

nor Simpson, 78, has received the award). If influence with the Pentagon is a goal, be born in Hungary and emigrate (von Neumann, 51, and Teller, 88). Do not worry about suicide (only two, Boltzmann, 24, and Fischer, 46), or an otherwise violent death (Lavoisier, 8, and Archimedes). Expect a reasonable lifespan. Only Clerk-Maxwell (12) and possibly Euclid (59) died before the age of 50, and the living scientists already have an average age of 74. Ernst Mayr, born in 1904, energetically heads this group.

If this is beginning to sound like a parlour-game, that is no surprise: Simmons's methods do not bear close scrutiny. Nevertheless, he has brought off his assignment with a good deal of aplomb, and his volume conveys both the excitement and the human dimensions of science. It may not satisfy the purists, but it offers portraits of 100 remarkable individuals who have changed the way we think about the world and ourselves. □

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Walking wounded

The Killing Factory: The Top Secret World of Germ and Chemical Warfare

by John Parker

Smith Gryphon: 1996. Pp. 230. £16.99

Alistair Hay

Preparation for chemical and biological warfare is still a very secretive affair. Anyone who attempts to peer behind the veil that governments use to hide their activities in this area will find it firmly drawn. John Park-

er's book is claimed to investigate "the top secret world of germ and chemical warfare". The author does describe much that was previously secret, but it is a history that has been revealed by others over the years.

With all the information now available, there is ample subject matter for Parker's pen. As an experienced journalist he has an eye for a good story, and his text races along, noting most of the important milestones. In addition, Parker includes valuable testimonies from individuals who experienced the effects of chemical agents.

These testimonies provide revealing, but heartbreaking, reminders that the victims are not just the poor bloody infantry, or civilians caught downwind of an exploding bomb, but also those who worked with the chemical agents or volunteered to take part in tests. Over the years thousands of servicemen have voluntarily participated in programmes either to investigate the properties of chemical warfare agents or to develop antidotes.

During the Second World War, British, American and Australian servicemen took part in some of the most testing of these programmes in northern Queensland, to investigate the incapacitating properties of mustard gas. This chemical agent poisons through inhalation or skin contact. Protective clothing and a respirator are required for full protection, but there are no antidotes.

The author notes that in 1943 there was concern that Japanese forces might use mustard gas in the Pacific theatre of war. Tropical heat increases the effectiveness of the gas, and military planners needed to know whether exposure to it would disable soldiers totally or whether some might still be able to fight.

Most of those who volunteered to take part in the experiments wore respirators and

were exposed to the gas in purpose-built chambers. Twenty-four hours after exposure, significant blistering occurred on the skin, and days later the blistered area had become painfully ulcerous. The body areas most severely affected were those that became hot and sweaty — the groin, armpits and wherever clothing was tightly pressed against the skin. On the days following their exposure to the gas, the volunteers were sent on route marches or over obstacle courses until their disability was such that they could barely walk. Some of these walking wounded were still able to man defensive positions, whereas others required hospital treatment.

Ethical approval for the chemical warfare trials carried out in Australia in 1943–45 would not be forthcoming today. Parker says that at the time, and even today, chemical warfare experts, as well as volunteers, felt that the programme provided valuable information. But it is to the shame of the governments concerned that for decades they denied that these trials ever took place. Eventually, and only some six years ago, the Australian government agreed to compensate survivors for related injuries.

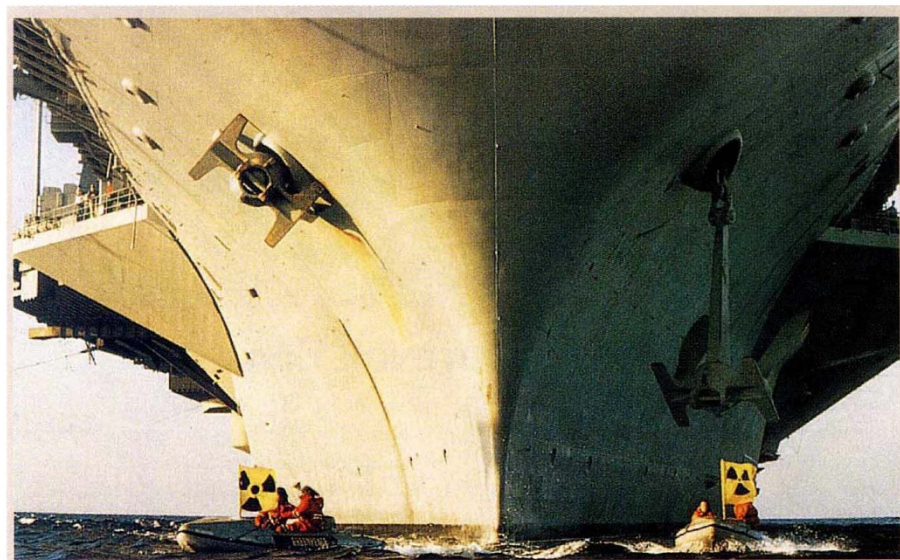
Volunteers who took part in trials in the United Kingdom are less fortunate. The UK government denies that they have any health problems. How it can arrive at this conclusion without conducting any systematic investigation on some of the thousands who volunteered has yet to be explained.

The injustice of this position leaps from the pages of *The Killing Factory* as Parker recounts case after case of volunteers who knew little about the consequences of what they had agreed to undertake. The author is also outraged about the treatment of servicemen and women suffering from what has come to be known as 'Gulf War syndrome'. Many of the troops who fought against Iraq in 1991 have since complained of ill health.

The cause of their ill health is unclear. Some claim that it is due to exposure to low concentrations of the nerve agent Sarin, which was released in the bombing of Iraqi munitions dumps. Others blame either the vaccines they were given against biological agents, or the prophylactic against nerve gas which they took in tablet form three times a day.

Until recently the UK government, unlike the US administration, had refused to provide funding for any epidemiological investigations. Consistently sceptical about the existence of any syndrome, the UK government has just agreed to fund two large-scale investigations. These will assess the extent of ill health in Gulf War veterans, and investigate whether service in the Gulf has had any adverse effect on reproduction, including rates of miscarriages and birth deformities.

Stories about some milestones in the his-



Greenpeace campaigners challenge the military might of the USS Eisenhower in a demonstration against nuclear weapons. From *Greenpeace*

Witness: 25 Years on the Environmental Front Line by Kieran Mulvaney and Mark Warford (Andre Deutsch, £20).