Insensible Perspiration and Oily Vegetable Humor: An Eighteenth Century Controversy Over Vegetarianism

Ken Albala
University of the Pacific, kalbala@pacific.edu

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Quack diets are nothing new. Nor have they always been easily dismissed. In eighteenth-century Italy, a virulent controversy arose over a meatless wonder diet. This controversy would eventually play itself out in the field of nutritional theory, as dietary writers scrambled to incorporate the latest scientific findings into their recommendations.

In 1743, an Italian physician, Antonio Cocchi, published a book claiming that everyone would benefit from giving up meat. Cocchi tried to argue the advantages of his vegetarian diet scientifically, and his book, Del Vitto Pitagorico (The Way of Pythagoras), was received with enthusiasm. Two years after its publication, it was translated into English as The Pythagorean diet, of vegetables only, conducive to the preservation of health, and the cure of disease. In 1762, the book was translated into French. Apparently Voltaire read and admired it.1

During this time, rival scientific schools were competing for dominance, and Cocchi was not the only one scrambling to incorporate the new findings into his dietary recommendations. Shortly after the original publication of Del Vitto Pitagorico, two other physicians, Giuseppe Antonio Puiati and Giovanni Bianchi, attacked Cocchi for lacking scientific understanding and for recommending for sick and healthy alike a diet appropriate only for those with specific diseases.

Nutrition Moves to the Periphery

It was during this time that nutrition began to lose center stage among the medical arts, as the focus—even among authors writing about nutrition—shifted to therapeutics. Since ancient times, nutritional theory and diet had been at the core of professional medical training and practice. “Diet” itself had once had a broader meaning, including careful attention to exercise, air quality, emotions, and sexual activity. The emphasis on nutrition and diet stemmed ultimately from Hippocrates, who had stressed prevention over therapy. In the late seventeenth century, however, this began to change. With the coming of the scientific revolution, physicians began systematically to investigate physiology and even to stumble across effective therapies for their patients’ ills. Wrangling over theories of how best to prevent disease gave way to experimentation and an empirical approach to finding cures. Clinical medicine was the hot new topic. Nutrition fell by the wayside, where it has remained ever since. (Most modern medical schools do not
require a course in nutrition for future practitioners; today’s physicians are trained to diagnose, drug, and cut.)

The recommendations of nutritional theorists thus shifted from ways to maintain the average person in health to ways to prevent or treat disease. In the seventeenth century, the most exciting new research in nutrition was conducted on diseases such as scurvy, gout, and various ailments that were lucrative to treat, including obesity. As the study of nutrition, apart from its role in disease, was displaced from the clinical mainstream, it became difficult for those writing about the subject to keep up with the most recent scientific findings. To gain respect, these writers were obliged to couch their recommendations in the latest scientific terminology, whether they fully grasped it or not. Frequently, they simply pasted this terminology over their basic ideas, which remained unchanged. This practice, much like the shift from prevention to therapy, has left its legacy.

The Way of Pythagoras
At the time when Cocchi was writing, vegetarian diets were typically prescribed for sick patients, but he recommended that everyone abstain from meat. To bolster his argument, he drew upon the findings of three new schools of physiology. First, there were the Paracelsians or iatro-chemists, who had begun to analyze the chemical constituents of food and to describe certain physiological processes in chemical terms, e.g., as the interaction of salts, sulphur, and mercury. For example, Jan Baptist van Helmont, who belonged to this school, explained digestion as the decomposition of food in an acidic environment. Second, there were the mechanical investigations of the late seventeenth and the eighteenth century: Giovanni Borelli and the iatro-mechanical school sought to explain physiology in terms of the latest findings in physics. For example, they viewed the body’s conduits as little pneumatic pumps controlling the passage of fluids and air through pressure gradients. Last, and most important for the case at hand, was the measurement of “insensible perspiration” proposed in the early seventeenth century by the Italian Santorio Santorio, who considered the quantity of perspiration to be an indication of the rate and force of metabolic activity. In fact, it is upon the validity of Santorio’s approach to studying physiology that the entire vegetarian controversy hinged.

These ideas were rather haphazardly combined by Cocchi not only with each other but with the older system of humoral physiology, which had been inherited from the Greeks, particularly Hippocrates and Galen. The Greeks had posited that all foods have inherent qualities—that affect the “humoral balance” of the person who eats them. A cold cucumber, for example, could cause excessive phlegm and lead to a cold. Although few physicians still discussed sickness as the imbalance of the four principal humors—blood, phlegm, cholera, black bile—they still conceived of food as heating or cooling the body, or as drying or moistening it, distinctions that constituted the cornerstone of the old system. Furthermore, humoral physiology still informed much of the popular conception of what went on in the body, even as scientists were groping for other levels of understanding.

Cocchi, in promoting his vegetarian diet, tried to overturn the humoral notions of nutrition by referring to the latest scientific findings. Like those who criticized him, Cocchi drew extensively upon the work of the new schools, especially that of Santorio. Those who criticized Cocchi also used Santorio to support what were essentially Hippocratic ideas. In other words, very old nutritional theories came to be clothed in new garb.

Cocchi’s work, oddly enough, not only purported to be a scientific defense of the Pythagorean diet, but a defense of the ancient Greek Pythagoras himself as a wise man whose empirical research led him to make discoveries millennia ahead of their time. Among these discoveries was counted his abstemious vegetarian lifestyle, which “[w]e see at once accords with the best rules of medicine deduced from the most exact modern knowledge of the nature of the human body and the constituents of foods…” This idea—that the most ancient authors, such as Moses, Hermes, and Pythagoras, were bearers of the priscia scientia (original wisdom or knowledge) and knew much more than those who followed—prevailed throughout the early modern period. Claiming Pythagoras to be an ancient forerunner of the scientific revolution, however, was one of the points Cocchi’s enemies found easiest to tear apart.

Essentially, Cocchi’s arguments rested on one simple physiological principle: the food that most people eat is far too dry and difficult to digest. The dryness impedes the natural “insensible perspiration.” Insensible perspiration is a sure sign that nutrients have been transported throughout the body and that nutritive matter has been assimilated and waste products eliminated. Santorio, writing one hundred years before Cocchi, was not the first to suggest that the body eliminates waste products through perspiration, but he was the first to quantify this process, which he did with his famous weighing machine, on which he systematically weighed himself for years. Comparing the weight of food and drink ingested to that of the residual waste products, which were usually a little lighter than the food, Santorio
concluded that the remainder exits through the skin’s pores and via exhalation. He also calculated which foods produce the most perspiration; these foods he considered to be the most thoroughly incorporated, hence the most nutritious.

**Meat Clogs the Passageways**

There is no direct evidence that Cocchi had actually read Santorio’s *Medicina statica*. Nevertheless, taking Santorio’s ideas as a starting point, Cocchi concluded that because meat products produce less perspiration than plant foods, they clog the body’s passages. Ultimately, therefore, they are less beneficial. A diet of uncooked fruits, vegetables, and clear water would keep people healthy longer and prevent scurvy, gout, and elephantiasis, all of which are a result of crude, indigestible matter remaining in the body. Meats are too glutinous and cohere excessively to the body, causing waste products to accumulate. Optimal nutrition depends on the “subtlety”—the lightness, clarity, and mobility—of the body’s fluids: the more subtle the fluids, the more easily wastes can be passed out. “How much then our vital fluids ought to be subtle is manifest in their needing to be gradually refined through insensible perspiration, so exiting the living body.”

Cocchi was also certain that the sheer volume of fluids in the body promotes transpiration, and here he speaks of blood, liquids, and vapors, not of the four humors. Fruits and plants provide a more readily abundant and usable form of fluid than animal products and even dried vegetable matter. He assumed that Pythagoras abstained from fava beans because they are usually dried. Pythagoras probably would not have disapproved of fresh ones, Cocchi concluded.

In his defense of vegetarianism, Cocchi also drew upon the claims and principles of the other new schools. Vegetables, he insisted, if broken down chemically, contain a great deal of water, some salts and acids, and finally a moderate amount of “oily vegetable humor” (fats). Flesh and eggs, on the other hand, contain an excess amount of “oily vegetable humor.” Furthermore, a certain “saponaceous” (soapy) quality in plant matter helps clean out the body’s tiniest passages. (At least conceptually, this is not very far from our modern idea that certain foods, e.g., green tea, cleanse the body by destroying free radicals.) Advertising his scientific knowledge, Cocchi also paid lip service to the mechanical school, describing how oily and viscous (“terrestrial”) fluids travel more slowly through the body’s narrow passages, while lighter and thinner ones move more quickly, thus aiding digestion.

Cocchi assured his readers that this diet does not follow “the poetic imagination of the barbaric school, but hails from the secure light of our times given by anatomic medicine and mechanics, natural history, and experimental physics, of which a part is sound chemistry.” By “barbaric school,” he meant humoral physiology, which had condemned fruits and vegetables as being too watery and phlegmatic. Cocchi’s aim was to replace such outdated nutritional wisdom—something only the ignorant would believe in—with proper scientific findings. Vegetables, he claimed, “are not damnable as the vulgar believe, but wonderfully useful and good.”

One of the most salient examples of Cocchi’s attempt to incorporate science is his rejection of wine. In ancient theory, wine was the analogue of blood, and, as such, it was classed among the perfect nutrients. But Cocchi claimed that wine liquefies the aliments too much, preventing the proper cohesion and agglutination of nutritive matter. At least this was how he explained that Pythagoras’s diet was scientifically consistent. Similarly, Cocchi explained Pythagoras’s abstention from garlic, onion, leeks, dried fruits, and nuts as an attempt to ward off excessive dryness. Preventing dryness, in fact, was the sole principle that informed Cocchi’s vegetarian diet.

Despite his appeal to science, Cocchi himself conducted no experiments. To give his claims an air of legitimacy, it was sufficient—or so he hoped—to mention the new schools.

Where would Cocchi have gotten the idea that dry foods and a dry body lead to premature aging and sickness? Nowhere are such notions mentioned in the ancient descriptions we have of Pythagoras or in the explanations of why he chose to be a vegetarian. Rather, Cocchi’s opinions were based on the latest studies of scurvy and gout. More than anything else, it was the study of disease that guided Cocchi’s vegetarianism. Disease, in Cocchi’s opinion, originates in excessive solidity and the improper flux of waste products: “In general, all sicknesses derive from excessive robustness of the solids, from acrid, rancid and oily and salty fluids, from their thickness and their heavy gluey deposits, and from too vivacious activity moving the internal force.”

The latter would have caused excessive perspiration and hence no proper nutrition.

The point is that the physicians’ understanding of the causes of gout had informed Cocchi’s entire dietary plan, which was proposed for healthy and sick alike. It was not only that people were eating too much meat and not enough fruits and vegetables; in Cocchi’s mind, they needed no meat at all.

Cocchi also noted that few vegetables are eaten in times of war, on ocean voyages, or, especially, among the wealthy. It is precisely under these circumstances that scurvy appears.
The cause of scurvy is not, as many contended, the poor climate, the sea air, or an excessive consumption of salty meats—it is only the lack of vegetables. Cocchi noted that the number of cases of scurvy increases when a spring snowfall destroys the young green plants. Here, his observations were scientifically sound, but his conclusion—that meats are unnecessary and that people should live entirely on vegetables—is, at best, unwarranted by the evidence he presents.

Again, studies of pathology inform dietary recommendations for the healthy. Cocchi further supported his point—albeit with more anecdotal evidence (of a kind we often see nowadays in connection with the Mediterranean diet)—by remarking that Tuscans are among the healthiest people in the world, and for one principal reason: poverty leads them to eat an abundance of fresh fruits and vegetables and very little meat. Their health stands in stark contrast to that of the average wealthy European, who subsists on an almost entirely meat-based diet.

Not only are there many robust peasants who live on vegetables, especially mountain people, but we should not forget “the Japanese, most ferocious who scorn dangers and death, yet abstain from animals.” Thus, Cocchi mustered yet more anecdotal evidence to support the new vegetarian diet and to convince his readers that they need not fear a loss of vigor or energy, qualities they supposedly received from animal flesh.

What exactly did this diet promise? And how did the potential vegetarian hope to be transformed by it? Cocchi’s diet is nothing more than an appeal to the literate, affluent reader who hopes to prevent, remove, or mitigate some of the diseases remaining therein. Vegetables, Pujati concluded, offer less nutritional value than other foods because so much of their mass is expelled from the body, sometimes with purgative force. As we would say, they don’t stick to the ribs.

Pujati contended that the liquid part of vegetable matter is essentially indigestible, too. That onions and garlic leave a lingering odor on the breath is a sure sign that they have not been properly converted by the body. Since they do cut through the body’s gluey fluids, logically they should have been recommended by Pythagoras himself, that “most clear illustrator of the vegetable diet,” as Pujati sarcastically remarked. But Pythagoras shunned onions, and that, for Pujati, is an inexcusable inconsistency in Cocchi’s argument. Even more irrational, Pujati thought, was Cocchi’s use of Santorio’s data. Just because vegetables make you sweat more does not mean that they must be better for you than meat.

Armed with a full store of Hippocratic ammunition, Pujati proceeded to illustrate just how dangerous vegetables really are. He recounted numerous personal experiences of country people and city dwellers who picked wild herbs and ended up suffering horrible intestinal problems, vomiting, and diarrhea. Pujati claimed it was the vegetables that caused these problems, rather than a water-borne virus or cholera. Furthermore, Pujati provided examples based on his own
临床经验表明，挨饿的人们生活并不富裕而健康。恰恰相反。11

健康和贫穷的观念，他坚持，是谬误。普贾蒂可能已经见过许多例子，我们如今称作的风热症在威尼托，那里的贫苦人主要以玉米粥为食。

普贾蒂的论点实际上是一种结合了最新的科学研究和希波克拉底和盖伦学说的奇怪混合。希波克拉底、普贾蒂提醒我们，水果难于消化，是腐烂的。还有，已知的医生，例如弗比斯库斯·福图纳图斯·普莱姆...他说第一，水果是充满肉眼可见的蠕虫的，而且因为这个原因，它们可以证明它们含有更多的营养物质。故而，它不是仅仅实用的观察，但是理由充分的，因为处理过的情况它也能导致额外的和危险的疾病。其次，它们会导致恶梦，会干扰睡眠。”12

科奇的水果是容易消化的论点也是不成立的，根据普贾蒂。葡萄，例如，是容易消化的，但是皮肤上是不容易消化的。普贾蒂引述了最近的实验，包括它们的盐酸和盐酸，其中一个由肉和蔬菜，另一个单独由蔬菜。尽管它们的成分是相同的，肉汤和蔬菜的体积增加，这证明汤中含有的营养物质。希波克拉底指出，任何实验，即使是这个表面的，都可以被证实，至少可以被证明得充分让人信服。

普贾蒂的论点是科学的，他以科学的方式工作，当然，是第一手知识，关于消化的影响。例如，引述了卡西尼·波埃尔哈尔夫的著作，荷兰的医生，他在莱顿大学医学院是当时欧洲最好的医学院。波埃尔哈尔夫关于胃酸和碱类的使用理论非常著名，至今仍被每一所高中的化学学生记住。

普贾蒂指出，科学观察和理性的，连同声言，仍然是一次次的和博学的。普贾蒂的论点实际上是希波克拉底的一个非常奇怪的混合。普贾蒂的论点是科学的，他用科学的方法工作，当然，是第一手知识，关于消化的影响。例如，引述了卡西尼·波埃尔哈尔夫的著作，荷兰的医生，他在莱顿大学医学院是当时欧洲最好的医学院。波埃尔哈尔夫关于胃酸和碱类的使用理论非常著名，至今仍被每一所高中的化学学生记住。

普贾蒂承认了科奇是对的，指出指出水果是容易消化的论点是错误的。例如，科奇指出，水果是容易消化的，但蔬菜不是。普贾蒂指出，科学家们用气压计和天平在他们的时代，用”气压计“证明了生产气体的实验。普贾蒂承认，科奇是正确的，指出指出水果是容易消化的论点是错误的。例如，科奇指出，水果是容易消化的，但蔬菜不是。普贾蒂指出，科学家们用气压计和天平在他们的时代，用”气压计“证明了生产气体的实验。普贾蒂也讨论了关于工作，赫尔曼·波埃尔哈尔夫，荷兰的医生，他在莱顿大学医学院是当时欧洲最好的医学院。波埃尔哈尔夫关于胃酸和碱类的使用理论非常著名，至今仍被每一所高中的化学学生记住。

但有一点可以肯定。任何事情可以被证明，或者至少被证明得足够让愚蠢的观众信服，以科学方法和较少的数字。

普贾蒂的论点是足够希波克拉底的；他的结论，任何科学的证明。随意的引用科学余热保持了定期的写作，关于营养，科学教育——什么都没有。对于普贾蒂，这一个不成立——实践权威和也许经验已经提供了真理的标准。但在1650年或者更早，任何类型的实验——逻辑的，相关的，或者其他的——已经有了“证明”。

普贾蒂承认，科奇是对的，指出指出水果是容易消化的论点是错误的。例如，科奇指出，水果是容易消化的，但蔬菜不是。普贾蒂指出，科学家们用气压计和天平在他们的时代，用”气压计“证明了生产气体的实验。普贾蒂认为，任何实验，即使是这个表面上的，将会加强他的论点。

普贾蒂使用已经出了他的方式来证明他的科学知识远超过科奇。例如，引述了俄伊普勒的著作，在他的一天，但是与一个“气压计”实验，气体的产生可以被证明。普贾蒂被引用于一个实验由物理学家斯蒂芬·海斯，谁，在《扁平》(On flatulence)中，指出洒桶中的水和水生产的气泡，显示了洒桶中的水的体积和洒桶中的水的体积。

不接触到的糖类发酵产生二氧化碳，普贾蒂认为，水果引起了消化道的不自然的发酵，这是为什么他们会带来。他也是引述了一次实验由伟大的英语物理学家罗伯特·波伊尔，普贾蒂认为，科学知识是证据。
Bianchi Joins the Fray

Yet another attack on Cocchi was published in 1752. This was Se il vitto pittagorico di soli vegetabili sia giovevole per conservare la sanità, a per la cura d’alcune malatie, written by Giovanni Bianchi, the town physician for Rimino. Bianchi had actually delivered his paper several years earlier, in 1747, in Florence at the Accademia de’ Lincei. Like Pujati, Bianchi criticized Cocchi for all the absurdities he had spouted about Pythagoras. Bianchi’s principal concern, however, was the vegetarian diet. He began with the practicality of it. Would it even be possible to subsist on raw vegetables in cold countries, where fresh produce is not always available and where people have to cook their food for warmth? “The greater part of the world, or the most beautiful, would be depopulated in a few hours for not being able to last through the winter because of a lack of fresh fruits and green herbs necessary to sustain life.”

To further support his claim against vegetarianism, Bianchi mustered evidence from Hippocrates, as well as from the more recent scientific findings. Bianchi asserted that Cocchi’s book did not accord with the latest knowledge of the human body. Bianchi, too, had read a bit more science and could see immediately the superficiality of Cocchi’s claims. He even purported to describe the chemical constituents of certain foods. “Certainly herbs and fruits are composed of things very different than our flesh, our blood and our parts, as chemical analysis easily shows.” This was why “herbs and fruit” could not provide suitable nourishment. In fact, the ancient idea that the body can be nourished only by substances similar to it informs Bianchi’s entire condemnation of vegetarianism. Thus, Bianchi was using eighteenth-century science to prove medical precepts of two thousand years earlier. (This is not to suggest that his ideas are complete nonsense. In fact, he cites an experiment in which bread was chemically analyzed and found to have an acidic principle, a vegetable principle, and a gelatinous, alkaline principle, which was akin to animal substances. Without knowing it, he was, of course, referring to gluten, the protein found in bread. Bianchi’s conclusion that the presence of gluten made bread the most nourishing of vegetable substances is not far from our present understanding of nutrition. What is interesting is his bizarre combination of traditional dietetic ideas jumbled with what might be called the earliest food science.)

Another of Cocchi’s arguments that Bianchi proceeded to destroy is that we were meant to eat vegetables because of the anatomy of our mouths, our flat teeth, and our lack of sharp claws. Flaunting his superior knowledge of anatomy, Bianchi pointed out that we are strikingly different from herbivores, whose ruminant stomachs and larger colon make a vegetable diet feasible. Rather, humans resemble omnivores, like bears, which eat both animal and vegetable foods.

His principal criticism of Cocchi, however, was to point out the latter’s inconsistency. It is true that over-consumption of meats can promote sicknesses such as scurvy, leprosy, and elephantiasis: “I concede that the inmoderate use of meat without the mixture of vegetable matter produces a thickening of our blood and of other fluids in our body, which for this reason corrupt, and give rise to various maladies.” He had in mind the very wealthy, but Lapplanders, he said, are also a perfect example of those who are subject to scurvy for lack of vegetables. Bianchi agreed with Cocchi that vegetables have acrid, saponaceous qualities that cleanse the blood. But if that is the case, then why exclude from the Pythagorean diet such vegetables as onions, garlic, and radishes? And why prohibit spices like pepper, ginger, and cloves, which scour the body’s passages and prevent scurvy? The reasoning here was perfectly Hippocratic. What Bianchi failed to realize was that Cocchi’s departure from classical sources was intentional.

Bianchi was willing to admit that a diet of meat alone is harmful, but so, too, would be a diet of only raw fruits and vegetables. On top of that, a diet without wine was unthinkable. Favoring a balanced but varied diet—in fact, the more kinds of food consumed, the better—Bianchi even proposed that people try certain meats that had gone out of fashion, like dog, wolf, donkey, and horse. (Northern Italians seem to have taken his advice regarding horse!) New kinds of vegetables, like corn, should also be promoted. Above all, moderation is the key.

Fruits and vegetables contain many beneficial chemical properties, but some of these are highly acrid and corrosive, e.g., vitriolic salts, nitrous compounds, and sulphurous compounds. More generally, every food has its proper use, and even the most beneficial food can be harmful in excess. Vegetables are indispensable, but they should not be all we eat. To suggest that a vegetarian diet recommended for certain maladies should be universally applied for all people, whether healthy or sick, was, for Bianchi, a flagrant error.

Diets Are Not For Everyone

What Bianchi was pointing to here is the theme outlined at the beginning of this paper: Cocchi had let the latest pathological findings inform his entire dietetic plan, when in fact the diet ought only to have served to cure, or to mitigate the effects of, particular illnesses. This sort of extrapolation,
from dietary measures recommended for a few disease-afflicted individuals to recommendations for the general population, pervades nutritional thought right down to the present. In an effort to avoid certain diseases, standard dietary recommendations get slanted and skewed. The cart pulls the horse. If the point of nutritional science is to maintain health and prevent disease, then can the study of pathological states really offer an accurate guide to the best nutritional principles for everyone?

The argument over vegetarianism recounted here marks a departure from “hygiene” (in the older sense of regulating health by means of diet, exercise, etc.) and an embrace of diets, which were initially designed to help people avoid specific diseases. This little episode is only one example of the tendency to extend dietary recommendations, originally drawn up in response to (and as therapy for) specific diseases, to a much larger group. Several other examples might be cited, such as the furor of the past few decades over whether reducing sodium intake cures hypertension, or the present concern with cholesterol, a concern that initially targeted those at risk for heart disease.

Thus, we have not shaken off the legacy of the shift that occurred in the late seventeenth and eighteenth century: our own nutritional principles are still driven by pathology. If blame could be placed anywhere, it would have to be on science, or more precisely, on one of the expectations that science sets up—that is, that once there is a measurable parameter, measurement in and of itself has explanatory power. In the case discussed here, the measurable parameter was “insensible perspiration.” Such measurement was regarded (at least by Cocchi) as a valid basis from which to evaluate the nutritive capacity of various categories of foods. The idea that any new experimental procedure or means of quantification (e.g., statistics) offers unshakeable proof is certainly naïve, however prevalent. Nevertheless, anyone writing about nutrition—now as in the past—is obliged to refer to these studies. Interpretation is often superficial (as in many popular nutrition guides); misinterpretation abounds. This little controversy over vegetarianism, as isolated as it may have been, nonetheless shows in capsule form the direction that nutritional science would take in the two hundred fifty years that followed.

**Notes**

I would like to extend my thanks to the Biblioteca Internazionale “la Vigna” in Vicenza for allowing me to read their copies of these texts. Particular thanks are due the staff for offering their generous and invaluable assistance.

2. J. Trémolières, “A History of Dietetics,” in *Progress in Food and Nutritional Science* 1, no. 2 (1975): 96–100. Throughout this article, the author shows how diseases, scurvy in particular, came to dominate discourse on nutrition after the mid-seventeenth century.
5. Ibid., 47–48.
6. Ibid., 40.
7. Ibid., 50.
8. Ibid., 64.
9. Ibid., 81.
11. Ibid., 77–78.
12. Ibid., 49.
13. Ibid., 55.
16. Ibid., 40.
17. Ibid., 62.