Session 4A

The Debate

This House Believes that Rachel Carson would not today have written *Silent Spring*

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Platform Papers:	4A-1 to 4A-5

This house believes that Rachel Carson would not today have written *Silent Spring*. An overview of the issues for debate

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Few science publications have become best sellers. An exception is a book which was written in 1962 by an American marine biologist called Rachel Carson. The book was called *Silent Spring*. It has remained in print since then and the name has passed into popular legend in the same way as have climate change, food miles, one planet living.

The length of time which has passed since she wrote the book has provided an adequate period to assess whether her predictions have come to pass. This allows us to question whether, were she alive today, she would still have felt moved to produce *Silent Spring* in its original form or in a modernised format. This is the focus of our debate.

Silent Spring is most commonly remembered because of its warnings about the potential damaging impact of pesticides, especially DDT and related organochlorine insecticides. DDT may have been the trigger for the book but it was so much more than just an attack on a particular chemical or even on a particular type of approach to farming and on the management of the natural environment at that time. She asked hard questions about wisdom, essentially, just because we could do something, did that mean that we needed to do it or were we able to say 'no' that simply is not wise. We would now relate this to the need to care for our planet and the importance of caring for what we have been gifted by our creator God. Rachel Carson identified the importance of communities of all organisms, everywhere. She identified options in agriculture for using the management of systems and of biological processes as the most sustainable means of farming. She saw this as having advantages for the health of our planet and of humanity. At the core of this is the issue of balance.

In his introduction to the UK edition of the book Lord Shackleton, the Antarctic explorer, said the book made "a persuasive case for human beings to learn to appreciate the fact that they are part of the entire living world inhabiting this planet and that they must understand its conditions of existence and so behave that these conditions are not violated". He also wrote: "The agricultural establishment is so convinced of the great benefit in increased production through the use of these chemicals that when they come to balance the problem in utilitarian terms they find it difficult to see the wider and longer term consequences."

In his preface to the book Sir Julian Huxley said:
"The present campaign for mass chemical control, besides being fostered by the profit motive is another symptom of our exaggerated technological and quantitative approach. The ecological approach on the other hand involves aiming at a dynamic balance, an integrated pattern of adjustment between a number of competing factors or even apparently conflicting interests. Ecology in the service of man cannot be merely quantitative it has to deal with total situations and must think in terms of quality. One conflict is between the present and the future."

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The above comments were written around 50 years ago. Since then the use of pesticides has become the norm and food has been produced in unparalleled quantities. Agriculture continues and pesticides seem not to have precluded biological activity in the soil. The importance of environmental issues is widely owned. Indeed they would today be owned to varying degrees by both those who base their farming around the use of pesticides, and by those to whom such methods are an anathema. In addition the basic arguments employed by Rachel Carson are currently being employed on both sides of the current climate change debate. These issues were not clear cut when *Silent Spring* was written .They remain equally unclear. Ultimately all forms of agriculture seek to be sustainable, at least in the desire to be able to continue food production into the future. All forms of agriculture acknowledge the importance of biological organisms in the soil and their role in promoting plant health. What is at issue is what the most appropriate balance is? What have been the consequences of an approach which Rachel Carson felt was bound to be harmful? To what extent have her predictions been realised?

What this debate may say is that this book has as much to say in 2007 as it did in1962. It continues to be argued by those who doubt the wisdom of current approaches to farming that much of current farming aims at dominating at least some of nature rather than working with it in partnership though natural cycles and processes. It is also alleged that at least some engaged in agriculture behave as if they believe it to be a business like any other so ignoring the scope and breadth of its impact on the natural environment. If global climate change is the greatest market failure then it has been suggested that the ways in which we currently run our farming are significant elements in that failure. Despite this natural cycles continue and much of an increasing world population is fed.

The claims made for DDT and related materials in the 1960s have similarities to the claims made for GM technology in the 1990s and which are currently being made for nanotechnology. The need for business to be profitable is not in dispute but it is now appreciated that there is a need to run financial calculations over suitably long periods and to restrict the externalities. It is increasingly appreciated that there is a need to put into calculations elements which are not capable of being expressed in economic terms. This could argue that there would continue to be a need for *Silent Spring* to be written or it might argue that we continue to work, as we have always done within the capacity of biological processes to regenerate themselves.

Silent Spring in its day did raise important issues. It might be argued that this case was accepted and appropriate actions taken so that what might have been did not occur but potentially damaging technologies were used with out the problems arising. This would of course leave unstated the question of whether there are new issues which would have prompted the writing of a different but equally challenging new *Silent Spring*. The centenary of its author's birth requires us to recognise the continued reality of the issues and to examine whether we are better place to effectively manage our new technologies than Rachel Carson felt was the case over 40 years ago.

This house believes that Rachel Carson would not today have written *Silent Spring*. To propose the motion

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There can be little doubt that Rachel Carson, the biologist and lyrical writer on nature and science touched off a major controversy on the effects of pesticides through her book, *Silent Spring*. Her poetic account of the state of nature and her description of the heinous consequences of the use of pesticides to treat disease in plants or to promote crop yield, made Carson's book one of the most significant of the last century. In part, she spawned an environmental industry, which continues to sustain itself with exaggerated claims, non-scientific assertions and a self-serving agenda. In 1962, Carson probably did not foresee the consequences of *Silent Spring*, but no doubt she would have been pleased, with the attention her book brought to the use and abuse of pesticides in farming and domestic situations. Yet nearly all objective assessments of *Silent Spring* have agreed, it is a synthesis of biological certainty, combined with an Utopian view of nature, sprinkled with anecdotal evidence of the dreadful environmental and human health consequences from the use of pesticides. The essence of this debate is whether Carson would find it necessary, to warn of a global apocalypse from the use of pesticides in the 21st century.

At present the agroscience industry is held in relatively poor regard by much of the general public, and, in particular, by a segment of NGO's who are emotionally committed to preventing the use of pesticides, and the expansion of organic farming. It is ironic that pesticides should be held in such low regard compared to, for example, pharmaceuticals. Pharmaceutical products have improved the health and well-being of those suffering from various diseases, and in particular, the development of antibiotics has saved millions of lives over the last five decades. However, the agroscience industry, has not received its deserved accolade for having made a larger beneficial impact on the global population. The use of herbicides has greatly improved the yield of numerous crops, and insecticides and fungicides have allowed greater production of fruits and vegetables so essential for a healthy diet and for increasing the longevity of the human population. By improving the quality of fruit and vegetables the public are more willing to purchase products with unquestionable health benefits. Since the end of the Second World War, there has been a progressive rise in life expectancy in developed countries. This is largely due to improved nutrition and health, rather than the increased availability of medicare.

It is clear that in the early days of the use of pesticides, and insecticides in particular, excessive quantities of synthetic chemicals were often applied in farms and domestic environments. However, over the last four to five decades, with the development of pesticides that are highly selective to plants, insects or fungi, the quantity of product that is applied has fallen from kgs to grams/acre. Furthermore, environmental and human safety is comprehensively assessed and regulated by numerous authorities before products are marketed. Indeed, Carson never stated that she was opposed to the use of pesticides, only to their abuse and their unnecessary use in the production of food, and the cultivation of garden products. Perhaps Carson would have positively welcomed the advent of the highly active and selective products now available to farmers, which combined with the use of GM traits in crops, allows lower total chemical load and more selectivity and choice in the use of pesticides.

Arguably, the greatest global challenge is the enormous increase in world population. Carson, in *Silent Spring*, commented on the consequence of an ever increasing human population. The demographics for the future indicate that unless there is some cataclysmic event in the next 40 or so years, by 2050 the population of the earth will be in excess of nine billion. In effect this means that between now and then, there needs to be at least a 50-100% increase in calorific output from food and feed to meet demand. The vast majority of experts who address this challenge conclude that it cannot be done by organic farming which is relatively inefficient, and that pesticides will have to be used in order to improve yield. Increasingly in the coming years biofuels will be added to the food and feed challenge facing world agriculture. Although biofuels cannot substitute for oil, it should, in the short to medium term, help to alleviate the pressure on oil supplies. While I doubt that Carson would applaud all the consequences of the massive industrialisation of India and China, as a biologist she would recognise that the growth in the human population cannot be sustained without improvements in the outputs from available arable land. Without significant increases in yield on existing acres the pressure to bring virgin forest and permanent pasture into agricultural production will increase. This will increase greenhouse gases and negatively impact on biodiversity.

It is arguable to what extent climate change will impact agriculture over the next 40-50 years. Global warming appears to be a real phenomenon that may well be a consequence, at least in part, of human activity. Crop patterns will have to adapt to changes in climate through use of modern technology, especially through improved crop varieties that can be adapted to survive in drought stress conditions or on land where salt content in soil is greatly increased. Biotechnology can contribute through GM or smart breeding approaches. If Carson was alive today, her book would not be about the use of pesticides, but the consequences of over-population of the earth and she would no doubt argue that unless this issue is addressed, the long-term consequences for the stable management of societies in the major continents will be at risk.

Finally, I would like to address Rachel Carson's major preoccupation with the harmful effects of DDT. Carson exaggerated the misery that DDT caused to the environment and to human health. It is certainly contentious as to whether the environmental effects of DDT on thinning egg shells was really significant in reducing the population of birds. What is not in contention is the false claim that DDT provokes serious health effects to humans. Indeed the inventor of DDT was awarded the Nobel Prize for Medicine in 1948 and DDT was recognised as a phenomenal advance in the treatment of disease vectors If Carson was a really caring environmentalist, interested in the nature of man and his environment, I doubt if she would have taken any pleasure in the feeding frenzy of environmental and health concerns, which led directly to the withdrawal of the product in most countries of the world based on persistence of DDT metabolites. I do not agree with those who take the view that the three to six million additional deaths globally from malaria is the real legacy of *Silent Spring*, but ask yourself what would have happened if these numbers of innocent men, women and children, had died as the result of the use of a pesticide. Carson would have recognised the irony, that in an attempt to protect the environment and the health of the population from DDT, the banning of this chemical caused immeasurable misery and death from malaria. No-one has been held to account for this tragedy, but if Carson were alive today she would not write *Silent Spring* if only to avoid the unintended consequences arising from its publication.

This house believes that Rachel Carson would not today have written *Silent Spring*. To oppose the motion

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100 years after Rachel Carson's birth she remains one of the most significant inspirations of many in today's environmental movement. All of those involved in the Soil Association over the last 50 years or more feel a close affinity with a scientist who shared our founder's' emphasis on healthy soils as the foundation of the process that produces healthy livestock and crops, and healthy food for people to eat.

Rachel Carson was an inspiration in part because she was right about the damage caused by industrialised, intensive agriculture. Over the last 60 years in the UK, we have lived through declines in farmland birds and native plants that have been uniquely terrible, causing destruction not seen since the last ice age. But it was Rachel Carson's dignified, brave determination in the face of the vicious, ferocious campaign against her, and her scientific supporters, that many found most inspiring. Not for the first time, the pesticides industry proved their own worst enemy. The phrase 'silent spring' entered public consciousness because Rachel Carson was right, and because her enemies were spectacularly wrong.

In the UK, the case that early pesticides were causing terrible damage to wildlife was taken up by two far-sighted scientists and leading conservationists, Dr Ian Prestt, later Director of the Royal Society for the Protection of Birds (RSPB), and Derek Ratcliffe, Chief Scientist of the then Nature Conservancy Council (NCC). They were first ignored, then treated with contempt and vilified by an unholy alliance of industry and government scientists, then proved right. It is true that Rachel Carson's extraordinary personal courage, and the courage and determination of decent scientists like Ian Prestt and Derek Ratcliffe, helped prevent the total disaster she foresaw.

Now that the conservation movement has become a force to be reckoned with, it is hard to remember the huge battle the RSPB and the NCC fought in the 60s and 70s to get the worst pesticides banned. It is even harder to imagine just how vulnerable and powerless those conservationists involved felt in the face of industrial might. Nor is it easy to convey the shock and personal pain that honest scientists felt when subjected to the dishonest political and personal campaigns against them by this alliance of seemingly all-powerful forces of government and corporate science.

Looking back now, it is easy to see that Rachel Carson, and those scientists who accepted what the data showed was actually happening, greatly underestimated the negative consequences of the agricultural revolution that pesticides were simply a part of. We now know that those early conservationists, and non-organic farmers at the time like me, were consistently far too optimistic about our ability to mitigate the continuing, terrible impact pesticides and the related changes in farming were to have over the subsequent 50 years. They and others saw the crude damage caused by the destruction of semi-natural habitats - the loss of wild flower meadows, ancient hedges, native woodland, wetlands and moors.

What they failed to understand was that on top of this the environmental impact of farming was continually changing for the worse under the synergistic impacts of farm specialisation and the loss of mixed farms, far more efficient and powerful machinery, new crop varieties, and the growth of simpler rotations and Winter cropping. These processes continue today.

In addition, no one in the 1960s had any idea of the massive releases of CO_2 that were the result of conversion of permanent and semi-permanent grasslands and erosion caused by over-grazing in the uplands - an unexpected consequence of intensive agriculture. Nor was any thought given to the huge greenhouse gas emissions and the inherent unsustainability of a system that relies on nitrogen fertiliser made from and with fossil fuels. Rachel Carson also failed to foresee the horrors of the intensive livestock systems we now take for granted, the systemic cruelty based on routine medication with powerful drugs, the consequent pollution and the unhealthy food thus produced.

Nor did those early scientists, and many that followed them, have the analytical techniques or accumulated evidence to understand the far more subtle, long-term impacts of pesticides. Rachel Carson understood the horrors of bio-accumulation, but not the new horror of global distillation of persistent chemicals, nor of long-term endocrine disruption, and it is our better understanding of these accumulative, long-term and low dose impacts that have proved her worst fears right. For these and other strong, scientific reasons, the system of risk assessment deployed to allow the use of pesticides is at last coming under sustained scientific criticism. This system has served the pesticides industry well, and the public interest very badly, for the last 60-odd years.

Rachel Carson did not live to see the failure of the new agriculture to eradicate global hunger or eliminate starvation, or to see the rapid growth in diet-related disease this new approach to food production has landed us with. Nor, more sadly, did she live to see the rapid, global growth in the healthy organic alternative, a farming system that nurtures the soil and all else that she cared about, protecting fresh water, benefiting wildlife, caring for farm animals, and providing people with a healthy diet.

This house believes that Rachel Carson would not today have written *Silent Spring*. To second the proposition

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The world has changed substantially since the publication of *Silent Spring* and many of its ideas have entered the mainstream. One of the many changes in the farming community has been the move to better understand other, often recreational, users of the countryside and the multiple demands of customers. This has lead to widespread adoption of crop husbandry practices that simultaneously promote economic production and ecosystem benefits.

Organisations like the Farming and Wildlife Action Group and Linking Environment and Farming (LEAF) now attract many farmers, especially here in Scotland where membership of LEAF counted towards entry into the Rural Stewardship Scheme. My personal experience of the changes engendered by such organisations has come about through engagement with LEAF and the beneficial consequences that I have observed both on farms and at my own institute.

LEAF promotes integrated farm management in which traditional farming methods are combined with modern technologies to deliver a whole farm policy that is both economically viable and environmentally responsible. Through a self-auditing process which demands honesty and time to complete, a critical review of husbandry practices leads to changed management that ought to result in the highest standards of food production with the minimum environmental impact.

In relation to pesticides and chemicals, farmers who are members of LEAF aim for:

- Crop rotations that control weeds and crop diseases in subsequent crops;
- Minimal reliance on crop protection chemicals;
- Efficient soil management and appropriate cultivations to conserve soils;
- Enhancement of wildlife habitats both for their intrinsic/aesthetic values and to assist with pest management.

LEAF farmers, then, use fertilisers and pesticides to keep animals and crops healthy but the chemicals are targeted at specific organisms.

Science has advanced substantially since the publication of Rachel Carson's book and, in addition to advances in synthetic chemistry that target specific organisms, we are now beginning to understand some of the ways in which plants themselves employ chemicals to protect themselves from each other and from pests. Some examples of these aspects of chemical ecology include:

- The release of sorgoleone from sorghum roots as a potent herbicide that is inhibitory to broadleaf and grass weeds;

- Momilactone release from rice roots and husks to suppress aquatic weeds;

- Control of various fungal pathogens through the release of sulphur-containing volatiles such as isothiocyanates from green manures containing brassicas such as kale and mustard.

More emphasis is likely to be given to these plant-produced chemicals as interest in developing non-food crops and valuable, biologically-active molecules grow.

Carson's attack on the widespread use of DDT has spurred the development of active compounds with specific organisms as targets. Chemicals affecting several trophic groups in the food chain have disappeared, and the farming community is growing increasingly adept at managing crops in ways that remove only the specific pest while protecting other wildlife.

This house believes that Rachel Carson would not today have written *Silent Spring*. To second the oposition

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In all of her books, Ms Carson wrote about ecological relationships and attempted to make them clear to an educated non-specialist. When a profile published in *Nature* in July 2007 claims that only now "ecology transforms into a more quantitative science" there must still be a gap between ecological science as it is practiced and the general scientific public's perception. *Silent Spring* brought ecological explanations to bear on problems of agricultural intensification. It found that government-sponsored pesticide application programmes failed to consider ecological relationships that had been demonstrated years earlier. Ms. Carson explained ecological relationships, drawing on substantial research from networks of scientists who often were her colleagues at the US Fish and Wildlife Service. She chose to excel in popular science writing rather than continue her own research career in the 1930s. She made an impact unmatched in the 20th century; it was intellectual as well as political. As Professor Stephen Toulmin said:

"Think of the 1992 Rio Conference. The idea of more heads of government meeting in the same place at the same times than ever before in history--the idea that Rachel Carson did *this*? This is an extraordinary exemplification of what scientific thinking becomes when it finds the salient points at which you can touch political nerves....It's impossible to say those questions are only scientific ones or only humanistic ones, because they are precisely the kinds of questions that arise within this new overlap of the exact sciences and the humanities."

We have to return to Ms Harriet Martineau, the political economist and sociologist who shared Charles Darwin's social circle, to find a popular writer of similar skill and importance. As if Ms Carson were alive today, like Ms Martineau she would have to travel to a developing country (in her predecessor's case the USA) and gather, through inspired and indefatigable network building, new data about the impact of contemporary pesticide overuse in the countries where only 20% of pesticides are used, but over 80% of poisoning cases take place. Ms Carson would again have written *Silent Spring*, albeit with more international data, and it would again have had major political impact.

Pesticides are still the only chemicals that are intentionally designed and applied to be toxic to multiple species in the open landscape. More people handle and apply these toxic chemicals intentionally than any others, more people are harmed by these toxic chemicals than any other chemicals, and the vast majority of people so harmed are poor and live in rural areas in developing countries. There is no doubt a better regulatory architecture for pesticides than 45 years ago, but globally there are far more people harmed by pesticides than 45 years ago. The failure of regulatory implementation, and the continuing presence of highly toxic pesticides in developing countries where the vast majorities of agricultural workers live and work, is a greater human catastrophe than took place in the 1940s to 1960s and formed the evidential basis of *Silent Spring*.

Both FAO's and Novartis Foundation's field surveys of self-reported occupational poisoning at latest spraying in developing countries give over 20% which would mean, conservatively, over 60 million people affected every growing season. As my friend and colleague from the UN International Labour Organization, Peter Hurst, is making brilliantly and painfully clear this year, an outrageously large proportion of those workers are children who are often more vulnerable to hazard and are poisoned at work.

Much of the pesticide applied in food crops in developing countries has been unnecessary, and was driven by the same kind of government subsidy programmes that supported the growth of pesticides in the USA between 1945 and 1960. At national level, between the 1960s and 1980s both Indonesia and India subsidized and increased pesticide consumption between 500% times, with staple grain production increasing by about 40%. Since then staple grain production increased by about 30%, remaining ahead of population growth, while insecticide consumption in food crops dropped by 40%. In developing countries with over 25% of the world's population food production increased while pesticide use decreased. This meant significant national policy reforms, but still needs to be extended to the remaining 50% of the world's population that lives in developing countries that overuse pesticides through poor policies and programmes. We would benefit from Ms Carson's genius, commitment, and skill with ecological explanations to capture the deeper ironies of this crisis. Especially in the tropics, crop pest populations are more often kept in check by the actions of natural enemy populations than by extreme weather, but when these ecological relationships are disrupted by insecticide applications the pest populations exhibit resurgence or secondary release. The insecticides subsidized and recommended for food crop control may often trigger insect population outbreaks. The importance of maintaining intact food webs with sufficient numbers of ecological guilds has been shown for rice, cotton, citrus, legumes, oil palm, coconut, brassicas, maize, and a number of fruits. As climate change shifts mean temperatures upwards in many temperate ecosystems, insect population regulation may in these systems may become more dependent on monitoring and enhancing natural enemy populations under a regime of milder winters.

What would Ms Carson write today about transgenic crops? I think she would be skeptical, as many of us in the UN system are, of claims that transgenic varieties can solve the world's hunger problems. She would have demanded convincing evidence of their performance, and she would undertake the hard work to search literature and query networks to find data. I think she would not accept the claim that simply by spending more money on research, practical answers to major problems would automatically emerge. I think she would have investigated studies on the food safety issues associated with transgenic-containing foods and concluded that there is little evidence of risk. I think she would have welcomed the farm scale evaluations of herbicide-resistant transgenic crops in the UK, and concluded their results were well-founded.

On malaria and DDT, she again would search primary literature, and find ecological and medical specialists among whom she would build networks. She would be impressed with alternatives like integrated vector management being developed in Sri Lanka, and she would have been horrified by the continuing unacceptable death rates. She would carry her skepticism over to challenge the simple claims that DDT house spraying is always the best malaria control strategy. She would demand better ecological studies of mosquitoes and *Plasmodium*. I think we would all learn a lot from her.