
Pope Francis on the Environmental Crisis

— ◆ —

A. M. C. WATERMAN

In the early months of his papacy, Francis promulgated the apostolic exhortation *Evangelii gaudium* (The joy of the Gospel), which declared the evangelical basis of his commitment to environmental protection: “An authentic faith . . . always involves a deep desire to change the world, to transmit values, to leave this earth somehow better than we found it. We love this magnificent planet on which God has put us . . . The earth is our common home and all of us are brothers and sisters” (2013, 182).

The encyclical *Laudato si'* (“Praise be to thee”), which appeared in May 2015, is an extended exposition of that theme (Francis 2015, 3).¹ With the possible exception of John Paul II’s encyclical *Centesimus annus* in 1991, *Laudato si'* has attracted more attention, both favorable and unfavorable, than any papal utterance since *Humanae vitae* by Paul VI in 1968.

The evident degradation of the human environment appears to many, including some of the best informed, to be a matter of life and death: if not for ourselves, then for our children and grandchildren. Reliable diagnoses of causes and well-informed consideration of cures are essential for public policy. The matter has attracted a wide range of responses, in many of which it is hard to disentangle objective analysis from sectional interest and ideological bias. Whether the Christian religion can throw any

A. M. C. Waterman is fellow of St. John’s College, Winnipeg, and professor emeritus of economics in the University of Manitoba.

1. Subsequent parenthetical references to *Laudato si'* cite paragraph numbers only. All italics in the passages quoted are in the original except where indicated. Standard author-date citations apply to other papal encyclicals and documents.

The Independent Review, v. 21, n. 3, Winter 2017, ISSN 1086-1653, Copyright © 2017, pp. 375-398.

light on such questions about the environment is important for millions worldwide. Pope Francis makes a very strong claim that it can.

It is therefore my purpose in this article to examine that claim critically. In the first section, I attempt a summary. In the second, I attend to the intellectual context. In the last, I consider some of the more contentious issues the encyclical raises: in economics, in biological science, and in theology.

What Does the Encyclical Say?

Laudato si, mi Signore, per sora nostra matre Terra,
la quale ne sustenta et gouerna,
et produce diuersi fructi con coloriti fior et herba.

—Francis of Assisi, “Cantico del sole,” c. 1224

Laudato si' is “addressed to every person living on this planet” (3). It is inspired by St. Francis of Assisi, whom John Paul II in 1979 declared to be “the patron saint of all who study and work in the area of ecology” (10, my translation). The seventh stanza of that saint’s perennially popular “Cantico del sole” celebrates “Our Sister, Mother Earth who feeds us and rules us” and is quoted at the outset of *Laudato si'* (1). The theme of the encyclical is “care for our common home.” It echoes Paul VI, John Paul II, and Benedict XVI’s judgment in perceiving the ecological crisis to be a consequence of the “irresponsible behaviour” of human beings (6). It has six chapters.

Taking Stock

The first of these chapters, “What Is Happening to Our Common Home,” deals with pollution and climate change (20–25), the availability of water (27–31), loss of biodiversity (32–42), decline in the quality of human life and the breakdown of society (43–47), global inequality (48–52), “weak responses” to these challenges (53–59), and a variety of options (60–61). It seems probable that this chapter has been the one most carefully read—perhaps, indeed, the only chapter most people have read. At any rate, its matter appears to have attracted the most attention.

Pollution of the atmosphere, soil, and water undermines the health of millions. Accumulation of nonbiodegradable, toxic, and radioactive industrial waste is beginning to make our common home look like “an immense pile of filth” (21). Much of this pollution is a consequence of our “throwaway culture.” Therefore, “technology, linked to business interests” is not “the only way of solving these problems” and may indeed make matters worse (22, 20). We must limit our use of nonrenewable resources and recycle those we do use.

Continuing use of fossil fuels causes carbonic, sulfurous, and nitric pollution—the first of which is directly linked to global warming and its train of ecological evils—which,

by increasing the acidification of the oceans, “compromise the marine food chain” (20, 23, 24). Rich nations’ increasing demand for water and increasing amounts of chemical pollution threaten the availability of potable water for millions, with far-reaching effects on nutrition, health, food production, and poverty.

Industrial and agricultural expansion have encroached on forests and woodlands, bringing loss of species diversification, and—in the case of tropical rain forests (the “lungs of our planet” [90])—diminishing their capacity to absorb carbon dioxide. It has also produced “the disproportionate and unruly growth of many cities,” with consequent “decline in the quality of human life” and even “the breakdown of society” (44). And because industrialization has been controlled by advanced capitalist nations in the Northern Hemisphere, many of its social costs have been externalized upon the economically subject South, thus increasing global inequality (48–52).

Most of these claims are widely known and generally—if not universally—accepted, yet official response has been weak, says Francis. We have come to expect only “superficial rhetoric, sporadic acts of philanthropy and perfunctory expressions of concern for the environment” (54).

The second chapter of *Laudato si’*, on the “Gospel of creation,” abruptly changes the subject. “Why should this document, addressed to all people of goodwill, include a chapter dealing with the convictions of believers?” (62): because there is “light offered by faith” (62–63), much of which may be found in “the wisdom of the biblical accounts” (65–75); because it is salutary to be reminded of “the mystery of the universe” (76–83); because of “the message of each creature in the harmony of creation” (84–88); because there is “a universal communion” of all living beings (89–92); because there is a “common destination of goods” (93–95), for “God created the world for everyone” (93); and because “before the gaze of Jesus” (96–100) “the very flowers of the field and the birds which his human eyes contemplated are now imbued with his radiant presence” (100). This chapter rests on the assumption that “science and religion, with their distinctive approaches to understanding reality, can enter into . . . dialogue fruitful for both” (62).

The most substantial section of this chapter (65–75) examines “what the great biblical narratives say about the relationship of human beings with the world” (65). It rebuts (effectively, in my opinion) the charge sometimes brought against biblical religion: that the “dominion” granted to humankind (Gen. 1:28) “has encouraged the unbridled exploitation of nature” (67). Rather, Francis argues, it is human sin that has disrupted our “three fundamental . . . relationships: with God, with our neighbour and with the earth itself” (66).

We must distinguish “nature” from “creation” (76). The universe did not come about by “chance” but by a “decision” of God” (77). Though we may study and understand “nature,” God’s “creation” is inherently mysterious. Therefore, it is “faith” that “allows us to interpret the meaning and the mysterious beauty” of the “unfolding” of “creation” (79).

Chapter 3 addresses “[t]he human roots of the ecological crisis.” It is based on the assumption—stated at the beginning of the encyclical—that the crisis is caused not by ineluctable natural constraints but by “the violence present in our hearts, wounded by sin” (2). Following his predecessor’s critique of technology (in *Caritas in veritate* [Benedict XVI 2009, 69–72]), Francis identifies as a manifestation of this “violence” the so-called technocratic paradigm, which “exalts the concept of a subject who, using logical and rational procedures, progressively approaches and gains control over an external object” (106). “Technological products are not neutral”; they condition lifestyles and shape social possibilities “dictated by the interests of certain powerful social groups” (107). “Genuine ethical horizons” are obliterated, and “life gradually becomes a surrender to situations created by technology, itself viewed as the principal key to the meaning of existence” (110). Therefore, we need “a distinctive way of looking at things”—policies, education, lifestyle, spirituality—that may “generate resistance to the assault of the technocratic paradigm” (111). Francis calls for “a bold cultural revolution” (114).

What the pope calls “modernity” evinces “an excessive anthropocentrism” (116). The “human being declares independence from reality” and “behaves with absolute dominion” (117). “Man sets himself up as God and thus ends up provoking a rebellion on the part of nature” (117; see also John Paul II 1991, 37). Therefore, “the ecological crisis” is a sign of “the ethical, cultural and spiritual crisis of modernity” (119), for anthropocentrism produces “a relativism which sees everything as irrelevant unless it serves one’s own immediate interests” (122). “Objective truth and universally valid principles are no longer upheld” (123).

The rest of chapter 3 descends to particularity. There is a “need to protect employment” (124–29), for “we were created with a vocation to work” (128). And we must be aware of “new biological technologies” (130–36) and understand their possibilities for both good and ill.

The fourth chapter introduces what appears to be a new concept: that of “integral ecology” (137). It begins with the usual definition of “ecology”: a scientific study of the relations of organisms to one another and to their surroundings (138). But because “everything is interconnected,” this scientific study “necessarily entails reflection and debate about the conditions required for the life and survival of [human] society” (138). It is a short step from this view to the bold assertion, quoted from *Caritas in veritate* (Benedict XVI 2009, 51), that “every violation of solidarity and civic friendship harms the environment” (n. 116). For example, “drug use in affluent societies creates a continual and growing demand for products imported from poorer regions, where behaviour is corrupted, lives are destroyed, and the environment continues to deteriorate” (142). Though the term *integral ecology* is never defined, it soon becomes apparent that it is not a detached and disinterested study but a program for advancing certain ends that are not themselves the result of scientific inquiry and that instead proceed from ethical and aesthetic imperatives that seem to be taken for granted. Because, for example, “there is a need” to “preserve the original identity”

of cities being rebuilt, “ecology . . . involves protecting the cultural treasures of humanity in the broadest sense” (143).

There is thus a “cultural ecology” (143–46). There is also an “ecology of daily life” (147–55) aimed at “efforts to bring about an integral improvement in the quality of human life” (147). For “if communities are created,” the very poorest victims of “densely populated residential areas” may “feel held within a network of solidarity and belonging. In this way, any place can turn from being a hell on earth into a setting of a dignified life” (148).

“Human ecology is inseparable from the notion of the common good, a central and underlying principle of social ethics” (156, 156–58). And it requires “justice between the generations” (158–62).

What Must We Do?

The first four chapters of *Laudato si'* are intended “to take stock of our present situation.” In chapter 5 (163–201), Francis lays out some “lines of approach and action” in light of “the profoundly human causes of environmental degradation” (163) and issues a call for “dialogue”: “in the international community” (164–75); “for new national and local policies” (176–81); on “transparency in decision-making” (182–88); on “politics and economy” in relation to “human fulfilment” (189–98); and on “religions” in relation to “science” (199–201).

Because the world is “interdependent,” solutions to “environmental problems” must be proposed from a “global perspective”; hence, “a global consensus is essential” (164). The United Nations Stockholm Declaration of 1972 was echoed twenty years later at the Earth Summit in Rio de Janeiro. There have been conventions on hazardous wastes, on trade in endangered species, and on protection of the ozone layer (167–68). But “international negotiations cannot make significant progress” when countries “place their national interest above the global common good”—as illustrated by the ineffectual outcome of the United Nations conference on sustainable development in Rio de Janeiro in 2012, which the pope denounces as a “failure of conscience and responsibility” (169).

National and local policy is often supported “by consumerist sectors of the population” and driven by “electoral interests” (178). “The mindset of short-term gain and results which dominates present-day politics and economics” inhibits politicians from supporting comprehensive environmental policies (181). Even when these policies are in place, corruption may “conceal the actual environmental impact of a given project” (182); hence, there is continual need of “dialogue and transparency” (182–88).

The common good requires “politics and economics to enter into a frank dialogue in the service of life” (189). The “absolute power of the financial system” is counterproductive and requires us to rethink “the outdated criteria which continue to rule the world” (189). The pope rejects “a magical conception of the market” (190) and in the next paragraph—almost in passing—offers what is perhaps the most radical

suggestion of the entire encyclical but never develops it further: “a decrease in the pace of production and consumption can at times give rise to another form of progress and development” (191).

“It cannot be maintained that empirical science provides a complete explanation of life . . . and the whole of reality” (199). Hence, there is need for dialogue among “religions” (note the plural) and “the various sciences” for the sake of “protecting nature, defending the poor, and building networks of respect and fraternity” (201).

“Many things have to change course, but it is we human beings above all who need to change” (202). Thus, the final chapter of *Laudato si'*, on “ecological education and spirituality,” proposes a “new lifestyle” (203–8); encourages education “for the covenant between humanity and the environment” (209–15); calls for “ecological conversion” (216–21); notes the “joy and peace” (222–27) we may feel when “free of the obsession with consumption” (222); promotes “civic and political love” (228–32) because “care for nature . . . includes the capacity for living together and communion” (228); speaks of “sacramental signs and the celebration of rest” (233–37); proclaims “the Trinity and the relationship between creatures” (238–40); celebrates Mary, the “Queen of all Creation” (241–42); and takes us “*beyond* the sun” (243–45, my italics; cf. “Cantico del sole”), where “at the end, we will find ourselves face to face with the infinite beauty of God” (243).

The encyclical ends with two prayers: the first for “all who believe in a God who is the all-powerful Creator”; the second for Christians who seek “for inspiration to take up the commitment to creation set before us by the Gospel of Jesus” (246).

The Intellectual Context of *Laudato Si'*

To a far greater extent than in any previous social encyclical, *Laudato si'* acknowledges the authority of independent, secular scientific research. But like all of the social encyclicals after *Rerum novarum* (Leo XIII 1891), it locates itself in the tradition of its predecessors and explicitly declares that it “is now added to the body of the Church’s social teaching” (15). And far more than any of its predecessors, it makes use of nonofficial sources.

The Scientific Background

The Ecological Society of America welcomed *Laudato si'* as “an eloquent plea for responsible Earth stewardship.”

The pope is clearly informed by the science underpinning today’s environmental challenges. The encyclical deals directly with climate change, its potential effects on humanity and disproportionate consequences for the poor, and the need for intergenerational equity. The document is remarkable for its breadth, as it also addresses pollution, overuse of natural

resources, landscape change, sense of place, and the loss of biodiversity. The pope recognizes that slow rates of change can mask the seriousness of environmental problems and the urgency to act. Pope Francis also acknowledges the importance of all taxa and all levels of biodiversity in sustaining our global commons. (2015)

Though there has been much criticism of this encyclical, relatively little of that criticism has been directed at its scientific assumptions: that climate change has produced a drastic and increasing degradation of the conditions of life for humans and for many other species; that it is caused by human economic activity; and that it is causally related to other obvious environmental evils such as atmospheric and oceanic pollution.

What criticism there has been seems to have occurred chiefly in the United States. A number of privately funded bodies, such as the libertarian Heartland Institute of Chicago and the Center for the Study of Carbon Dioxide and Global Change,² accept the fact that global warming is occurring but promote research intended to challenge the official doctrine—as maintained by the United Nations Intergovernmental Panel on Climate Change (IPCC)—that it is caused by human greenhouse gas emissions. Although 31,487 American scientists (9,029 of whom have doctorates, but chiefly in engineering) signed the Oregon Petition, “urging the United States government to reject the global warming Kyoto Protocol of 1997 and similar policies” (“Oregon Petition” n.d.), the effect on the world scientific community of such minority reports appears to have been negligible. For “the ‘scientific voice’ is no longer the voice of the sage individual, or a small group of sages, but the collective voice of essentially the entire community of relevant experts. The growth of the institutionalised assessment [as required by the IPCC]. . . permits scientists to speak with a collective voice” (Oreskes, Jamieson, and Oppenheimer 2015, 639).

Oddly enough, the other chief objections to *Laudato si’* on this score appear to have come from Roman Catholics who wish to distance themselves from unwelcome features of their pope’s message. The Australian cardinal George Pell “informed the *Financial Times* that the Church has no particular expertise in science. . . . [T]he Church has got no mandate from the Lord to pronounce on scientific matters. We believe in the autonomy of science” (qtd. in Scammel 2015). In the United States, a Roman Catholic candidate for the Republican presidential nomination in 2016, Rick Santorum, judged that “we probably are better off leaving science to the scientists” (qtd. in vanden Heuvel 2015). It is obvious that these assessments, whether deliberate or not, are misrepresentations of the encyclical. There is no attempt in *Laudato si’* to “pronounce on scientific matters.” There are, on the contrary, many signs that Francis and his drafting committee sought and received expert scientific advice.

2. Heartland Institute of Chicago, at <https://www.heartland.org/>; Center for the Study of Carbon Dioxide and Global Change, at <http://www.co2science.org/>.

Chief among the expert resources available to the papacy is the Pontifical Academy of Sciences, founded by Pius XI in 1936 and consisting of eighty eminent scientists from many countries who are elected without regard to religion. Its mission is “to promote the progress of the mathematical, physical and natural sciences and the study of epistemological problems relating thereto” (Pontifical Academy of the Sciences n.d., art. 2). Since 1936, forty-six of its members have received Nobel prizes. Its activities include conferences, workshops, and publications. A workshop in May 2014, titled “Sustainable Humanity, Sustainable Nature, Our Responsibility” (see the proceedings in Dasgupta, Ramanathan, and Sánchez Sorondo 2015)—jointly held with the Pontifical Academy of Social Sciences—received thirty-eight communications by leading authorities, not all of whom were academicians.

The principal author of one of the papers presented at this workshop (Schellnhuber and Martin 2015) was Hans Joachim Schellnhuber of the Potsdam Institute for Climate Impact Research (which he founded) and the Santa Fe Institute for Complex Systems Research. Schellnhuber—an atheist, a mathematician, and a theoretical physicist—is a world expert on the macroecological effects of climate change. In a recent essay, he considers the “common ground” that now exists between the scientific community and the papacy. “*Laudato si’* does not provide technical guidance. . . . However Pope Francis highlights the ethical dimension of the climate problem and provides fundamental principles to be applied for solutions” (Schellnhuber 2015, 7). Schellnhuber, “who is said to have helped draft the encyclical” (Niles 2015), was appointed to the Pontifical Academy of Sciences in June 2015.

First Things, “America’s most influential journal of religion and public life” (as it styles itself on its website), regarded Schellnhuber’s appointment as “incomprehensible.” “We can only make sense of it if we ask ourselves an unwelcome question: Is the Academy risking—if not engaged in—guerilla war against the pro-life movement?” (Mullarkey 2015). Whether one applauds or derides such sentiments (also found in other Christian, in particular Roman Catholic, reactions to *Laudato si’* in the United States), they do seem to imply a perception that modern, secular science, with its utter disregard of religious dogma, is now an element in the intellectual context of papal social doctrine to an extent that would have been unimaginable until quite recently.

In this openness to science, perhaps, Francis has sought to realize the ideal of his immediate predecessor, the intellectual Benedict XVI: “Open to the truth, *from whichever branch of knowledge it comes*, the Church’s social doctrine receives it, [and] assembles into a unity the fragments in which it is often found” (Benedict XVI 2009, 9, *my italics*).

Papal Social Doctrine

“The Church’s social doctrine” was inaugurated in 1891 with the encyclical *Rerum novarum* of Leo XIII. When Pius XI celebrated the fortieth anniversary of that celebrated document with his own “social encyclical,” *Quadragesimo anno* (1931),

he started a tradition that has continued to the present. *Mater et magistri* (John XXIII 1961) marked the seventieth anniversary of *Rerum novarum*; *Octogesima adveniens* (Paul VI 1971) the eightieth; *Laborem exercens* (John Paul II 1981) the ninetieth; and *Centesimus annus* (John Paul II 1991) the hundredth. To these we must add *Pacem in terris* (John XXIII 1963); *Populorum progressio* (Paul VI 1967); *Sollicitudo rei socialis* (John Paul II 1987), which marks the twentieth anniversary of *Populorum progressio*; *Caritas in veritate* (Benedict XVI 2009); and now *Laudato si'*. It is customary to supplement that list of strictly papal utterances with a few episcopal or synodal documents, beginning with those of the Second Vatican Council, in order to complete the primary sources of “Catholic social teaching” (Curran 2002, 7). For obvious reasons, this tradition forms the most important part of the intellectual context within which each new member of the series is conceived.

Two themes dominated *Rerum novarum* (Leo XIII 1891): first, “the misery and wretchedness pressing so unjustly on the majority of the working class” (3); second, the rejection of “the main tenet of socialism, community of goods” (15). The former were seen as a consequence of industrialization. The latter was provoked by the activity of “crafty agitators” but more fundamentally by the rapacity of secularizing European governments eager to seize the church’s ancient patrimony (Waterman 1982, 1991). Leo rejected class conflict and exhorted “masters and wealthy owners” to be “mindful of their duty” (62).

Although Leo blamed “the greed of unchecked competition” (1891, 2) for the misery and wretchedness of the workers, it was Pius XI who in *Quadragesimo anno* (1931) attacked “the so-called Manchesterian Liberals” and thus engendered the distrust of the unregulated market economy that characterized papal social doctrine until very lately and that Francis is seen to have revived.

The right ordering of economic life cannot be left to a free competition of forces. For from this source, as from a poisoned spring, have originated and spread all the errors of individualist economic teaching. Destroying . . . the social and moral character of economic life, it held that economic life must be considered and treated as altogether free from and independent of public authority, because in the market, i.e., in the free struggle of competitors, it would have a principle of self direction which governs it much more perfectly than would the intervention of any created intellect. (88)

It would seem from this passage and cognate passages in *Quadragesimo anno* (e.g., 14, 27, 54, 69, 109, 132) that Pius explicitly denied the possibility of a “spontaneous order” (Hayek 1967, 85) that arises when the unintended consequences of private, self-regarding actions by individuals are socially benign. For the “individualist economic teaching” of Adam Smith was based in the insight that “the sovereign must not be charged with a duty . . . for the proper performance of which no human wisdom or knowledge could ever be sufficient; the duty of superintending the industry

of private people, and of directing it towards the employments most suitable to the interest of the society” (Smith [1776] 1976, 687, my italics).

Where the information required to comprehend the working of a complex modern economy (e.g. eighteenth-century Britain) is beyond the power of any individual human mind to grasp, society can only remain viable if there is, in fact, “a free competition of forces”—constrained only by commutative justice among individuals and the rule of law.

Pius failed to grasp this because he was committed to a pre-Enlightenment organicist social theory according to which society is conceived as a *body* that, by analogy with the human body, must be controlled by its *head* (1931, 69, 75, 79, 83). And like many early-modern social theorists (e.g., Starkey [1538] 1989), he conceived that *body politic* in quasi-ecclesiological terms: “it will be possible to say in a certain sense even of this body what the Apostle says of the mystical body of Christ: ‘The whole body (being closely joined and knit together through every joint of the system according to the functioning in due measure of each single part) derives its increase to the building up of itself in love’” (1931, 90).

It is evident that “liberalism” of any kind, being founded on an individualistic conception of human life, must appear inimical to such a vision of society, as Pius’s repeated animadversions made clear (1931, 10, 14, 25, 27, 30, 122).

The “poisoned spring” of Smithian doctrine and of the “Manchesterian Liberals” who developed and in some ways vulgarized it was part of the mainstream of intellectual life in Britain and France in the eighteenth and nineteenth centuries. But for reasons I have outlined elsewhere (Waterman 1991, 1999, 2004, chap. 2), the Church of Rome excommunicated itself from that mainstream from about the middle of the eighteenth century until the accession of Leo XIII in 1878. And although Leo’s long pontificate did much to restore rigor and coherence to the intellectual life of his church, his adoption of Thomism as its official philosophy meant that the church would maintain a distance from mainstream thinking that wasn’t bridged until after the Second Vatican Council (1962–65).

Official hostility to “liberalism” therefore persisted in the social encyclicals down to the 1970s. “Unrestricted competition in the liberal sense” is “clearly contrary to Christian teaching” (John XXIII 1961, 23). “Unbridled liberalism paves the way for a certain type of tyranny” (John XXIII 1963, 26). The Christian cannot “adhere to the *liberal ideology* which believes it exalts individual freedom by withdrawing it from every limitation” (Paul VI 1971, 26). Corresponding to their scepticism about the efficacy of competitive markets, the popes were until recently far more willing than “Manchesterian Liberals” to trust the state—that is, “the public authority” (e.g., Pius XI 1931, 88; John XXIII 1961, 54, 1963, 136; Paul VI 1967, 33). For, according to Pius XI, “man’s productive effort cannot yield its fruits unless a truly social and organic body exists, unless a social and juridical order watches over the exercise of work” (1931, 69).

However, by the mid-1980s, the economic inefficiency and moral evil of Soviet communism had undermined faith in the state. John Paul II condemned communism’s

destruction of “creative initiative” and consequent “passivity, dependence and submission to the bureaucratic apparatus” (1987, 15; see also John Paul II 1991, 25). More importantly, he was led by his experience of socialism to introduce a radically new element into the church’s social doctrine. The antimarket rhetoric of Leo XI and his successors was suddenly set aside: “the *free market* is the most efficient instrument for utilizing resources and effectively responding to needs” (John Paul II 1991, 34), because of which “the Church acknowledges the legitimate *role of profit*” (35). John Paul’s successor cautiously recognized “the proper economic function of the market” (Benedict XVI 2009, 35), and the new doctrine has been codified in the official *Compendium* (347–50), compiled in 2004 by the Pontifical Council for Justice and Peace.

How much of this tradition has Francis handed on? Though he makes no mention of Leo XIII or Pius XI, their distrust of the market economy has resurfaced in *Laudato si’* (e.g., 56, 123, 203), as many have remarked. Paul VI gets five citations and John XXIII one. But Francis cites John Paul II thirty-seven times and Benedict XVI thirty times. No fewer than fifteen of the latter references are to *Caritas in veritate*, and the whole of *Laudato si’* is little more than a vast elaboration of *Caritas’s* paragraph 51. That paragraph in turn depends on three key ideas from *Centesimus annus* by John Paul II (1991, notes 123, 124, 125), who appears to have originated the term *human ecology* as used by Francis. Though one crucially important element of John Paul’s thinking—“the proper economic function of the market”—is missing, by far the most influential element in the intellectual context of *Laudato si’* is the scholarly and philosophical thinking of Francis’s two immediate predecessors.

Nonofficial Sources

Not everyone has this perception of *Laudato si’*. According to R. R. Reno, “Francis expresses strikingly anti-scientific, anti-technological, and anti-progressive sentiments. In fact, this is perhaps the most anti-modern encyclical since the Syllabus of Errors in 1864” (2015). Reno contrasts this putative attitude with the recognition by John Paul II and Benedict XVI of “modernity’s positive achievements.” He sees in *Laudato si’* a fear and distrust of technology, which in its view seeks “a lordship over all” and “tends to absorb everything into its ironclad logic,” as Reno explains. There may thus be, says Reno, “an internal contradiction” between the pope’s endorsement of “the consensus view about global warming” and his view that “‘the scientific and experimental method’ *itself*” is “part of the problem” (2015).

Benedict certainly expressed a profound appreciation of technology (e.g., 2009, 69), but Francis echoes that appreciation in *Laudato si’* (102, 103). His seemingly more pessimistic view in paragraphs 106–10 appears to have been influenced by the German philosopher of religion Romano Guardini (1885–1968), whose works Jorge Mario Bergoglio (a.k.a. Francis) studied in the 1980s with a view to a doctoral thesis. To a much greater extent than his predecessors, Francis has been willing to cite

nonofficial sources in his encyclical—including Aristotle, Dante, Teilhard de Chardin, and Paul Ricoeur, among others—and there are eight citations of Guardini, all to *The End of the Modern World* (Guardini 1950, 1998). Guardini’s thought is the third important component of the intellectual context of *Laudato si’*.

Das Ende der Neuzeit (Guardini 1950), originally translated into English in 1957, was also a powerful influence on Benedict XVI, much of whose writing “has been, at least implicitly, a long meditation on the work of Guardini” (Shannon 2014). Chapter 3, “The Dissolution of the Modern World and the World Which Is to Come,” is the source of all the citations of Guardini in *Laudato si’*. Power can create evil as well as good and has become demonic (Guardini 1998, 82–83). Note Guardini’s assertion that his hypothesis “*has nothing in common with that desire which would surrender the valid achievements of modern man*” (51, my italics). “The world outlook now being born . . . refuse[s] to venerate nature. . . . [M]an motivated by technology broke into the field of history and took possession. . . . The technological mind sees nature . . . as raw material to be hammered into useful shape” (55). The “gadgets and technics [*sic*]” forced upon “Mass man” by “patterns of machine production and of abstract planning” he “accepts quite simply; they are the forms of life itself” (60). But “the process of conformity” that “has done so much violence to man” also has a “positive meaning.” For “when all other substantial values have disintegrated comradeship remains . . . a sign of what is to come. . . . comradeship could help regain the values of the ‘Person’: benevolence, understanding and justice” (66).

Guardini’s analysis of the dehumanizing effects of technology and the destructive consequences of its instrumental conception of nature lies behind chapter 3 of the encyclical *Laudato si’*, “The Human Roots of the Ecological Crisis,” especially paragraphs 102–113 and 115–119, in which six of the references to Guardini occur. The other two references are in chapter 6, “Ecological Education and Spirituality,” paragraphs 203 and 219. These paragraphs evince not so much a fear and distrust of technology as a well-informed understanding of technology’s human and environmental costs. And they are fully consistent with Benedict’s critique of technology in *Caritas in veritate* (2009, 68–74).

The United Nations Rio Declaration on the Environment and Development of 1992 is cited three times in *Laudato si’*, and the Earth Charter of 2000 is cited once. But, aside from Guardini, the most cited nonofficial source is the Greek Orthodox patriarch Bartholomew I of Constantinople (1940–), with five citations (7–9). Bartholomew, known as “the Green Patriarch” for his widely influential advocacy of environmental causes, has insisted that “to commit a crime against the natural world is a sin against ourselves and a sin against God” (qtd. in 8) and “has drawn attention to the ethical and spiritual roots of environmental problems, which require that we look for solutions not only in technology but in a change of humanity” (9). It is evident that Francis finds the patriarch’s theological view of the environmental crisis congenial and in harmony with his own.

Discussion

The message of *Laudato si'* is so important and so ecumenical that it deserves the most careful and critical attention. Much of it is profoundly true and compelling. But in some places it seems either wrong or wrong-headed and in some others questionable or unnecessarily controversial. Pope Francis invites dialogue (chapter 5). We “people of goodwill” (62) to whom the encyclical is addressed can do our bit by helping to clear away some of the clutter. I address three of the more contentious sets of issues: in economics, in biological science, and in theology.

The Market Economy

Many commentators have observed that *Laudato si'* is “economically flawed” (Gregg 2015) and have noted the pope’s “well-established distrust of free-market capitalism” (Gardner 2015) and his attack on what he calls “a magical conception of the market” (vanden Heuvel 2015). As I explained earlier, papal social doctrine was consistently hostile to “Manchesterian liberalism” until 1991. In that year, in the aftermath of the collapse of Soviet communism, John Paul II acknowledged in *Centesimus annus* that “on the level of individual nations and of international relations, the *free market* is the most efficient instrument for utilizing resources and effectively responding to needs.” Thus, “the Church acknowledges the legitimate *role of profit* as an indication that a business is functioning well. When a firm makes a profit, this means that productive factors have been properly employed and corresponding human needs have been duly satisfied” (1991, 34, 35).

Immediately following these passages, John Paul adumbrated most of what was to become the content of *Laudato si'*: “consumerism,” “the ecological question” and “senseless destruction of the natural environment,” a Guardini-like critique of technology, and John Paul’s new concept of “human ecology” (1991, 36, 37, 38). Therefore, although John Paul guarded and qualified acceptance of “the proper economic function” of the market (e.g., 1991, 42), and Benedict even more so (2009, 35), it is evident that neither believed that his attention to environmental questions required him to revive the automatic hostility to markets evinced by Pius XI.

In this important respect, *Laudato si'* would seem to be a turning back of the clock. It claims to be an addition to “the Church’s social teaching” (15), yet it appears to ignore or even deny that this teaching now recognizes the “proper economic function of the market.”

Sometimes this denial is more apparent than real in *Laudato si'*. The assertion, for example, that “the environment is defenceless before the interests of a deified market” (56) has attracted much unfavorable notice. Yet some of the pope’s highly colored adjectives are explicable and not in themselves unreasonable. No economist entertains “a magical conception of the market” (190). Some noneconomists may indeed lapse into idolatry of a “deified market.”

On careful examination, therefore, some of the pope's strictures turn out to contain valid criticisms, which are undermined or weakened by hyperbolic language. For example, "Caring for ecosystems demands far-sightedness, since no one looking for quick and easy profit is truly interested in their preservation. But the cost of the damage caused by such selfish lack of concern is much greater than the economic benefits to be obtained" (36). Here we need only delete "caused by such selfish lack of concern." In another example, few readers would deny that "saving banks at any cost, making the public pay the price" (189), is bad public policy. But many would question what follows in the same sentence: that to do so only "reaffirms the absolute power of a financial system, a power which has no future" (189)—although they might then go on to agree, once again, that such action to save banks at the public's expense may "only give rise to new crises after a slow, costly and only apparent recovery" (189). In all such passages, and there are many, Francis is his own worst enemy, offering easy excuses to those who wish to evade or reject his message.

Many economists are willing, therefore, to go along with Francis at least to the extent of conceding that the market economy, both nationally and internationally, may not be in the best health—at any rate as judged by the standards of neoclassical theory.

According to that theory, a fully employed economy in which there is perfect information and in which there are perfectly competitive spot and futures markets for each good and service (and indeed in which there are markets for all contingencies in all future periods) will yield rates of production and consumption—when in general equilibrium—that are optimal in Pareto's sense: no one individual can be made better off save at the expense of others. Some have regarded this theory as a rationalization of Adam Smith's "invisible hand." It must be noted that individuals' relative position in equilibrium depends on the initial assignment of endowments.

It is obvious that some of these conditions are not met and perhaps can never be met. There is not a complete set of markets, and those markets that do exist are often far from perfectly competitive. Vigorous price competition, cutting profits to the bone for the benefit of customers, is all too often hard to find. Monopoly, or collusion between a few giants, is now typical in many sectors. Hence, these producers may levy a private and unofficial sales tax on their customers, which is inefficient and may be perceived as unjust. When there is high unemployment, which has often been common in developed economies in recent decades, prices may no longer signal relative scarcities; hence, production may no longer match relative needs. Idle productive resources, moreover, are both a waste and a cause of human misery. It is evident, too, that information is often far from perfect and that public goods and other causes of market failure abound. Last, because even under ideal conditions individual incomes are determined by initial endowments that depend simply on luck, any great disparity in incomes—such as exists at present, especially in the United States and Britain (Wilkinson and Pickett 2009)—may lead some to call in question the ethical basis of capitalism.

In addition to these departures from theoretical optimality, there is the fact, increasingly observed by economists, that an unprecedented relative expansion of the financial sector in recent decades has produced a “misalignment of private and social incentives” (Collier 2015, 3), which perhaps is a cause of what *Laudato si’* refers to as that “mindset of short-term gain and results which dominates present-day . . . economics” (181).

However, it is one thing to agree that the market economy of the present day falls short of its own standards of performance as these standards are formalized in economic theory, but quite another to conceive any more satisfactory alternative.

In many instances, no doubt, government regulation of markets may prevent or correct some of the worst failures of private enterprise. Yet government itself may sometimes be part of the problem. In every country where government’s desire to regulate exceeds its power to control its functionaries, corruption will flourish. And in stable and wealthy democracies where government depends on electoral success, strong incentives exist for rich and powerful individuals and corporations as well as for powerful labor and professional unions to engage in rent seeking by trading political support for exclusive favors. As in Britain before Margaret Thatcher’s reforms, for example, big business and big unions may unite with government in a conspiracy to rob the public.

Yet the capitalist (mixed) economy, despite its many infirmities, has since 1945 provided far more productive employment and generated far more wealth for more people and in more countries than ever before in human history. Pope Francis’s antimarket bias thus sometimes looks like willful blindness.

Most seriously for its argument, *Laudato si’* simply misses the point of the “deified market.” This is apparent, among other places, in the “the issue of water” (second section of chap. 1, para. 27–31): “Even as the quality of available water is constantly diminishing, in some places there is a growing tendency, despite its scarcity, to privatize this resource, turning it into a commodity subject to the laws of the market. Yet *access to safe drinkable water is a basic and universal human right, since it is essential to human survival*. . . . [W]ater continues to be wasted, not only in the developed world but also in developing countries which possess it in abundance” (30).

Economists know that it is not “despite its scarcity” but precisely *because of that scarcity* that water should be “subject to the laws of the market,” for until people have to pay a price for water’s use that reflects its relative scarcity, they will continue to waste it. If there are some who cannot afford that price, the remedy lies not in quantitative control by bureaucrats but in legislated transfers of income from the rich to the poor. Though water cannot possibly be a “human right” (because there can be no right to that which may be unfeasible), the “human survival” that depends on water is better served by the peaceable rationing of the market than by any conceivable alternative. And because it is not so much “waste” as paucity of infrastructure that creates water shortages in sub-Saharan Africa, Southeast Asia, and Latin America,

the profit possibilities offered by the market would create powerful incentives to invest in that infrastructure (Segerfeldt 2005).

Even Pius XI recognized in *Quadragesimo anno* that “the laws of economics . . . determine the limits of what productive human effort cannot, and of what it can attain in the economic field and by what means” (1931, 42). In 1994, John Paul II established the Pontifical Academy of the Social Sciences on lines similar to the Pontifical Academy of Sciences. It collaborated with the latter in a joint workshop on sustainability in 2014. The Pontifical Academy of the Social Sciences includes seven eminent economists, among them Joseph Stiglitz and Partha Dasgupta. Kenneth Arrow is an honorary member. (The late Gary Becker was a member of the Pontifical Academy of *Sciences*—which claims him as one of its own Nobel laureates.) It would appear, however, that the influence of economists on *Laudato si'* has been far less than that of natural scientists—possibly because fellow academicians from some other disciplines,³ especially sociology, are uneasy with the methodological individualism at the core of economic theory.

Ecology

Economics is the scientific study of the human response to scarcity. It is thus a special case of ecology, which includes the scientific study of the response of all living organisms to scarcity. Biological scarcity arises from natural fecundity in a finite world. “Necessity, that imperious all pervading law of nature, restrains [all species] within the prescribed bounds. The race of plants and the race of animals shrink under this great restrictive law” (Malthus 1798, 15). Charles Darwin got the key ecological concept of “the struggle for existence” from Robert Malthus and used it to develop his theory of natural selection (Darwin 1958, 120). What John Stuart Mill called “the spontaneous order of nature” ([1874] 1969, 381) occurs when each coexisting species in a particular habitat has reached its maximum population as set by physical geography and by the competition (or availability) of all other species. It may be regarded as a gigantic analogue of general competitive equilibrium in neoclassical economic theory—and, like the latter, it can seldom if ever be observed because of continual flux in its exogenous determinants.

The never-ending “struggle for existence” means a nature “red in tooth and claw.” For though symbiosis, mutualism, commensalism, and peaceful coexistence are widespread, both interspecific predation and intraspecific predation are so common as to appear usual and to justify Tennyson’s dismal characterization of “Nature” in his poem “In Memoriam, A. H. H.” (canto 56). The weak are parasitic on the strong. The strong prey on the weak. Even humans will kill and eat weaker humans if there is no other food.

3. The disciplines of the twenty-four ordinary academicians in the Pontifical Academy of Sciences include: demography (1), economics and development studies (7), history and religious studies (2), philosophy and political philosophy (5), political science and international relations (5), and sociology (4).

This is not quite the picture of nature we get in *Laudato si'*. St. Francis of Assisi “communed with all creation, even preaching to the flowers. . . . [T]o him each and every creature was a sister united to him by bonds of affection” (11). The pope warns us that “if we no longer speak the language of fraternity and beauty in our relationship with the world, our language *will be* that of masters, consumers, ruthless exploiters, unable to set limits on their immediate needs” (11, my italics). Here, too, however, Pope Francis jeopardizes his meaning by overstatement. A change of “will be” to “may become” converts this assertion into a valid and important proposition.

Like William Paley, whose work *Natural Theology* (1802) underpinned religious belief in Britain and America until Darwin, “St Francis . . . invites us to see Nature as a magnificent book” in which we can glimpse the “infinite beauty and goodness of God,” says Francis (12). However, when we no longer perceive the adaptation of species as God’s benevolent “design” but rather as blind and purposeless, the Book of Nature tells us a different story (Darwin 1958, 87). The pope rescues his namesake by correctly noting that “the harmony between the Creator, humanity and creation as a whole” was disrupted at the Fall (Gen. 3:17–19) and by reporting St. Bonaventure’s belief “that through universal reconciliation with every creature, St Francis in some way returned to the state of original innocence” (66). So the “struggle for existence” and organic evolution that results from it are not denied (18, 81). Yet Aristotle is later quoted in support of “design”: “Nature is nothing other than a certain kind of art, namely God’s art” (qtd. in 80).

It may be that the pre-Malthusian view of nature that still lingers in *Laudato si'* lies behind the pronatalism (180) that Francis shares with all of his predecessors (e.g., Pius XI 1930, 11, 54, 95; John XXIII 1961, 185–94; Paul VI 1968, 2; John Paul II 1987, 25). Like them, he believes that “demographic growth is fully compatible with an integral and shared development. To blame population growth instead of extreme and selective consumerism on the part of some, is one way of refusing to face the issues” (50). But once again Francis overstates his case. It seems probable that what John Paul II identified as “consumerism” (1987, 28) is indeed an important part of the problem today. But even had “consumerism” never existed, increased population consequent upon industrialization in the past two centuries is the fundamental cause of the environmental degradation we perceive today. World population, which was only very gradually increasing up to 1700, grew from one billion in 1800 to seven billion in 2011—all because industrialization produces more goods. And what “the Church’s social doctrine” has yet to accept and internalize is the biblical insight that “when goods increase, they are increased that eat them” (Eccles. 5:11). More human beings, however scrupulously they might eschew “consumerism,” place more strain on the environment. It is important to note that this strain is not primarily a matter of resource scarcity.

When John XXIII declared that “the resources which God in His goodness and wisdom has implanted in Nature are well-nigh inexhaustible” (1961, 189), he unwittingly resurrected the futile attempt by Marx and Engels (Perelman 1985, 465–70) to

answer Malthus through faith in “the progress of science and technology” (John XXIII 1961, 189). In this, he ran counter to the findings of those ecologists who believe that population has already exceeded the earth’s sustainable carrying capacity (e.g., Daily and Ehrlich 1992; Burger et al. 2012). Yet economists note that technical progress (i.e., “science and technology”) and Smithian increasing returns to scale have so far outweighed Malthusian diminishing returns. Julian Simon (1981), for example, would appear to agree with John XXIII, and he won a famous wager with Paul Ehrlich over a mutually agreed measure of resource scarcity from 1980 to 1990 (“Simon–Ehrlich Wager” n.d.). Perhaps economists tend in general to be more skeptical about carrying capacity and more optimistic about resource elasticity than ecologists and other natural scientists. In economists’ models, available resource inputs into production are usually increasing functions of price, whereas in engineers’ and natural scientists’ models they are taken as data.

Yet even if the ecologists are wrong, and productive resources are as elastic as John XXIII and the most optimistic of the economists believe, environmental degradation will worsen as the human population increases. More humans produce more greenhouse gases, and the earth’s capacity to absorb these gases without disastrous consequences is limited (Burger et al. 2012). This capacity does not appear to be an ordinary resource constraint capable of being identified and made elastic with respect to price. Though the only demographer in the Pontifical Academy might dissent (Dumont 2015), it therefore seems unlikely that, as Francis puts it in *Laudato si’*, “demographic growth is fully compatible with an integral and shared development” (50).

Virtue, Self-Interest, and Original Sin

Even if population were not a problem, there can be no serious doubt that the environmental evils described in chapter 1 of *Laudato si’* are caused by human agency, as the pope tells us. And only we humans can rescue ourselves from disaster—if it is not already too late. Not only do we all have to learn sustainable ways of living as individuals, but, what is going to be much more difficult, governments of sovereign states also have to become willing to enact and enforce laws and regulations that will inevitably injure the short-term interests of many of their subjects, including some of the most powerful. “The Church does not propose economic systems or programs” (John Paul II 1987, 41), but she does claim to be “an expert in humanity” (Paul VI 1967, 13). It is for this reason, I think, that Pope Francis believes that the Christian religion can throw light on these matters.

There are many references in *Laudato si’* to individuals’ and groups’ *duty* with respect to environmental protection (41, 64, 67, 70, 78, 79, 129, 167, 178, 211), all of them relevant. “The existence of laws and regulations is insufficient in the long run to curb bad conduct, even when effective means of enforcement are present. If the laws are to bring about significant, long-lasting effects, the majority of the members

of society must be adequately motivated to accept them, and personally transformed to respond” (211).

Perfectly true as this proposition is, it raises an important question: *How can individuals be “adequately motivated”*? Like Patriarch Bartholomew, the pope believes that we need “a change in humanity” (9). “Only by cultivating sound virtues,” Francis tells us, “will people be able to make a selfless ecological commitment. . . . Education in environmental responsibility can encourage ways of acting which directly and significantly affect the world around us” (211).

I wish to suggest that though virtue is indeed *necessary*, it is not *sufficient* to bring about the profound change in “lifestyle” that the pope very properly calls for (23, 59, 111, 164, 193, 203–8, 222). A “change in humanity” is very desirable. But even if such a change is possible, in principle it may take too long. Few of us will achieve the heroic virtue of St. Francis of Assisi because doing the right thing is often too costly. Consider a middle-level bureaucrat in Nigeria, with authority to enforce some environmental measure contrary to the interest of a powerful private corporation. He is wretchedly underpaid and has an ailing wife and four children to support. The corporation offers him a bribe. If he acts with integrity, his dependents will bear most of the cost. What he needs is a powerful incentive to refuse the bribe: in this case an adequate salary from his government. Then should we instead appeal to the better nature of the corporation’s managers? No. Not because they are “obsessed with maximizing profits” (190) but because they, too, are sinful human beings like the rest of us, who may not have the moral courage to incur serious costs for themselves and their loved ones if they act lawfully and justly. In all such cases, and they are well-nigh universal, we must also appeal to each agent’s *self-interest*.

Exclusive reliance on incentives might be self-defeating, of course. If individuals are expected to act well only when sufficiently rewarded, deliberately bad behavior might be rational, and corruption will become institutionalized. Even if this were not the case, the difficulty of achieving that degree of cooperation and collaboration at the national and international levels required to remedy environmental degradation would be exacerbated by the defection of free riders. Virtue is always necessary. But self-interest is the stuff of practical politics.

A famous archbishop of Canterbury declared in 1942 that “the art of government is . . . the art of so ordering life that self-interest prompts what justice demands” (Temple [1942] 1976, 65). Why should this be? John Paul II tells us in *Centesimus annus*,

[M]an, who was created for freedom, bears within himself the wound of original sin, which constantly draws him towards evil and puts him in need of redemption. Not only is *this doctrine an integral part of Christian revelation*; it also has great hermeneutical value insofar as it helps one to understand human reality. Man tends towards good, but he is also capable of evil. He can transcend his immediate interest and still remain bound to

it. The social order will be all the more stable, the more it takes this fact into account and does not place in opposition personal interest and the interests of society as a whole, but rather seeks ways to bring them into fruitful harmony. In fact, where self-interest is violently suppressed, it is replaced by a burdensome system of bureaucratic control which dries up the wellsprings of initiative and creativity. (1991, 25)

The market economy, even in its present state, is a powerful instrument for bringing “personal interest” and “the interest of society as a whole” into “fruitful harmony.” Jansenists of the late seventeenth century were the first to see this confluence clearly (Faccarello 1999, 22–29), and their insight was fully developed in the classical political economy of the English School (Waterman 2008, 2014).

Jansenist theology was deeply Augustinian. St. Augustine, who seems to have coined the term *original sin*, taught that God inflicted the state and its institutions on humanity as a *punishment* for sin, but under His mercy they may become *remedies* for sin by harnessing the self-regarding acts of sinful men and women to produce unintended consequences that are socially benign (Deane 1963, chaps. 3 and 4, *passim*). When *Centesimus annus* was promulgated, it was hailed in the United States as “a ringing endorsement of the market economy” (Neuhaus 1991, S8–S9), but its true significance was missed by all. It was in fact a belated recognition in papal social doctrine of Augustinian theodicy. The institutions of human society, such as the market economy, are conceived in sin and must always be imperfect. Yet under Divine Providence they may become a remedy for “the wound of original sin” by recruiting self-interest to the common good.

Laudato si' completely ignores this essential element in “the Church’s social doctrine.” Francis tells us instead that we must “learn to reject self-interested pragmatism” (215), for “our freedom fades when it is handed over to the blind forces of the unconscious, of immediate needs, of self-interest, and of violence” (105). True as this statement may be in general, its rejection of self-interest undermines his very proper desire that we should be “adequately motivated” to cultivate the ecological virtues. And by turning a blind eye to “the proper economic function” of the market, as in his seeming rejection of “carbon credits” (171), for example, he shoots himself in the foot, for virtue alone is not enough. We need all the incentives we can muster to induce individuals, corporations, and governments to behave in an ecologically responsible manner.

Conclusion

What can we conclude? *Laudato si'* is a vitally important contribution to public discourse on the environmental crisis. Its account of the evils now facing us and its warning of the disaster that impends are truly prophetic in the biblical sense. Its Christian understanding of God’s creation and of our proper place in it (chapters 2 and 6) provides a normative framework—perhaps the only adequate

normative framework—for environmental stewardship. And its recognition that virtue is necessary if laws and regulations are to be effectual is unquestionably right. But the force of its message is weakened in two ways: first, by its inability to recognize that population is crucial; second, by its failure to appreciate that in public policy human sin makes it necessary to supplement virtue by an appeal to self-interest—and that the market economy can be a very good way of achieving this.

Reference

- Benedict XVI. 2009. *Caritas in veritate* (authorized English translation). June 29. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/benedict-xvi/en/encyclicals/documents/hf_ben-xvi_enc_20090629_caritas-in-veritate.html.
- Burger, Joseph R., Craig D. Allen, James H. Brown, William R. Burnside, Ana D. Davidson, Trevor S. Fristoe, Marcus J. Hamilton, et al. 2012. The Macroecology of Sustainability. *PLOS Biology* 10, no. 6: 1–6.
- Collier, Paul. 2015. Wrong for the Poor. *Times Literary Supplement* (London), September 25.
- Curran, C. E. 2002. *Catholic Social Teaching, 1891–Present: A Historical, Theological, and Ethical Analysis*. Washington, D.C.: Georgetown University Press.
- Daily, G. C., and P. R. Ehrlich. 1992. Population, Sustainability, and the Earth's Carrying Capacity. *BioScience* 42, no. 10: 761–71.
- Darwin, Charles. 1958. *The Autobiography of Charles Darwin*. Edited by Norah Barlow. London: Collins.
- Dasgupta, Partha, Veerabhadran Ramanathan, and Marcelo Sánchez Sorondo, eds. 2015. *Sustainable Humanity, Sustainable Nature, Our Responsibility: Proceedings of the Joint Workshop, 2–6 May 2014*. Extra Series 41. Vatican City: Pontifical Academy of Sciences.
- Deane, Herbert A. 1963. *The Political and Social Ideas of St. Augustine*. New York: Columbia University Press.
- Dumont, Gérard-François. 2015. Population et nature: Antagonisme ou concordance? In Pontifical Academy of Sciences, *Sustainable Humanity, Sustainable Nature, Our Responsibility: Proceedings of the Joint Workshop 2–6 May 2014*, Extra Series 41, edited by Partha Dasgupta, Veerabhadran Ramanathan, and Marcelo Sánchez Sorondo, 79–124. Vatican City: Pontifical Academy of Sciences.
- Ecological Society of America. 2015. Press release, June 29. At <http://www.esa.org/esa/public-affairs/esa-communications/press-releases/>.
- Faccarello, Gilbert. 1999. *The Foundations of Laissez-faire: The Economics of Pierre de Boisguilbert*. London: Routledge.
- Francis. 2013. *Evangelii gaudium* (authorized English translation). Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/francesco/en/apost_exhortations/documents/papa-francesco_esortazione-ap_20131124_evangelii-gaudium.html.
- . 2015. *Laudato si'* (authorized English translation). May 24. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.

- Gardner, David. 2015. An Activist Pope Puts His Faith in Science. *Financial Times*, June 19.
- Gregg, Samuel. 2015. *Laudato si'*: Well-Intentioned, Economically Flawed. *American Spectator*, June 19. At http://spectator.org/63160_laudato-si-well-intentioned-economically-flawed/.
- Guardini, Romano. 1950. *Das Ende der Neuzeit*. Basel: Hess.
- . 1998. *The End of the Modern World*. Wilmington, Del.: ISI Books.
- Hayek, F. A. 1967. *Studies in Philosophy, Politics, and Economics*. New York: Simon & Schuster.
- John XXIII. 1961. *Mater et magistri* (authorized English translation). May 15. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/john-xxiii/en/encyclicals/documents/hf_j-xxiii_enc_15051961_mater.html.
- . 1963. *Pacem in terris* (authorized English translation). April 11. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/john-xxiii/en/encyclicals/documents/hf_j-xxiii_enc_11041963_pacem.html.
- John Paul II. 1979. Bulla: *Inter sanctos* (in Latin). November 29. At http://w2.vatican.va/content/john-paul-ii/la/apost_letters/1979/documents/hf_jp-ii_apl_19791129_inter-sanctos.html.
- . 1981. *Laborem exercens* (authorized English translation). September 14. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/john-paul-ii/en/encyclicals/documents/hf_jp-ii_enc_14091981_laborem-exercens.html.
- . 1987. *Sollicitudo rei socialis* (authorized English translation). December 30. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/john-paul-ii/en/encyclicals/documents/hf_jp-ii_enc_30121987_sollicitudo-rei-socialis.html.
- . 1991. *Centesimus annus* (authorized English translation). May 1. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/john-paul-ii/en/encyclicals/documents/hf_jp-ii_enc_01051991_centesimus-annus.html.
- Leo XIII. 1891. *Rerum novarum* (authorized English translation). May 15. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/leo-xiii/en/encyclicals/documents/hf_l-xiii_enc_15051891_rerum-novarum.html.
- Malthus, T. Robert. 1798. *An Essay on the Principle of Population: As It Affects the Future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and other Writers*. London: Johnson.
- Mill, John Stuart. [1874] 1969. *Nature*. In *Three Essays on Religion*, vol. 10 of *Collected Works of John Stuart Mill*. Toronto: University of Toronto Press.
- Mullarkey, Maureen. 2015. Notes on the Vatican Climate. *First Things*, July 14.
- Neuhaus, Richard John. 1991. Review Essay. *National Review* 43, no. 11 (Special Supplement): S8–S9.
- Niles, Christina. 2015. Breaking: Schellnhuber Appointed to Pontifical Academy of Science. *Church Militant*, June 17.
- Oregon Petition. n.d. *Wikipedia*. At https://en.wikipedia.org/wiki/Oregon_Petition. Accessed August 22, 2016.

- Oreskes, Naomi, Dale Jamieson, and Michael Oppenheimer. 2015. What Role for Scientists? In Pontifical Academy of Sciences, *Sustainable Humanity, Sustainable Nature, Our Responsibility: Proceedings of the Joint Workshop, 2–4 May 2014*, Extra Series 41, edited by Partha Dasgupta, Veerabhadran Ramanathan, and Marcelo Sánchez Sorondo, 617–49. Vatican City: Pontifical Academy of Sciences.
- Paley, William. 1802. *Natural Theology or Evidences of the Existence and Attributes of the Deity*. London: R. Faulder.
- Paul VI. 1967. *Populorum progressio* (authorized English translation). March 26. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/paul-vi/en/encyclicals/documents/hf_p-vi_enc_26031967_populorum.html.
- . 1968. *Humanae vitae* (authorized English translation). July 25. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/paul-vi/en/encyclicals/documents/hf_p-vi_enc_25071968_humanae-vitae.html.
- . 1971. *Octogesima adveniens* (authorized English translation). May 14. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/paul-vi/en/apost_letters/documents/hf_p-vi_apl_19710514_octogesima-adveniens.html.
- Perelman, Michael. 1985. Marx, Malthus, and the Organic Composition of Capital. *History of Political Economy* 17, no. 3: 461–90.
- Pius XI. 1930. *Casti connubii* (authorized English translation). December 31. Vatican City: Libreria Editrice Vaticana. At https://w2.vatican.va/content/pius-xi/en/encyclicals/documents/hf_p-xi_enc_19301231_casti-connubii.html.
- . 1931. *Quadragesimo anno* (authorized English translation). May 15. Vatican City: Libreria Editrice Vaticana. At http://w2.vatican.va/content/pius-xi/en/encyclicals/documents/hf_p-xi_enc_19310515_quadragesimo-anno.html.
- Pontifical Academy of Sciences. n.d. Statutes of the Academy. At <http://www.pas.va/content/accademia/en/about/statutes.html>. Accessed September 13, 2016.
- Pontifical Council for Justice and Peace. 2004. *Compendium of the Social Doctrine of the Church*. Vatican City: Libreria Editrice Vaticana. At http://www.vatican.va/roman_curia/pontifical_councils/justpeace/documents/rc_pc_justpeace_doc_20060526_compendio-dott-soc_en.html.
- Reno, R. R. 2015. The Return of Catholic Anti-modernism. *First Things*, June 18.
- Scammel, Rosie. 2015. Cardinal George Pell Takes a Swing at Pope Francis' Environmental Encyclical. *Cross*, July 17.
- Schellnhuber, Hans Joachim. 2015. Common Ground: The Papal Encyclical, Science, and the Protection of Planet Earth. Potsdam Institute for Climate Impact Research. At <https://www.pik-potsdam.de/images/common-ground>.
- Schellnhuber, Hans Joachim, and Maria A. Martin. 2015. Climate-System Tipping Points and Extreme Weather Events. In *Sustainable Humanity, Sustainable Nature, Our Responsibility: Proceedings of the Joint Workshop, 2–4 May 2014*, Extra Series 41, edited by Partha Dasgupta, Veerabhadran Ramanathan, and Marcelo Sánchez Sorondo, 151–70. Vatican City: Pontifical Academy of Sciences.
- Segerfeldt, Fredrik. 2005. Private Water Saves Lives. *Financial Times*, August 25.

- Shannon, Christopher. 2014. Romano Guardini: Father of the New Evangelization. *Crisis*, February 17.
- Simon, Julian. 1981. *The Ultimate Resource*. Princeton, N.J.: Princeton University Press.
- Simon–Ehrlich Wager. n.d. *Wikipedia*. At https://en.wikipedia.org/wiki/Simon-Ehrlich_wager. Accessed August 22, 2016.
- Smith, Adam. [1776] 1976. *An Inquiry into the Nature and Causes of the Wealth of Nations*. 2 vols. Oxford: Oxford University Press.
- Starkey, Thomas. [1538] 1989. *A Dialogue between Pole and Lupsett*. Edited by T. F. Mayer. London: Royal Historical Society.
- Temple, William. [1942] 1976. *Christianity and Social Order*. London: Society for Promoting Christian Knowledge.
- Vanden Heuvel, Katrina. 2015. Pope Francis vs. Wall Street. *Washington Post*, June 23.
- Waterman, A. M. C. 1982. Property Rights in John Locke and in Christian Social Teaching. *Review of Social Economy* 40, no. 2: 97–115.
- . 1991. The Intellectual Context of *Rerum novarum*. *Review of Social Economy* 49, no. 4: 465–82.
- . 1999. Market Social Order and Christian Organicism in *Centesimus annus*. *Journal of Markets and Morality* 2, no. 2 (Fall 1999): 220–33.
- . 2004. *Political Economy and Christian Theology since the Enlightenment: Essays in Intellectual History*. Studies in Modern History. Basingstoke, U.K.: Palgrave Macmillan.
- . 2008. The English School of Political Economy. In *The New Palgrave Dictionary of Economics*, 2nd ed., edited by Steven N. Durlauf and Lawrence E. Blume. London: Palgrave Macmillan. At http://www.dictionarofeconomics.com/article?id=pde2008_P000355. doi:10.1057/9780230226203.0480.
- . 2014. Theology and the Rise of Political Economy in Britain in the Eighteenth and Nineteenth Centuries. In *The Oxford Handbook of Christianity and Economics*, edited by Paul Oslington, 94–112. Oxford: Oxford University Press.
- Wilkinson, Richard, and Kate Pickett. 2009. *The Spirit Level: Why Greater Equality Makes Societies Stronger*. London: Allen Lane.

Acknowledgments: I am deeply grateful for the astute criticism and valuable advice of those who read and commented on an earlier draft: Alice Boyle, Geoffrey Brennan, Father Charles Curran, Peter Drake, Ross Emmett, Samuel Gregg, Michael Hadley, Mary Hirschfeld, Deirdre McCloskey, Paul Oslington, Paul Stimers, and Robert Whaples. They will find this version considerably modified and I hope improved by their generous assistance. Any remaining errors of fact or interpretation are my sole responsibility.