

## **British Pugwash discussion meeting**

University College London, 26 May 2010

### ***Armed robots and military nanotechnology: dangers and concepts for preventive limitation***

Prof. Jürgen Altmann, Faculty of Physics, Technische Universität Dortmund

Professor Altmann reviewed the military uses of robots, particularly uninhabited vehicles (UAVs) and their potential future role in and influence on warfare. The US is the dominant player in this area, with the Predator drone and Reaper already in use. Development plans up to 2034 covering air, surface and underwater vehicles have been mooted but some more ambitious schemes have already been cancelled. Nonetheless the US military will persist in developing this technology and if successful, other states are likely to follow.

Other areas of development are in outer space – for example, kinetic energy anti-satellite weapons – and very small vehicles (less than 40 cms long) carrying arms or explosives for special operations. Other robots are already in use for mine clearance and other tasks.

Autonomous operation of such vehicles is envisaged, with decisions on targeting being made without human intervention. This has numerous ethical implications in complex situations on the ground and also raises questions of responsibility for war crimes that may occur.

Nanotechnology can facilitate not only mini and micro versions of such robots, but also metal-free firearms, very small missiles, selective biochemical weapons and manipulation of soldiers' bodies.

Professor Altmann raised the question of how these technologies, which frequently have dual-use implications, could be controlled in the military arena. He advocated developing a system of preventive limitation, where possible banning systems before implementation:

- 1) Use the preventive elements already found in international treaties and instruments, including the NPT, partial Test Ban Treaty, ABM Treaty and the chemical and biological weapons conventions. In addition aspects of the humanitarian laws of war could be applied.
- 2) Prevent destabilisation and arms races – i.e. horizontal and vertical proliferation.

International agreements based on these principles would require intrusive monitoring which many states, including the US, might resist. However, Professor Altmann pointed out that the world may be faced with a choice between finding a way to make the international system capable of implementing such an agreement, and increased global instability.