patient in bed for four weeks after he is able to take a diet of reasonable caloric value…[but] if he is not able to take so high a diet, he should be kept for the same period at a level at which he does not have to pass sugar. After that time has elapsed he is allowed to get up by degrees."[7] Given these catastrophes and contradictions, diabetics and their doctors understandably despaired.

Then, after thirty years of scientific inability to isolate insulin, in the summer of 1921 Canadian Frederick Banting determined to ligate the pancreatic duct in order to expose the second secretion; Charles Best, a graduating senior, was assigned to help him do the chemical tests at the University of Toronto. They achieved remarkable results on Marjorie, a severely diabetic collie, isolating insulin for the first time and effecting a replacement therapy for the disease in the canine. Banting, a distant relative of the nineteenth-century London diet pamphleteer William Banting, had little research experience. Trained as a surgeon, Banting served with the Canadian Army in France, was wounded and nearly lost an arm. Back in Ontario after the war, he opened a practice as an orthopedic surgeon, but financial concerns led him to earn

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[5] See George Graham, *The Pathology and Treatment of Diabetes Mellitus* (London: Hodder and Stoughton, 1923). Graham later wrote *Food Values and the Ladder Diet*, a dietary therapy for diabetes augmenting insulin dosage.

[6] F.J. Poynton, "Five Cases of Diabetes Mellitus in Young Children." *British Medical Journal* 1 (1923): 277–279. Poynton later oversaw the introduction of insulin at Guy's Hospital.

[7] Graham, *Pathology and Treatment*, 101–103.

a living teaching and in October 1920 he found a job as a demonstrator in anatomy, physiology and surgery at the University of Toronto Medical School. Later that month, he came across an article on the pancreas and diabetes by an American, Moses Barron, in the course of preparing for his teaching duties and decided to try an experiment that would extract islet cells by tying up the pancreatic duct.[8] Banting approached J.J.R. Macleod, Scottish-born chairman of the Department of Physiology at Toronto and a widely recognized authority on carbohydrate metabolism, for permission to try to isolate insulin and the equipment needed to experiment. In May 1921 Macleod eventually acceded to Banting's persuasion, giving him ten dogs, a laboratory for two months, and an undergraduate assistant, Charles Best, to do the analyses of sugar in blood and urine.

Based on Banting's hypothesis, binding the pancreatic ducts in a few of the dogs ought to cause the pancreases to degenerate in weeks, leaving only the islets of Langerhans functional and insulin producing. When that did not happen on schedule, Banting determined that each of the ligatures had been too tight, allowing for the creation of a sort of bypass that reestablished the duct. To avoid this problem, Banting tied multiple ligatures with varying tensions along the duct and after another three weeks confirmed the degeneration of the dogs' pancreases. Banting surgically removed the pancreases and Best ground them up into a saline solution; the mixture was then administered intravenously to a previously depancreatinized, now diabetic dog. Best analyzed the blood sugar levels every half-hour and within two hours the dog's clinical condition improved. Although the dog died several days later when the pancreatic extract ran out, the experiment proved Banting's theory and extraction technique.

That lack of extract was the next hurdle to overcome and Banting, remembering that a French histologist, Edouard Laguesse, had found that the pancreas of an unborn calf was unusually rich in islet cells, set out to procure pancreases from nine unborn calves at a nearby slaughterhouse. Using their new mixture, Banting and Best injected the dog

[8] Banting flamboyantly described the epiphany he experienced reading Barron in his "The History of Insulin," *Edinburgh Medical Journal*, new series 36 (1929): 2. An American, Ernest Lyman Scott, developer of the standard blood test for diabetes in 1914, had already tried closing the duct in unsuccessful experimentation; he also attempted to isolate insulin through chemical extraction but this work was inconclusive: L.N. Magner, "Ernest Lyman Scott's Work with Insulin," *Pharmaceutical History* 19 (1977): 103–108; McQuillan, "Discovery of Insulin," 107–108.

Marjorie, whose diabetes had been earlier induced by pancreatectomy; Marjorie lived seventy days on extracts from unborn calves. They then tried a timesaving idea: use the extract of fresh, non-degenerated pancreas. But Banting and Best failed to recognize the positive results and persisted with their faulty hypothesis that degeneration of the pancreas was necessary to obtain pure internal secretion. Boiling the extract rendered it inactive; exhausting the pancreas' external secretion with secretin, a hormone found in the pancreas and other organs, proved all too effective. Extracts prepared with secretin lowered blood-sugar quickly but caused profound shock, the hurdle that had stopped all previous researchers. More and more control experiments were carried out as Macleod realized it was this thorough testing that needed to be extended in order to make it impossible for critics to deny Toronto's positive effects. However, larger supplies were needed for a significant stockpile of extract, so the team turned to whole beef pancreases treated with an acid alcohol process that made ligation unnecessary. With a group of workers attacking various problems under Macleod's direction, albeit not always harmoniously, a speedy outcome ensued. Macleod himself put the name insulin into practice.[9]

Banting, Best and Macleod delivered the results of the research to the American Physiological Society, meeting at Yale University in late 1921, but only Macleod's name appeared on the formal paper; Banting and Best were referred to only as collaborators. Banting felt he had been overtaken by Macleod and his idea taken out of his hands. Because of this growing animosity, Banting and Best rushed to establish their leadership of the project. Shortly thereafter at Toronto General Hospital, they began a clinical trial of "iletin," the extract of fresh beef pancreas on Leonard Thompson, a sixty-five pound teen-age diabetic. The boy was given 15 ml. of the "thick brown muck," as colleagues described the material, but the ill-timed experiment ended unsuccessfully. Thompson developed abscesses at the injection sites and became even sicker. Then Macleod assigned Toronto Ph.D. (1916) James Collip, a trained biochemist with an established reputation, to join the group and refine Banting's crude mixture; Collip developed the process that purified the concoction by means of alcohol fractional precipitation and replaced

[9] Macleod acknowledged that Edward A. Sharpey-Schafer, an English histologist, first suggested "insulin" in 1916 for the then abstract internal secretion of the pancreas, but Oscar Minkowski attributes the name to Belgian Jean de Meyer in a paper published in 1910. Minkowski, "Historical Development," 5.

Thompson's missing insulin. The boy's blood glucose fell from 520 to 120 milligrams of glucose in one-tenth liter of blood (mg/dl) in one day and he began to gain weight and regain strength.[10]

Bestowing the Nobel Prize in Medicine on Banting and Macleod in 1923, the awards committee overlooked Best. Banting, furious at Macleod for the oversight, publicly insisted that half of his monetary reward should go to Best, and Macleod shared his with Collip.[11] The acrimony resulting from the awards and adulation that attended the collaborators' accomplishments split its members forever, not unlike the squabble engaged in a generation earlier by Oscar Minkowski and Eduard Pflüger. Macleod, a longtime Aberdonian, left Canada in 1928 for a Regius Professorship in physics at the University of Aberdeen, his alma mater; he died in 1935.[12] Banting, who had become close friends with James Collip, fought for and received acclaim as the primary discoverer, receiving an Ontario research professorship and a lifetime annuity. Knighted in 1934, he was killed in an airplane crash in Newfoundland in 1941. World Diabetes Day, November 14, commemorates Banting's birthday. According to historian Michael Bliss, the deaths of Macleod and Banting enabled Charles Best, overwhelmed by hunger for recognition, to establish the myth in the public mind that he and Banting alone were responsible for the discovery of insulin and to "deliberately distort the historic record."[13]

Best lobbied ceaselessly to couple his name to Banting's and to discredit Macleod's and Collip's contributions to the discovery, but traditional scientists from the start lined up behind the elder professor's reputation. As early as 1929, when Minkowski wrote up a history of the work that led to insulin, he referred to "the Toronto group of Macleod

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[10] MacCracken and Hoel, "From Ants to Analogues," 140. See also documents and narrative about the discovery of insulin on-line at http://digital.library.utoronto.ca/insulin/.

[11] For more on the controversy, see J.H. Pratt, "Reappraisal of the Researches Leading to the Discovery of Insulin," *Journal of the History of Medicine* 9 (1954): 281–289; M.J. Williams, "J.J.R. Macleod: The Co-Discoverer of Insulin," *Proceedings of the Royal College of Physicians of Edinburgh* 23 (1993), supplement.

[12] In its tourist information brochure, "Facts about Aberdeen," the city of Aberdeen trumpets its connection with leadership in diabetes, noting the contributions of Rennie, Fraser, and Macleod as well as ongoing activity at the university today.

[13] Michael Bliss, "Rewriting Medical History: Charles Best and the Banting and Best Myth," *Journal of the History of Medicine and Allied Sciences* 48 (1993): 254. Also overlooked in the hubbub of insulin application was Romanian physiologist Nicolas Paulesco, a near simultaneous success story.

and co-workers."[14] And, as Bliss concludes, unbiased investigation "re-establishes the vital contributions of Macleod and Collip."[15] James Collip died in 1965 and Best in 1978. Long after their passing, however, some historical confusion and not a little personal regret remains in the wake of their insulin breakthrough.

But history's judgment had yet to be rendered when Eli Lilly and Company of Indianapolis won a temporary license to manufacture the new miracle substance as soon as it became clear that the Toronto laboratories originally participating in the project could not handle large-scale production. Insulin demand worldwide rose so fast that an experienced pharmaceutical house had to step in and in May 1922 Lilly agreed to pay royalties to the University of Toronto to support research in return for manufacturing rights in North and South America. Development in the United Kingdom took place separately with patent rights assigned to the Medical Research Council (MRC) in November 1922, an offer that came out of the blue to "an interested but skeptical" organization.[16] One prominent diabetologist, P.J. Cammidge, wrote a letter to the *British Medical Journal* disparaging patient reliance on insulin and called treatment "a will-o'-the-wisp."[17] Perhaps such signal reluctance coupled with a cautious two-pronged production intimated a lack of urgency within the MRC. When in December, clinical testing commenced in Britain, it was long after hundreds of lives had been saved in Canada and the United States, and even then fewer than fifty patients in eight hospitals received insulin in the winter of 1922–1923.

Robert Tattersall has analyzed the four years in Britain following the breakthrough when insulin treatment was introduced.[18] The MRC, established in 1913 to distribute funds under the terms of the 1911 National Insurance Act, set up trial centers in teaching hospitals and university infirmaries nationwide, but despite the almost immediate improvement patients experienced in clinical trials in North America, many problems surfaced in Britain.[19] Burroughs Wellcome and a joint

[14] Minkowski, "Historical Development," 5. Banting and Best get only passing mention.

[15] Bliss, "Rewriting Medical History," 274.

[16] Bliss, *Discovery of Insulin*, 165.

[17] P.J. Cammidge, *British Medical Journal* 2 (18 November 1922): 997. See also his *Insulin Treatment of Diabetes Mellitus* (Edinburgh: Livingstone, 1924).

[18] Robert B. Tattersall, "A Force of Magical Activity," *Diabetic Medicine* 12 (1995): 739–755.

[19] Originally the Medical Research Committee, the Council was made permanent by royal charter in 1920. See its official web site http://www.mrc.ac.uk.

venture between Allen and Hansburys and British Drug Houses had made only small quantities of insulin. There were simply not enough supplies to provide insulin immediately to all the diabetic patients in the United Kingdom, so the MRC made the decision to get insulin to only the most severe cases. In the meantime, J.J.R. Macleod thought that fish, with their more accessible islets from which extraction was simple, might offer a cheaper and easier source, especially for maritime countries. He sent his research workers to investigate, but they found it impossible to keep up with the rapid gutting and disposal of fish on board trawlers at sea fishing round the clock.[20]

Eventually, Eli Lilly delivered supplies to Britain to augment the production of the British pharmaceuticals and soon all restrictions on its sale were lifted. A familiar obstacle was the unshakable lack of empathy many experts in the field felt for the diabetic sufferer as few hospitals adapted treatment to the patient. Overlooking the human factor, Graham and Poynton focused their attention on diabetes as a biochemical problem. At St. Thomas's Hospital, Hugh MacLean, also a biochemist, supervised the testing of insulin "in spite of his relative lack of clinical experience."[21] An Aberdonian, Dr. Robert (Robin) Lawrence at King's College Hospital, a diabetic himself and survivor of the Allen starvation diet, proved an exception to this repeated professional shortcoming. While some diabetologists recommended low carbohydrate and low insulin for their patients, Lawrence suggested moderation in both; he knew firsthand that it was difficult to keep blood sugar constantly normal, making the diabetic life "unnecessarily hard without adequate benefit."[22] Moreover, Lawrence demonstrated the sort of bedside manner, albeit in a clinical setting, that encouraged people to follow his instructions. He took his first insulin injection in May 1923.

Another predicament was the cost of insulin. The first British-made insulin reached hospitals in April 1923 but already complaints filled

[20] Williams, "Aberdonians," 189. During World War II, with the abattoirs of North America and Europe unavailable to diabetics in Japan, fish insulin was widely used.

[21] MacLean's 1957 obituary, quoted in Tattersall, "Force of Magical Activity," 747.

[22] See Robin D. Lawrence, *The Diabetic Life: Its Control by Diet and Insulin* (London: Churchill, 1925). Lawrence was luckier than Paula Inge, the eleven year-old daughter of the dean of St. Paul's Cathedral, who died after lapsing into a diabetic coma in March 1923; she is often unhappily compared to American Elizabeth Hughes, fifteen year-old diabetic daughter of Charles Evans Hughes starved to forty-five pounds on the Allen diet, but who began receiving insulin in August 1922 and lived a normal life until her death in 1981.

the air about the price of animal pancreases and alcohol needed to make large quantities of the product. While insulin remained scarce, the Medical Research Council would only release it to hospitals with adequate facilities for measuring blood sugar. Opinions surfaced that insulin would be wasted through the lack of individual dietetic control and regular blood sugar testing, that some period of starvation, even years of it, ought to precede the use of insulin, and that hysterical bouts of over-eating by diabetics would deplete valuable insulin supplies altogether. Of course diabetics themselves, lacking comprehensive health insurance, had to pay for insulin and tests, although Poor Law Guardians were empowered to help the destitute do so.

A further debate, voiced in *The Times* in August 1923, centered on whether "ignorant" diabetics could administer their own insulin injections or if such a procedure ought to be left to a physician. Dr. Lawrence made his patients at the diabetic clinic give their own injections and claimed that "one minute's practical demonstration" could teach a patient independence from nurses and doctors. But here, too, economics entered the picture, the impact of patient self-injection on physicians' incomes. Many English physicians, Tattersall asserts, not only wanted to protect their patients from the possible misuse of a powerful remedy but also wanted to safeguard their skills from general practitioners.[23] And what about checking blood sugar? It was diabetic research, after all, that led to the invention in 1922 of blood evaluations that required only a finger prick, far better than the 20 ml formerly needed for a single assessment. Because too much insulin could lead to hypoglycemia, regular testing could indicate what level of treatment was best for an individual patient. While relatively simple to ascertain for those with the technical skills, determining blood sugar levels usually required laboratory facilities. Balking at this new diagnostic tool, George Graham insisted on the greater accuracy of urine tests: "Isolated blood-sugar determinations can never replace urine examination."[24] Not available for patient use, blood glucose kits for English physicians marketed in 1922 cost £3 15s. Many doctors demurred, however, noting that daily measuring of blood was costly and an unwise use

[23] Tattersall, "Force of Magical Activity," 750. Apollinaire Bouchardat (1806–1886) taught his patients to test their urine for sugar and Joslin agreed that "the instruction of the diabetic patient should not end with urinary tests." Quoted in ibid., 749.

[24] Graham, *Pathology and Treatment*, 105. Graham preferred Benedict's solution over Fehling's for urine testing.

of resources. For them, keeping a trace of sugar in the urine of diabetics seemed less risky than making it sugar-free.[25]

Dr. Lawrence had his own personal struggles with hypoglycemia, but found through self-experimentation and record-keeping of his dosages that he could stave off abnormally low blood sugar. He even ate raw pancreases to determine if that might be more effective than insulin injections, "the worst experiment I ever tried on myself: to chew, swallow and keep down raw pancreases was a terrible and nauseating hardship, and after swallowing it felt as if the gullet was being digested. A serious return of sugar and acetone occurred to disprove this nonsense."[26] Regular hours, a carefully calibrated diet, and exercise improved his control over the disease. He felt well enough to marry in 1928; Charles Best served as his best man at the wedding. Lawrence devised a simple method, the "Line-Ration Diet," for general practitioners to teach their patients; its success led him to write *The Diabetic Life*, first published in 1925, and a manual for patients and nurses, *The Diabetic ABC* (London: H.K. Lewis, 1929).

Insulin also aided against infection in diabetics and helped wounds heal after surgery. Doctors found that patients could be saved from diabetic coma, impossible before insulin. Depending on the advice of their physicians, some diabetics returned to a normal, albeit insulin-dependent life. J.K. Rennie at Glasgow reported that his patients resumed their jobs and household responsibilities; children could expect to reach adult life. If patient management was strictly maintained and if insulin was further refined and purified, diabetes could be controlled. W.P.D. Logan has shown a dramatic reduction in diabetes mortality rates among Type 1 boys and young adults after 1923, coinciding with the use of insulin; diabetes death rates among Type 2 elderly men and women continued to rise.[27] Doctors still bickered, however, over what sort of diet worked best for diabetics with adequate insulin. Most diabetologists reasoned that patients should regulate their carbohydrate intake, but the information in print for the carbohydrate content of foods was inadequate until Dr. Lawrence collaborated with a young associate, Robert A. McCance, to analyze more than a hun-

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[25] Tattersall, "Force of Magical Activity," 752. See also Hugh MacLean, *Modern Methods in the Diagnosis and Treatment of Glycosuria and Diabetes* (London: Constable, 1922).

[26] Robin Lawrence quoted in James G.L. Jackson, "R.D. Lawrence and the Formation of the Diabetic Association," *Diabetic Medicine* 13 (1996): 12, 16.

[27] W.P.D. Logan, "Mortality in England and Wales from 1848 to 1947," *Population Studies* 4 (1950): 142.

dred plant foods for available carbohydrate. They published these values as a MRC Special Report in 1929.[28] Some research, however, substantiated claims that a diet rich in carbohydrates improved glucose tolerance, an observation that was corroborated in studies done by Harold P. Himsworth at University College Hospital in London in 1935.[29] Himsworth also clearly identified the two principal types of diabetes and developed a test to distinguish between them. Although few pathographies written by recovering diabetics in the 1920s and '30s shed much light on what lives were really like post-insulin, optimism reigned. Despite persistent prescriptive differences among experts, long-range plans could be made for the indefinite survival of the previously doomed victims of diabetes.

Dr. Lawrence, together with his patient, the writer H.G. Wells, formed the Diabetic Association in 1933, the first patient-oriented association to be established in the United Kingdom.[30] The organization solicited donations for research, published *The Diabetic Journal* (called *Balance* since the 1960s) beginning in 1935, and spearheaded the establishment of health camps for diabetic children. As the European political scenario degenerated, the association made plans with the Home Office to evacuate diabetic children from London in the event of war. In August 1939 sixty-six boys and girls were successfully evacuated to a permanent residential home at Hutton in Essex. Hutton remained open throughout the war and became the forerunner of specialized residential homes for children with particular disorders. The outbreak of war concerned medical experts who feared that the availability of insulin and government-imposed food rationing would compromise the health of diabetics. U-boat activity threatened supplies of pancreases, which had to be imported, and air raids destroyed stocks, 36,000 vials of insulin in one warehouse fire. When the Medical Advisory Committee urged the standardization of insulin labeling, Lawrence proposed a color-code to differentiate between soluble and protomine zinc insulins; the color-codes were introduced in 1943. In the wake of severe meat

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[28] R.A. McCance and R.D. Lawrence, *The Carbohydrate Content of Foods* (London: H.M.S.O., 1929).

[29] H.P. Himsworth, *Clinical Science* 2 (1935): 67–94. Himsworth became director of the medical unit at University College Hospital in 1939 and a member of the MRC in 1948.

[30] Portugal claimed the earliest diabetes association (1926), but Britain was next; the prefix "British" was not adopted until 1954. In 1950 Robin Lawrence established the International Diabetic Federation.

rationing, the Diabetic Association recommended that diabetic patients be granted an extra meat ration in exchange for their sugar ration, a proposal accepted by the government; artificial sweeteners were largely reserved for the diabetic community.[31] The association sent specimen diet sheets that referenced rationing to every general practitioner in the country, making a profound impact on the ability of British diabetics to survive wartime deprivations.

Long-lasting protamine zinc insulin was introduced in the 1930s, followed by neutral protamine Hagedorn (NPH) in the 1940s and the lente series of insulin in the 1950s. By 1945, a newly diagnosed ten year-old had a forty-five year life expectancy; a thirty year-old had 30.5 more years, and a fifty year-old almost sixteen more years to live. Life insurance became available "to the controlled diabetic who adheres diligently to his diabetic regimen and who cooperates with his physician." Although the rate was higher than for ordinary policies, the mere availability of insurance was considered evidence of "the progress the profession has made in controlling diabetes."[32] But manufacturers still faced the demands of collecting huge stockpiles of animal pancreatic tissues until DNA technologies allowed synthesis of a human type of insulin. That leap forward came about as a result of the extraordinary work of MRC scientist Frederick Sanger, two-time winner of the Nobel Prize in chemistry. Sanger, a native of Gloucestershire, worked for over a decade at the MRC laboratories near Cambridge to determine the complete amino acid sequence and structure of insulin, an achievement that earned him his first Nobel in 1958. Once a protein's sequence is known, it can be recreated synthetically; insulin became the first protein to be chemically constructed in 1963. Sanger then turned his attention to genetics, decoding the DNA of a small virus. His success in fully sequencing that genome proved invaluable to the Human Genome Project and garnered his second Nobel in 1980. In 2003, more than two years ahead of schedule, the International Human Genome Consortium announced the triumphant completion of its project with

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[31] 64,000 diabetics applied for special rations by the end of 1942, about one-third of those eligible. Jackson, "R.D. Lawrence," 20–21.

[32] From an advertisement in the March 1947 *Postgraduate Medicine*, commemorated fifty years later in a special issue on diabetes; see *Postgraduate Medicine* 101 (1997): 150. For other implications as diabetes changed from an acute to a chronic disease, see Paul Weindling, "From Infectious to Chronic Diseases: Changing Patterns of Sickness in the Nineteenth and Twentieth Centuries," in *Medicine in Society*, ed. Andrew Wear (Cambridge: Cambridge University Press, 1992), 303–316.

one-third of the mission carried out by the Wellcome Trust Sanger Institute, the sole British organization involved and the largest single contributor to the enterprise.[33]

Only in the 1960s did it become possible to measure insulin levels, to distinguish categories of diabetes, and to prescribe for complete insulin deficiency versus resistance to insulin. Problems persisted, however, as impurities in re-crystallized insulin provoked immunogenic activities including the formation of antibodies against insulin. An advertisement in the 1974 issue of *The History of Medicine* touted that "for the first time in the U.K." Novo Industries, "by means of chromatographical separation," could provide monocomponent insulin with "zero or minimal immunogenic reactions." The manufacturer cautioned, however, that patients transferring to the new insulin "may require substantially smaller dosage."[34] Shortly after the development in 1976 of the hemoglobin A1c test, which can assess blood glucose levels for the preceding three months, an American biotechnology company announced production of recombinant DNA insulin in 1978 and by 1996 the first recombinant DNA human insulin analogue, lispro (Humalog), appeared. Since then more than 300 insulin analogues—animal, chemically modified, and biosynthetic—have been documented.[35]

The discovery of insulin and its application to the treatment of diabetes did not eradicate either variety of the disease. Eating habits that rely on sweetened and processed foods continue to turn ever younger people into Type 2 diabetics. Increased sugar consumption triggers many diseases and T.L. Cleaves, who in 1938 charted sugar intake with diabetic mortality, pointed to dental caries as an early warning system for the disease among the undiagnosed.[36] Today's diabetic life expectancy is still lower by about fifteen years than the general population. Insulin brought about an epochal breakthrough to be sure, prolonging lives and mitigating the worst effects of the disorder, but it did not cure diabetes. Great strides have been made to improve the ease and safety of insulin injections, while implantable insulin pumps

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[33] The Wellcome Trust, established in 1936 under the will of Sir Henry Wellcome, and the MRC founded the Sanger Institute in 1992 in honor of Frederick Sanger. See the April 2003 Wellcome Trust report, "The Finished Human Genome," on-line at http://www.wellcome.ac.uk.

[34] See the Novo ad in *History of Medicine* 6/2 (1974): 22.

[35] MacCracken and Hoel, "From Ants to Analogues," 143–144.

[36] T.L. Cleaves, *Diabetes, Coronary Thrombosis and Saccharine Disease* (Bristol: John Wright, 1966).

allow diabetics, including world-class athletes, to deal with their conditions effectively. Perhaps the fruits of stem-cell research or other genetic engineering can ultimately eradicate the disease. An announced task of human genome researchers points toward detecting genes that predispose to Type 2 diabetes, and a gene on chromosome 20, one decoded by the Sanger Institute, appears to be altered in diabetics. Nonetheless, the epidemic of Type 2 diabetes rages on unabated despite public health announcements about the need for weight control, sound diet and exercise. Most diagnosed diabetics, when educated, take charge of their disease, using sophisticated blood glucose meters to chart their readings in ways that would have amazed 1920s critics of patient self-monitoring. A majority of Type 2 diabetics not needing insulin take oral medications, in conjunction with reducing carbohydrates, which facilitate greater acceptance by their bodies of their own insulin. Approximately 19 percent of Type 2 diabetics require insulin and another 12 per cent use both insulin and oral medication.

However, given the inexorable need to watch for insulin problems in Type 1 sufferers and the consistency needed to maintain good blood sugar numbers in Type 2 diabetes, impatient diabetics look to find unorthodox ways of actually curing themselves. Typical of the sort of "irregular" diabetes treatment today is the advertisement ("as seen on TV") of Dr. James Chappell, an American peddling a book, *A Promise Made, A Promise Kept*, that details "the secrets to stop, reverse and cure diabetes and other life-threatening diseases." By means of "natural healing based on seven key ingredients (including one amazing herb) used to cure diabetes for more than 1500 years," Chappell urges his audience to "take back control" of their own lives and "not to wait for modern medicine to find a cure!" Claiming to have helped 10,000 people in thirty-four years, he offers the book for $19.95 and free DVD, neither of which is sold in any store. Besides curing diabetes, Chappell promises an improved immunity system, detoxified body, and younger looks. Just as quacks and charlatans lambasted the learned physicians of early modern London for their stultified approach to healing, current commercials for products like these attack "modern medicine and big drug companies [for not being] in the business of curing disease."[37] Nonetheless, Chappell's assurances resonate with diabetics who that

[37] Available from Health Resources, Placentia CA 92871; advertisement in *Florida Times-Union* 7 July 2005.

feel straight-jacketed by anxiety as they attempt to manage a disease that never goes away. Type 2 sufferers are twice as likely as the general public to be diagnosed with depression as they juggle demands that in order to keep well they must cope with stress, exercise more, test their blood sugar frequently, daily create healthy menu options for themselves and floss their teeth more often.

Tired of waiting for the tantalizing promise of genetic manipulation from stem-cell investigations are Type 1 diabetics like American writer Deb Butterfield. After enduring the deteriorating effects of "juvenile" diabetes in her youth and adulthood, Butterfield underwent a pancreas transplant. She now enjoys good health and has become a public champion for such surgeries, now relatively commonplace.[38] Unfortunately, the success of the once last-ditch response to worsening diabetes has created great demand for pancreas transplants, as has the success of other organ transplants. Fifteen years ago, about 20,000 people in the United States were on waiting lists for all organs; today about 88,000 are and the number of donors has not kept pace. In 2002, the American Medical Association, concerned about waiting times for transplantation, voted to endorse pilot projects to give families financial incentives, like cash payments to help cover the costs of funerals, for donating their deceased loved ones' organs.[39] In 1978, a group of German researchers described the first successful European islet autotransplantation after total pancreatectomy in a patient suffering from painful chronic pancreatitis. According to Dr. Reinhard Bretzel, Director of the International Islet Transplant Registry, an allogenic islet transplantation on a patient with Type 1 diabetes, performed in the same hospital in 1992, achieved the desired goal of insulin independence; by 2002 over fifty Type 1 diabetics worldwide were off insulin following islet transplantations.[40]

For Type 2 diabetics another challenge looms, prompted largely by the public costs of treating the disease when not managed effectively by sufferers. Governmental entities could monitor people with diabetes, just as they tracked those with infectious diseases as way to halt epidemics. Thomas Frieden, Health Commissioner for New York City,

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[38] Deb Butterfield, *Showdown with Diabetes* (New York: Norton, 1999).

[39] Gretchen Reynolds, "Will Any Organ Do?" *New York Times Magazine* (July 10, 2005), 37.

[40] Reinhard G. Bretzel, " "What is the Cause of Type 1 Diabetes Mellitus—How Can We Cure This Disease?" *Journal of Molecular Medicine* 80 (2002): 4.

recently justified a plan to require medical laboratories to report to the city the results of A1c tests that disclose how well individual patients are managing their diabetes by indicating blood glucose control over a few months, unlike the daily glucose tests diabetics give themselves. The A1c test is given for both Type 1 and Type 2 diabetes, the latter linked to obesity and accounting for about 90 percent of diabetics. Frieden pointed to a $5 billion a year price tag in New York to treat diabetes and its collateral damage of blindness, kidney failure, amputations and heart problems. Moreover, diabetes is the fourth leading cause of death in the city. Although diabetes is not contagious, the basis for intervention by public officials in the past, any government's interest in the health of an individual collides with that individual's right to privacy, setting up legislative and judicial contests over these rights in the future. Dr. Amy Fairchild, an expert on public health ethics at Columbia University, said disease-monitoring programs have historically been able to overcome privacy worries if the health threat is sufficiently frightening. "We respond with surveillance when we believe something has reached epidemic proportions," Fairchild said. "And this may fit the profile. Have we become a nation of obese people who are all going to get diabetes?"[41]

Similar burdens for diabetics loom in Great Britain where about 1.4 million people are known to have diabetes and another one million who have diabetes and are not aware of it. Residents of the United Kingdom with Asian or Afro-Caribbean ancestry are particularly at risk. Moreover, since about 80 percent of Type 2 diabetics are overweight, an upsurge in obesity levels among Britons has triggered serious worries on the part of health authorities and led to calls for governmental action. Obesity affects three times more people in Britain now than it did twenty years ago; 40 percent of the population could be overweight within the next generation. Philip James, chairman of the International Obesity Task Force, reported recently "the rise in obesity in Britain is as fast or faster than anywhere else in the world."[42] Childhood obesity has reached 16 percent in 6 to 16 year-olds in Britain, increasing the risk of youngsters developing Type 2 diabetes. Many health experts agree with James' assessment that "politicians need to understand that regulation is required and that is a popular move."

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[41] http://www.cnn.com/2005/HEALTH/07/25/tracking.diabetes.ap/index.html.
[42] Quoted in *Diabetes in Control Newsletter* 182 (June 24, 2004), item 14.

Some regulation has already taken place. According to the British Diabetic Association, Type 1 diabetics who are treated with insulin must inform the Driver and Vehicle Licensing Agency as soon as possible after diagnosis. They are limited to a driver's license of up to three years duration. Type 2 diabetics treated with tablets or diet alone qualify for licenses renewable until age 70. But the type of diet and the shifting recommendations by the experts make daily life for diabetics a continuous challenge. Very low calorie diets produce quick weight-loss results and equally rapid regaining of pounds. Liberal carbohydrate regimens seem to induce higher concentrations of triglycerides in poorly controlled diabetes and to reduce high-density lipoprotein (HDL) concentrations, resulting in greater risk of coronary heart disease. High protein, high fat diets versus low protein, low fats: each variation can exacerbate or diminish the collateral health dangers faced by those with diabetes. No single dietary approach for diabetics will succeed without awareness of other risk factors such as sedentary lifestyle, the socioeconomic burden of expensive health care, lack of education as to sound nutritional principles, and smoking. Only with attention to these can the incidence of the major causes of death be reduced among people with diabetes.[43] Fortunately, instructional resources are readily available to diabetics and widespread attention to diabetic education has resulted in group patient activities and the creation of internet resources like http://www.dlife.com.[44]

Historian Chris Feudtner has called diabetes "a disease in motion," meaning that as innovative therapies join the ranks of diabetic treatment patients must confront novel problems and "new cycles of transmutations." He recommends less emphasis on heroic cures and more on the rudimentary ethic of caring. Another sign of change is the adjustment downward of ideal blood sugar readings from a maximum of 140 mg/dl, once considered normal, to less than 126 mg/dl. Indeed, 100–125 mg/dl results are now labeled "pre-diabetes," indicating a greater susceptibility to the disease as one ages and puts on weight. The Diabetes National Service Framework has set clear objectives for Great Britain that are based on therapeutic partnership, expert guidance, and integrated service provision, the achievement of which

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[43] Aaron I. Vinik and Rena R. Wing, "The Good, the Bad, and the Ugly in Diabetic Diets," *Endocrinology and Metabolism Clinics of North America* 21 (1992): 270.

[44] For the rapidly-expanding programs of therapeutic patient education, see Peter Watkins, "From the Editor," *Clinical Medicine* 2 (2002): 493–494.

necessitates change and renewal of working practices, information systems, and professional and organizational relationships.[45] Diabetes may no longer be an acute threat to its victims, but when mismanaged still causes more renal failure, more amputations and more blindness than any other disease. To avoid these debilitating consequences, diabetics must discipline themselves to a life of self-care. As Feudtner insists: "In these heady days of organ transplantation and gene therapy, our technological innovations need to be supplemented by a greater degree of personal and social introspection."[46] How diabetics today live with their disease amidst changing patterns of sickness affects us all.

[45] Bob Young, "The Diabetes National Service Framework—a real opportunity?" *Clinical Medicine* 4 (2004): 69–71. See also Simon Page, "Glycaemic Management of Type 2 Diabetes," *Clinical Medicine* 4 (2004): 302–306.

[46] Chris Feudtner, "A Disease in Motion: Diabetes History and the New Paradigm of Transmuted Disease," *Perspectives in Biology and Medicine* 39 (1996): 161, 167.

EPILOGUE

There is no progressive arc to follow in the history of diabetes, although there surely has been change in dealing with the disorder. True understanding of diabetes has waxed and waned, and effective treatments rediscovered repeatedly over time. Many of the things that we know about the disease have been known for a millennium or more, such as the sweetness of victims' urine, the differing types of the disorder, and the link to excessive food and drink associated with diabetes that develops gradually. For centuries diabetes has persisted as a human scourge, ruining the lives of young, middle-aged, and old victims. Though they observed few confirmable cases, Greco-Roman doctors recognized that the desiccating thirst and polyuria of diabetes would prove fatal if untreated and so developed imaginative regimens and therapies for their patients to follow. Hippocrates, Galen and others from the classical world offered the advice to achieve balance in one's life and to exercise in order to maintain health, guidance that resonated down the centuries, being advocated again from Victorian times to the present. Furthermore the ancients' proclaiming that disease arose from internal disproportion of the humors presaged an understanding of the origins of Type 1 diabetes, but nonetheless seems prescient once medical scientists isolated the malfunctioning pancreas of sufferers. And they were not far off the mark in blaming internal mechanisms for all cases of diabetes, given the role of heredity and the inability of Type 2 bodies to use the insulin their pancreases make. However, the practitioners of the new medicine associated with Renaissance-era mavericks like Paracelsus and von Helmont also had it right, targeting external forces as triggers for some diseases. The rise in Type 2 diabetes cases from early modern days testifies to changes in habits of diet and fitness associated with industrialism and "westernization" of culture. Researchers have located significant changes in rates of Type 2 diabetes in rapidly developing countries and among peoples who consume inordinate carbohydrate calories on a regular basis. While years of deprivation have created temporary downturns in the rates of diabetes mortality, such as in Britain during World War II, those downturns proved

not only short-lived but produced accelerated mortality once the crises passed.

During the late Middle Ages and Renaissance the sagacity of traditional Galenic medicine arrived in Britain where the wisdom of the classical world dovetailed nicely with local folkways. Through competent translations into English, medieval healers came to link humoralism with astrological medicine and its methods. Both university-educated, "learned" physicians and their unlicensed counterparts applied the doctrine of the four humors, seeking to restore the healthy equilibrium the body lost in illness. Though they handled few cases of identifiable diabetes, medicos tried to redress the body's imbalance from expelled fluids by using single-ingredient "simples" based on local herbs. Almanacs and other inexpensive sources of iatric information suggested recipes tied to the zodiac and best administered when the heavenly signs were propitious for the individual sick person in question. Renaissance-era healers also began to grasp the relationship between obesity and certain illnesses and thus encouraged moderate diet and exercise for their overweight clients. By the mid sixteenth-century, however, challengers to Galenism came to dispute its exclusive focus on the humors and sought other solutions in the laboratory, throwing the learned Royal College of Physicians into tumult for generations yet ultimately producing a more inclusive, published pharmacopoeia. Instead of emphasizing the individual nature of an illness and treatment, these challengers looked for general solutions that could be applied to a category of sufferers, for "specifics" to cure specific ailments. The politics of the English Civil War complicated the divisions within medicine even further, adding jurisdictional rivalries to the simmering theoretical clash. Puritan-Parliamentary allies supported a more democratized, less elite system of treating the sick, such as represented by the ambitions of surgeons and apothecaries to offer cheaper, personalized care. London apothecary Nicholas Culpeper led the way in the 1650s, bringing published medical advice in the vernacular to the masses, including the first extensive essay on diabetes.

Physicians in late seventeenth-century Britain, like Thomas Willis and Richard Morton, noticed that two discrete forms of the disease manifested in patients of disparate age groups, but they still tended to treat all types of wasting sicknesses the same; Willis blamed copious eating and drinking for the malady, but Morton detected a familial tendency to "the pissing evil." Though long-established as a diagnostic technique, the measuring and evaluating patient urine at a distance,

even with celestial charts as guides, had proven insufficient as a prelude to therapy. Traditional humoral responses to excessive thirst and urination required a putting back of moisture lost to the body. How to do that proved to be the challenge early modern physicians needed in their quest to alleviate diabetic suffering and possibly find a cure for the disorder. Stimulated by the emphasis on clinical observation associated with Thomas Sydenham rather than reliance on Latin learning, doctors all over Britain experimented with different sorts of diets and regimens, some requiring careful hospital-based monitoring of patient intake and outgo. Younger victims died quickly despite medical intervention, their disease oblivious to any treatment. The response of older patients to stringent therapeutics, however, inspired both hope and entrepreneurialism among attending physicians. Starvation and near-starvation diets, milk-only diets, diets composed mainly of bran cakes, patients tried all manner of diets at the behest of their doctors. Some had trouble maintaining a monotonous regime that left them constantly hungry and their physicians frequently scolded them for a lack of self-control, an anti-diabetic theme that continues to this day.

Inspired by perceived successes, enterprising healers published their advice so that sufferers, or those who cared for them, could provide semi-professional tending at home. Books and brochures containing authoritative instructions on dealing with diabetes proliferated from the early eighteenth-century, peaking during the self-help craze in Victorian Britain. Doctors' casebooks and medical school lecture notes from all parts of the country illuminate the various kinds of treatments tried and with what results. Diabetics themselves wrote little about their affliction, likely out of embarrassment driven by public attitudes about the repulsive symptoms of the disease or because publicizing one's illness went against the middle-class grain of social self-assurance and personal dignity. Pathography is a twentieth-century phenomenon.

Despite the confident attitude of prescribing physicians in the eighteenth and nineteenth centuries, the actual site of the diabetes remained elusive until the late-1800s, having puzzled theorists and clinicians who searched for the cause of the disease and tried to understand its dual face. While one form of the disorder struck youngsters with acute symptoms that resulted in rapid disintegration and death, some other sort of diabetes attacked older men and women more slowly, leaving chronic conditions and protracted deterioration in its wake. The search for answers about diabetes took place within the development of the scientific method in medicine, established on the continent but

quickly transported to Britain by well-traveled medical scholars. Even after determining the role of the pancreas in diabetes and on the eve of the discovery of insulin, competing researchers and practitioners still struggled with the reality of Type 1 deaths as the clocked ticked away lives. The Canadian team's breakthrough, once its implications had been fully understood, did change the lives of juvenile diabetics in Britain and produced a dramatic lowering of diabetes mortality among children and young adults. But in the wake of this success came the realization that questions of costs and controls had yet to be answered, policy matters that bedeviled the nation for years. Not part of those calculations was the still unsolved dilemma of adult-onset diabetes, a problem that persists today, beyond the scope of this historical study. Unlike other disease biographies, one cannot proclaim a cure for either variety of the disease or the significant reduction of Type 2 as a multi-faceted health plague. Diabetes can only be managed. In this sense, there can be no neat conclusion to the saga of diabetes in Britain or, for that matter, anywhere else, because "the past is never dead; it's not even past."[1]

[1] William Faulkner, *Requiem for a Nun: A Play from the Novel* (New York: Random House, 1959), Act I, Scene iii.

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