

ENVIRONMENTAL TOXICOLOGY:
THE LEGACY OF *SILENT SPRING*

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Edited by D A Christie and E M Tansey

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INTRODUCTION

As she struggled against ill-health to complete her fourth and final book, Rachel Carson pondered the best course of treatment for her cancer: chemicals or radiation.¹ Described as one of the most important contributions to Western literature and as one of the 'books that changed America',² *Silent Spring* (1962) is also considered the 'effective beginning' of 'toxic discourse'.³ Radiation and chemicals linger in the text of *Silent Spring*. Drawing the reader's attention to these twin toxic hazards, Carson effectively fused the pre-existent pollution concerns of urban and industrial reformers to the ecological sensitivities of resource conservation and wilderness preservation. Her forceful vision helped to establish the modern environmental movement.⁴ Forty years after the publication of *Silent Spring*, the Wellcome Trust Centre's Witness Seminar convened to assess the legacy of this book in relation to environmental toxicology.

As a belief that disease or illness might be determined by physical surroundings, 'environmentalism' had roots in antiquity. But the second half of the seventeenth century witnessed a revival of Hippocratic teaching that connected disease to airs, waters and places. Beginning in the late eighteenth century, a contingent of Edinburgh-trained medical practitioners drew upon this revival to locate medical problems in a wider social context. They linked disease to overcrowding, and to a lack of cleanliness and ventilation. By the 1830s, this activist, 'environmentalist' medicine had become subsumed within Chadwickian social reform (page 49).⁵

By the twentieth century, however, changes in theories of disease causation and in the organization of medicine effected a reassessment of the relationship between physical environment and human health and disease. The twentieth

¹ Lear L. (1997) *Rachel Carson: Witness for nature*. London: Penguin Books, 378–9.

² Lutts R H. (1985) Chemical Fallout: Rachel Carson's *Silent Spring* [Carson R. (1962)], radioactive fallout and the environmental movement. *Environmental Review* 9: 211–25, 211.

³ Buell L. (2001) *Writing for an Endangered World: Literature, culture, and environment in the US and beyond*. Cambridge (USA) and London: The Belknap Press, 35.

⁴ See Walker M J. (1999) The quiet voice of *Silent Spring*. The legacy of Rachel Carson. *The Ecologist* 29: 322–5.

⁵ See Flinn M W. (1965) Introduction to Edwin Chadwick *The Sanitary Condition of the Labouring Population of Great Britain*. Edinburgh: Edinburgh University Press, 1–73; Riley J C. (1987) *The Eighteenth-century Campaign to Avoid Disease*. Basingstoke: Macmillan; Hamlin C. (1998) *Public Health and Social Justice in the Age of Chadwick, 1800–1854*. Cambridge: Cambridge University Press.

century ushered in an 'epidemiological transition' from a pre-industrial demographic regime, dominated by epidemic infectious diseases, to modern patterns of death from chronic degenerative diseases. At the same time, the rise of scientific medicine generated an elevated awareness of disease and illness.⁶ Written under the pseudonym Lewis Herber, Murray Bookchin's *Our Synthetic Environment* placed this epidemiological transition in the post-Second World War context. Published in the same year as *Silent Spring*, Bookchin's book argued that concerns for infectious diseases had been replaced by environmentally related public health problems, such as heart disease and cancer (pages 19 and 25).⁷

As Carson pointed out, the synthetic insecticide industry was 'a child of the Second World War'.⁸ Although the insecticidal properties of DDT were discovered by Paul Müller just prior to the outbreak of hostilities in 1939, the Second World War provided this new chlorinated hydrocarbon insecticide with the perfect stage on which to showcase its properties (page 4). Wartime concerns for agricultural production and for the threat of insect vectors of disease helped to accelerate the dispersal and acceptance of DDT. Faced with a post-war industrial cache of the insecticide, the US government released DDT for civilian use in August 1945, before the completion of definitive tests for chronic toxicity. Within less than a decade, the total USA production of DDT rose from approximately 10 million pounds to over 100 million pounds in 1951. By the time that Carson drew attention to the pervasive presence of this insecticide, US production had peaked at 188 million pounds. And its success spawned the introduction of 25 new pesticides.⁹

The knowledge and application of insecticides were not new: they had an ancient ancestry. Most often meant for small-scale household and garden applications, a variety of organic materials had been employed. The use of animal and vegetable oils and tars stretched back to antiquity. From the late seventeenth century, tobacco, hellebore, quassia, derris, pyrethrum, soap, and lime all became

⁶ Weindling P. (1992) From infectious to chronic diseases: Changing patterns of sickness in the nineteenth and twentieth centuries, in Wear A. (ed.) *Medicine in Society: Historical essays*. Cambridge: Cambridge University Press, 303–16.

⁷ See Gottlieb R. (1993) *Forcing the Spring: The transformation of the American environmental movement*. Washington: Island Press, 87.

⁸ Carson R. (1962; rept. 1987) *Silent Spring*. Boston: Houghton Mifflin, 16.

⁹ See Perkins J. H. (1978) Reshaping technology in wartime: The effect of military goals on entomological research and insect-control practices. *Technology and Culture* 19: 169–86; Lear L. (1997): 119.

recognized pest control substances. But the late nineteenth century witnessed the first mass application of inorganic toxic insecticides (pages 3–4). The ravages of the Colorado beetle, the gypsy moth, and the cotton boll weevil evoked the introduction of the best-known arsenical insecticides – Paris green, lead arsenate and calcium arsenate. Although perfectly aware of the poisonous attributes of these insecticides, medical opinion most often focused on acute toxicity and neglected chronic toxicity.¹⁰ In the wake of the epidemiological transition, Carson reversed this focus. But it was not simply the shift from acute infectious to chronic degenerative diseases that provided *Silent Spring* with fertile ground for its warnings of the ‘pollution of the total environment of mankind’.¹¹

Highly visible fatal pollution events had certainly highlighted the urban industrial threat to public health prior to the publication of *Silent Spring*. Killer smogs in the Meuse valley, Belgium (1930), Donora, Pennsylvania (1948), and London (1952) (pages 38 and 52) demonstrated the lethal cost of the twentieth century’s unprecedented consumption of fossil fuels.¹² But Carson alerted the public to an invisible pollutant that could travel great distances, accumulate in body fats, and cause cancer, birth defects and mutations. *Silent Spring* was a child of the Cold War. Explicitly pairing chemical insecticides with radiation, Carson wrote in the shadow of the apocalyptic mushroom clouds over Hiroshima and Nagasaki.¹³ Moreover, by noting the close relationship between insecticides and chemical warfare, she cast these substances in the nefarious role of weapons of war and mass destruction (pages 4 and 33).¹⁴

Silent Spring opened with ‘a fable for tomorrow’. It described a community bereft of the beauty of wildflowers: in which fruit trees were barren, birds silenced, and ‘everywhere was a shadow of death...No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it

¹⁰ See Whorton J. (1974); Clark J F M. (2001) Bugs in the system: Insects, agricultural science, and professional aspirations in Britain, 1890–1920. *Agricultural History* 75: 83–114.

¹¹ Carson R. (1962; rept. 1987): 39.

¹² See Brimblecombe P. (1987). For an excellent account of the historically unprecedented scale and pace of anthropogenic environmental change in the twentieth century, see McNeill J. (2000) *Something New Under the Sun: An environmental history of the twentieth-century world*. London: Allen Lane.

¹³ This is essentially the point made by Lutts R H. (1985).

¹⁴ Carson R. (1962; rept. 1987): 16. In addition, see Russell E. (2001); Weindling P J. (2000) *Epidemics and Genocide in Eastern Europe, 1890–1945*. Oxford: Oxford University Press, for the relationships between insecticides and chemical and biological warfare.

themselves'.¹⁵ Although genetic and other ecological 'mega-hazards' have been added to nuclear and chemical threats, the fable for tomorrow retains its resonance as a powerful allegory of the 'Risk Society'. Post-industrial society struggles collectively to come to terms with the indeterminate risks to human survival that have been forged on the glowing embers of a faith in progress. Unlike the famines, epidemics and natural catastrophes that haunted pre-industrial society, these new hazards have been generated by human decisions. Paradoxically, much of the collective anxiety stems from an inability to determine with any precision the extent of the threat (pages 11–12, 20, 23).¹⁶ Environmental epidemiology, for instance, can rarely identify exposure to a specific chemical at a particular time as the cause of a single person's disease (pages 47–8, 66–70). Moreover, arguments rage over who should determine the nature of a risk. As the authors of many of the hazards, technocrats may not be the most suitable choices. In an effort to establish a guide for potentially harmful human activities, a group of individuals met at Wingspread in Racine, Wisconsin, in January 1998. They agreed that where large numbers of humans were faced with potentially irreversible harm, it was best to err on the side of caution: they produced a statement on the 'precautionary principle'¹⁷ (pages 16, 20, 24, 72).

Perhaps shaped by the limitations imposed by her gender, Rachel Carson forged a career in science that placed her in an ideal position to offer a timely critique of the technocratic society. From a very early age, she honed her talents as both a naturalist and a writer. While pursuing her undergraduate degree at the Pennsylvania College for Women, she vacillated between English and science before finally opting for a major in the latter. And after graduating from Johns Hopkins University with a Master's degree in zoology, she enjoyed a successful career as a writer and editor for the Bureau of US Fisheries (which later became the US Fish and Wildlife Service). After almost 16 years at this job, and after the publication of three popular books on marine biology, Carson had the scientific knowledge and a vast network of expert friends, colleagues and acquaintances upon which she could draw for the production of her final, and most controversial, book.¹⁸

¹⁵ Carson R. (1962; rept. 1987): 1–3.

¹⁶ Beck U. (1992) From industrial society to the risk society: Questions for survival, social structure and ecological enlightenment. *Theory, Culture & Society* 9: 97–123.

¹⁷ Montague P. (1998). The precautionary principle. *Rachel's Environment & Health Weekly*, no. 586, February 19. See www.psrast.org/precaut.htm (site accessed 13 April 2004).

¹⁸ See Lear L. (1997) for an excellent biographical account.

As a warning of the hazards of industrial pollutants, *Silent Spring* was born of important changes to the countryside. Post-war reconstruction entailed an intensification of agricultural production that accelerated in the years following 1960 (page 6). Farming metamorphosed into 'agribusiness' as holdings increased; specialization and mechanization flourished as the mixed farm went into sharp decline. Cheap nitrogenous fertilizers were applied to enhance soil fertility (page 21) and a 'huge expansion' in the application of synthetic chemicals ensued. Carson, however, remained unconvinced that pesticides underpinned the farm production required to sustain a burgeoning population (pages 6–7).¹⁹ As a British agricultural researcher observed in 1998: 'Pesticides and inorganic fertilizers have got us into a situation where farming looks like a nineteenth century smokestack industry'.²⁰ And in tones reminiscent of Carson, Colin Tudge has recently criticized agricultural science and technology that has become divorced from the principles and traditions of sound husbandry.²¹

As she repeatedly emphasized in the storm that followed in the wake of her book, Carson did not call for a ban on chemical pesticides. She pleaded for a more informed and measured use of these substances. Her sensitivity for, and popularization of, 'the ecological web of life' encompassed a criticism of modern science and technology (pages 4–5). 'This is,' she observed, 'an era of specialists, each of whom sees his own problem and is unaware of or intolerant of the larger frame into which it fits. It is also an era dominated by industry, in which the right to make a dollar at whatever cost is seldom challenged.'²² With this sentiment, Carson became the 'spiritual grandmother...to the whole counter-cultural rejection of technocracy' in the 1960s.²³ For her, this was part of a longer-running campaign to bridge the chasm between what C P Snow had called the 'two cultures' in his Rede lecture of 1959. By wedding her talents as a

¹⁹ See Carson R. (1962; rept. 1987): 9.

²⁰ Simmons I G. (2001) *An Environmental History of Great Britain: From 10 000 years ago to present*. Edinburgh: Edinburgh University Press, 258–70.

²¹ Tudge C. (2003) *So Shall we Reap*. London: Allen Lane.

²² Carson R. (1962; rept. 1997): 13.

²³ See Marwick A. (1998) *The Sixties: Cultural Revolution in Britain, France, Italy, and the United States, c.1958–c.1974*. Oxford: Oxford University Press, 88. For an historical exploration of the relationship between insect control, professional ambitions and ecology, see Palladino P. (1996) *Entomology, Ecology and Agriculture: The making of scientific careers in North America, 1885–1985*. Amsterdam: Harwood Academic Publishers. For the British context, see Sheail J. (1985) *Pesticides and Nature Conservation: The British experience 1950–1975*. Oxford: Clarendon Press.

literary intellectual to her scientific knowledge, Carson aspired to replace an economic with an ecological approach to insecticides (pages 8–9).²⁴

With the increasing emphasis on lifestyle choices and personal responsibility for health, it has become difficult to shift the focus from managing individual health to controlling the influences of the world around us in an ecologically informed manner (pages 21–22).²⁵ Rachel Carson embodied some of these tensions. Undoubtedly embarrassed by the cultural freight of some perceived personal failing, she never used the word ‘cancer’ or ‘malignant’ in relation to the disease from which she suffered in tragically ironic silence. But she referred directly to the threat of cancer from chemical insecticides in two of the chapters of *Silent Spring*, on which she was working at the time.²⁶ Eighteen months after the publication of *Silent Spring*, and 40 years ago this month [April 2004], Rachel Carson died from cancer. By raising our ‘toxic consciousness’, she contributed to a shift in perception of Western society. Whereas once defined by what it produced, Western culture is now defined by the waste and pollution that it generates. The Cold War era that gave birth to *Silent Spring* has been supplanted by ‘the Age of the Environment’.²⁷

John Clark
St Andrews

²⁴ Graham F Jr. (1970) *Since Silent Spring*. Greenwich: Fawcett Publications, 63.

²⁵ See Davis D. (2002) *When Smoke Ran Like Water: Tales of environmental deception and the battle against pollution*. Oxford: Perseus Press, xvi–xix.

²⁶ See Lear L. (1997): 368. In addition, see Sontag S. (1991) *Illness as Metaphor* and *AIDS and Its Metaphors*. London: Penguin Books.

²⁷ Deitering C. (1996) The Postnatural Novel: Toxic consciousness in the fiction of the 1980s, in Glotfelty C, Fromm H. (eds). *The Ecocriticism Reader: Landmarks in literary ecology*. Athens and London: University of Georgia Press, 196–203; Wilson E O. (2000) The Age of the Environment (suggestion for new name for post-Cold War era). *Foreign Policy*, Summer 2000.