Military-Industrial Complexities, University Research, and Neoliberal Economy

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Abstract:

The paper provides an analysis of the militarization of scientific research and the scale and consequences of military and defence related research on university campuses in the United States and United Kingdom. It achieves this through an analysis of the historical background to the complex forms of articulation which have developed between the military, industry and university research. Particular consideration is given to developments in the United States from 1940, including concerns expressed about the impact of an expanding military-industrial complex on the conduct of research in universities. Drawing on critical social and historical research the paper analyses the relationship between universities and colleges and the institution of the military in the United States and the United Kingdom, the symbiotic relationship between neoliberalism and militarism, and in addition, the consequences for the conduct of research in the natural sciences and the social sciences within universities.

Key words: military-industrial complex; Eisenhower; university research funding; neoliberalism; Minerva Initiative and militarization of social science; Research Excellence Framework; RAND.

Introduction: the myth of a peaceful modernity

The institution of the military has a prominent if not pivotal place within contemporary social life. Emboldened by the anticipated progressive effects of Enlightenment liberal thought on the organisation and conduct of human affairs, social analysts such as Henri Saint Simon (1760-1825) and Auguste Comte (1798-1857) expected scientific and technologically driven industrial innovation would substantially reduce, if not resolve, humanity's problems and simultaneously quell the threat of militarism and war (Gane 2006). Contrary to such expectations the underlying reality of modern life has continued to be conflict, or anticipation and preparation for the same, and warfare has been a too-frequent and costly occurrence. The development of industrialism has not led to the expected marginalization of militarism; on the contrary, '[w]hat the main drift of the twentieth century … revealed is that ... the economic and the military have become structurally and deeply interrelated, as the economy has become a seemingly permanent war economy; and military men and policies have increasingly penetrated the corporate economy' (Wright Mills 2000: 215).

The Enlightenment notion of a rational ordering of social and political life represented conflicts and wars as 'relics of an era nearing its end, an era not yet illuminated by the Enlightenment' (Joas and Knöbl 2013: 3). The subsequent historical period has demonstrated that any peace dividend, if such has existed, has been at best intermittent and has been overshadowed by a growing industrialization of war. Scientific and technological research has made possible the manufacture of ever-more complex and powerful modern weaponry with massive destructive potential and has thereby further increased the risk of large-scale warfare and nuclear conflict (Giddens 1991: 74 and 172-3). The assumption that 'modernity is peaceful' and that we have become less violent, as Pinker (2011) argues, is contradicted not only by the persistent presence of wars, violence, and conflicts, but also by the 'cultural importance of war' and the continuing, if not increasing, significance of the institution of the military within modern life (Joas 1999: 459: 468).

The military-industrial complex: history and political economy

How did it come to this? How has it happened that so many social, economic, and cultural resources are devoted to global military provision and deployment? Let us begin with a data snapshot of where things stand in respect of the major players in global military expenditure. In 2013, global military spending was reported to be $1747 billion; in the United States, after a $44 billion drop in its military expenditure following reductions in overseas operations in Afghanistan and Iraq, military spending stood at $640 billion (Perlo-Freeman and Solmirano 2014: 1). Notwithstanding a reduction of 7.8% in military expenditure in the course of 2013, the United States was still spending roughly equivalent to China, Russia, Saudi Arabia, France, the United Kingdom, Germany, Japan, India, and South Korea combined (Perlo-Freeman and Solmirano 2014: 2, Figure 1). Moreover, in 2015 President Barack Obama presented his fiscal 2016 budget proposal to Congress, which included a planned 4.5% increase in US military spending. **(1)**

The data provided on military expenditure in the United States generally relates to the Department of Defense and does not include significant levels of expenditure on a range of other military and defence-related matters that come out of the budgets of other departments – for example, nuclear weapons production, maintenance and research (Department of Energy), security and protection (Department of Homeland Security), counter-terrorism (Federal Bureau of Investigation), and reconnaissance satellites and intelligence gathering, as well as research to improve performance of military airplanes (National Aeronautics and Space Administration). Accurate estimates of the actual levels of US military spending are hard to achieve, but a complex budget-based approach employed by Cypher (2007) calculated that in 2006 military-related expenditure was already in the region of $929.8 billion and a comparable calculation for 2007 indicated an even higher figure of $1002.5 billion (Foster et al 2008). According to governmental accounts the size of US military expenditure is the second highest budgetary item after Social Security but, as Hossein-zadeh (2009) argues, insofar as Social Security is a 'self-financing trust fund', then the largest source of US government expenditure is on military and defence.

From 1940, and the onset of a dramatic increase in US military expenditure required to create the military capacity necessary to prepare the country for participation in the Second World War, substantial military spending has been a significant feature of the US economy. It is in this period that the US military budget began to increase significantly and business began to engage in military production on a growing scale, causing concern to be expressed at the time about 'the rising power of big business and the armed forces' (Parker 2005: 163). The configuration of powerful military and industrial interests growing in strength in the United States from the 1940s provoked serious concerns about the influence that might be exerted over the post-war policies of democratic governments, concerns which were articulated by academic analysts and, most tellingly, by a President of the United States as he was about to leave office (Galbraith 2005; Mills 1967 [1958]; Eisenhower 1961).

Military-industrial complexities

Deployment of the term 'military-industrial complex', to describe the configuration of interests that brought business corporations and the military into an increasingly close relationship, gained traction following the public farewell address delivered by Dwight Eisenhower, the 34th President of the United States, on January 17th 1961. In a wide-ranging speech, Eisenhower made reference to the United States' 'unmatched material ... riches and military strength', to the country's 'free government' and to the importance of protecting and fostering liberty (1961: 1036). Yet, the speech is perhaps best remembered for its identification of potential threats and one in particular that Eisenhower believed arose from the growing influence exerted by the military institution and a growing armaments industry.

Eisenhower (1961: 1038) noted how rapidly the US military had grown and that global conflicts had compelled the nation 'to create a permanent armaments industry of vast

proportions' and, in addition, to create a large defence establishment. Recognizing that the scale of the expenditure on military security exceeded the net income of all US corporations at the time, Eisenhower (1961: 1038) commented that the conjunction of interest and influence of 'an immense military establishment and a large arms industry' was a new and necessary development, yet there were significant and troubling implications for society. Eisenhower cautioned:

> In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist (1961: 1038).

Eisenhower had in mind the potential threat to liberty and to the representative democratic political system, implying that oversight and regulation of 'the huge industrial and military machinery of defense' would be necessary (1961: 1038).

Taking stock of the period from the onset of the Second World War, and in particular the changes in military and industrial technologies and associated developments deriving from complex and costly scientific research, Eisenhower observed that a 'steadily increasing share is conducted for, by, or at the direction of, the Federal government' (1961: 1038). A substantial share of the Federal government funding of scientific and technological research went to university institutions. The implications for universities were considerable, as Eisenhower recognized:

> [T]he free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of new electronic computers (1961: 1038).

The risk, as Eisenhower (1961: 1039) saw it, was that the scale of Federal funding and the heavy emphasis placed on associated governmental project priorities would exercise an inappropriate, if not dominating, influence and be detrimental to 'the nation's scholars', shaping their research interests, what they chose to research and how they proceeded to do so. With the benefit of hindsight, Eisenhower's concerns seem more than justified. In the subsequent six decades, Federal government expenditure on military matters has grown significantly, along with the influence of industrial corporations involved in the production of armaments, equipment, resources, and a range of services for military use and military personnel. During this period the United States has 'spent more on its military-industrial complex than all of the other countries in the world combined have spent on defence' (Naughton 2014). An additional significant feature of the period has been a relative shift of emphasis from kinetic weaponry to '"smart" miniaturised weaponry ... and information warfare' and the growing significance of the latter, exemplified by increasing US National Security Agency (NSA) and UK Government Communications Headquarters (GCHQ) global data capture, has led reference to be made to 'the evolution of a military-information complex' (Naughton 2014). In turn, there has been a significant increase in the levels of Federal funding provided to universities for directly and indirectly military-related forms of scientific and technological research, including in the social sciences (Long 1986; Ghoshroy 2011; Price 2011; Department of Defense 2014a: 2014b).

While the notion of a 'military-industrial complex' is associated with Eisenhower, the term had already been employed in the immediate aftermath of the Second World War by Winfield Riefler (1947); the configuration of interests signified by the term had been identified in critical analyses of elites in the United States in the work of sociologist C Wright Mills in the late 1950s (2000 [1956]; 1967 [1958]). **(2)** Moreover, embryonic signs of the essential dynamics of a military-industrial complex have been traced further back to the decades before the First World War, when struggles for geopolitical hegemony led to closer relationships beginning to be forged between governments and armaments industry in research and development designed to deliver advanced weapon technologies (Cooling 1979; Epstein 2014). In studies of increasing collaboration between government, armaments industry, and the military in the late nineteenth century, Cooling (1979: 108-9) identifies 'the blueprint for ... [and] first tentacles of a modern military-industrial complex', and Epstein (2014: 2) argues that 'a new paradigm for procuring weapons brought the military-industrial complex into existence'. The increasing complexity and expense involved in developing industrial naval technology, specifically 'armor and armament of the new steel navy' in Cooling's (1979: 9) study and torpedoes in Epstein's study, meant that established materials and methods of shipbuilding, and traditional methods of weapons construction, had to change. In consequence collaboration on research and development between governments and private industry became necessary.

Epstein (2014: 2) reports that such collaboration made subsequent ownership of intellectual property rights difficult to determine and led to legal disputes with private industry in both the United States and Great Britain:

> In the name of national security the American and British governments pursued their intellectual property rights claims ... Exploring them provides a valuable new perspective on the creeping militarization of peace in two liberal democracies.

It was the sophisticated and, at the turn of the century, cutting-edge weapon technology of the torpedo that transformed the relationship between government, military, and the armaments industry. Governments sought to introduce national security measures to protect and control developments in weapon technology and weapon systems in respect of which they had collaborated and provided funds, in order to prevent private corporations selling such weapons on the open global armaments market. Torpedoes were complexly engineered weapon systems and they contributed significantly to 'the origins of the military-industrial complex' (Epstein 2014: 3). Although significantly smaller in scale, key elements of the military-industrial complex had been assembling from the end of the nineteenth century, notably,

> replacement of the market by command, public-sector investment in private-sector technological development, the role of technocratic elites in the policy process, the beginnings of big science, and government outreach to academia (Epstein 2014: 229).

In the twentieth century, the elements identified above grew in scale and scope. The need for industrial mobilization to ensure adequate provision for the armed services in the course of the First World War led to the formation of the Council for National Defense and its National Defense Advisory Commission. This development has been identified as particularly

influential in laying 'the foundation for that closely knit structure, industrial, civil and military', which subsequently became more extensive, complex, and influential within the United States (Koistinen 1967: 379 and 385; see also Wright Mills 2000 [1956]; 1967 [1958]).

Power elite and Pentagon system

In a critical analysis conducted in the late 1950s in the United States, Wright Mills (2000: 5) noted the inter-connectedness between the major institutional hierarchies – the political-military-economic establishments – their access to powerful technologies and the significant consequences of their activities:

> The decisions of a handful of corporations bear upon military and political as well as economic developments around the world. The decisions of the military establishment rest upon and grievously affect political life as well as the very level of economic activity. The decisions made within the political domain determine economic activities and military programs. There is no longer, on the one hand, an economy, and on the other hand, a political order containing a military establishment unimportant to politics and money-making. *There is a political economy linked, in a thousand ways, with military institutions and decisions* (2000: 7-8, emphasis added).

The economic relevance of the military establishment was evident in peacetime early in the twentieth century with the engagement of the Corps of Engineers in the construction and maintenance of harbours and the control of rivers. Yet, while the military exerted a social and economic influence early in the century, it was only for a relatively brief period, primarily during the First World War, and it was not till the Second World War that a close and continuous interconnection was established between military and industrial corporations (Wright Mills 2000: 7-8; see also Koistinen 1967).

On retirement from the services, following the Second World War, significant numbers of military personnel moved to become members of corporate boards and a range of lucrative contracts were made by the military with industrial corporations. Taking stock of the respects in which military demands influenced the corporate economy, Wright Mills concludes that '[b]ack of this shift at the top, and behind the increased military budget on which it rests, there lies the great structural shift of modern Anglo-American capitalism toward a permanent war economy' (2000: 215). Military expenditure, in contrast to social expenditure, has constituted capital's preferential form of state expenditure. This has been particularly evident in the United States where 'military Keynesianism' rather than social spending has been the default economic policy of successive US governments as they have sought to regulate the business cycle by expanding 'military allocations to ensure an adequate level of aggregate demand for commodities' (Custers 2010: 80). In short, as well as meeting the requirements for military preparedness, dedicating substantial state expenditure to the military institution, or 'deficit-financing of its militarism', has represented a politically popular means of combating economic stagnation, of stimulating aggregate demand in the economy, in a manner that compliments and supports, rather than competes with, private capital (Harvey 2005: 152; Custers 2010; Galbraith 1969a; Baran and Sweezy 1970; Mandel 1978).

Intervention by the state to maintain the economy is a longstanding feature of modern capitalism, whether monopoly, late, or neoliberal in form. Chomsky (1993) credits

‘international military Keynesianism’ with having reconstructed ‘state capitalist industrial societies’ and as having provided ‘the basis for the huge expansion of Transnational Corporations’. Yet, while acknowledging the significance of state military expenditure, or the ‘Pentagon system’, especially for the way in which it has served as a vehicle for publicly underwriting the research and development costs of innovations in materials, products, and technologies, of which private corporations are the subsequent beneficiaries, Chomsky (2004) contests the value of a specific conception of a military-industrial complex, arguing that ‘government money’ or ‘the state sector’ is perpetually at the core of the economy.

Chomsky (2004) emphasises the continuing significant and wide-ranging role played by the modern state in the economy. Notwithstanding the neoliberal contraction of the state from the 1970s, including reductions in social and welfare provision, dedicated military expenditure by the state has remained substantial (Chomsky 2004; Harvey 2005). In the course of making a series of references to the many respects in which government expenditure has been deployed to fund research and underwrite development costs, in many instances to the benefit of private corporate interests or ‘private pockets’, Chomsky (2004) notes how leading academic institutions, including Massachusetts Institute of Technology (MIT) and Harvard, have received substantial research funds from various government departments. For example, the Department of Defense, through the Advanced Research Projects Agency (ARPA) established in 1958, funded research on computer communications networks in research laboratories and universities, including the University of California, Berkeley, and MIT, from which in due course the Internet and a constellation of global information technology corporations developed. **(3)**

The military, research, and the institution of the university

The experience of working on the US Strategic Bombing Survey in the mid-1940s led J K Galbraith to become concerned about the influence the military-industrial complex might exert in peacetime over democratic governments. Galbraith (1969b) was concerned about the overlapping interests and synergies between the military bureaucracy and industrial corporate military contractors He was particularly alarmed about the respects in which scientific research was being ‘reshaped to serve institutional and doctrinal goals’ (Parker 2005: 190). Following the Second World War the military had become the principal supporter and director of scientific research in the United States. As Wright Mills (2000 [1956]: 216) observed, ‘the general direction of pure scientific research has been set by military considerations, its major finances are from military funds, and very few of those engaged in basic scientific research are not working under military direction’.

A relationship between US universities and colleges and the institution of the military has been traced back to the 1862 Morrill Land-College Act, which provided resources to allow states to establish institutions promoting ‘agriculture and the mechanical arts’, with the proviso that military training and instruction was part of the curriculum (Abrams 1989: 16). However it was only with the approach of the conflict that began in Europe in 1939 that the

US military began to fund substantial scientific and technological research projects in major universities and colleges (DeLauer 1989). The largest government contracts for military research and development of more than $10 million went to each of the following six institutions: 'the Massachusetts Institute of Technology, the California Institute of Technology, Harvard University, Columbia University, the University of California at Berkeley and Johns Hopkins University' (Turse 2004). In the years following the war, many of the formative institutional networks and collaborative relationships between the military, universities, and the armaments industry were consolidated. By August 1946, when the Office of Naval Research received formal legislative authorisation to commence work, it had already successfully 'entered into contracts for 602 academic projects employing over 4000 scientists and graduate students' (Turse 2004). The fact that, following the Serviceman's Readjustment Act passed in 1944 (the GI Bill), many returning war veterans became students and went on to study science, engineering and other technical subjects, and that many faculty members also had 'direct knowledge and experience of military organizations', goes some way towards explaining the readiness with which the academic community embraced military-university cooperation in respect of research and development in the immediate post-war period through to the Vietnam conflict (DeLauer 1989: 132; Docherty 2015: 3).

In the post-war period the United States became a mobilized polity, within which scientific research and development became increasingly closely articulated with military and defence priorities and associated requirements (Bell 1973). Examples include 'two major research laboratories ... operated under contract by the University of California for the Atomic Energy Commission' (now the Department of Energy) both of which, in addition to supporting the development of nuclear weapons, have been involved in research on a range of other major military projects (DeLauer 1989: 132). Two additional research laboratories at Cal Tech and MIT respectively also became part of the military-university infrastructure. In 1947 the RAND Corporation, the first of the Federally Funded Research and Development Centers (FFRDCs), was established and although not formally connected with particular universities these centres developed 'advisory or steering-committee relationships' with a number of universities (DeLauer 1989: 132; Hruby et al 2011). Furthermore, university staff had close relationships with the Department of Defense (DoD) as members of scientific and technical advisory bodies and a significant number of university campus-based DoD funded research projects and programmes were set up, initiated from the late 1950s, by the Advanced Research Projects Agency (ARPA), which from 1972 became the Defense Advanced Research Projects Agency (DARPA). **(4)**

As a consequence of these developments and other related initiatives, the US government was spending twenty times as much on research and development by 1954 as it had before the Second World War, and the majority of it was on military and national security, leading 'pure' science research in some of the bigger universities to be increasingly dependent upon military funding. The increasing 'militarization of science' meant that some US universities virtually had become 'financial branches of the military establishment', receiving three or four times as much money from military as from all other sources combined (Wright Mills 2000: 217-218; see also Harvey 2005: 83).

The close relationship between the military and universities led to tensions, particularly around the need to preserve academic freedom from the intrusion of the state. There were also associated concerns about DoD rejection of peer review of funded military research initiatives and adoption of 'merit review, which, to curry favour with a broader congressional constituency, included such criteria as a balanced geographic and institutional distribution of awards' (Abrams 1989: 28). While opposition had been expressed to 'university sponsorship of classified or secret research', led by the President of Harvard University, other institutions, including MIT, took a different view and permitted classified research and classified doctorates to continue, appealing to rising national security concerns following the onset of the Cold War (Abrams 1989: 21). Military funding provided vital support for MIT and enabled it to maintain its national reputation at the forefront of research in engineering and science, and it remains the university 'whose research agenda is most closely aligned to the needs of the military' (Kirp 2003: 177). The overriding view in the 1950s and 1960s was that the level of federal funding for military contract research in universities 'played a major role in the explosion of knowledge in the United States and in the rise to pre-eminence of [Anglo-]American scientific disciplines in the world community' (Trow 1975: 113).

In the course of the Vietnam War, student protests and heated faculty discussions on professional ethics began to take place on university campuses in the United States over military funding of university research or 'war research' (Wilson 1989: 47). Universities with federal funding for military-related research were heavily criticized for being 'complicit' in the Vietnam War; and students, especially Students for a Democratic Society, targeted the 'military-industrial-intellectual complex' and expressed the view that universities should not be entangled with the DoD and the security state. University scientific research related to the military was criticised for its vulnerability to corruption because of the demand for secrecy, the prioritisation of applied work and product development over pure research, and, most of all, 'the subordination of academic work to military need rather than scientific purpose' (Wilson 1989: 48). The opposition of faculty and students to the Vietnam War and the close links between universities and the DoD caused some institutions to sever their connections with FFRDCs' (Abrams 1989: 27).

Following the end of the Vietnam War a combination of factors led to the military-industrial funding regime for academic research being called into question. Increasing global economic competitiveness, deteriorating US productivity in comparison to Europe and Japan, and signs of a developing information economy led 'US industrial leaders, long accustomed to R&D filtered through the military ... to have second thoughts' about past research funding practices centred on 'the military-industrial-academic model' (Slaughter and Rhoades 2010: 48) and to advocate research and development orientated more directly to civilian standards and entrepreneurial interests. In the period from 1975-1985 defence industries were restructured, 'defense prime contractors declined from fifteen to five', and Congress began to actively nurture civilian technology research and development and promote 'university-industry-government partnerships' (Slaughter and Rhoades 2010: 48). But developments from the 1980s, in particular what has been described as 'the largest military build-up in the post-World War II era' (Slaughter and Rhoades 2010: 47), have meant the militarization of US

universities has remained a highly contentious matter and it continues to be regarded as a threat to academic freedom and integrity (O'Dowd 2014: McCoy 2014; Bond-Graham 2013; Giroux 2007; Turse 2004; Hell and Bond-Graham 2003). **(5)**

Arming the academy, harming the institution of the university

In the 1980s Republican President Ronald Reagan (1981-1989) presided over a significant increase in military expenditure. Regan initiated a 'deficit-funded arms race ("military-Keynesianism")' (Harvey 2005: 88). Developments in technology seemed to promise innovative and powerful new weapon systems and the US DoD increased its funding of university research, including on work in areas specifically relevant to the Strategic Defense Initiative (SDI) set up by President Reagan in 1984 to pursue a technologically driven defensive strategy to combat attack by nuclear missiles (Kistiakowsky 1989; Wilson 1989). While the Association of American Universities (AAU) and university presidents welcomed increased research funding by the DoD, Reagan's 'Star Wars' initiative was greeted with a good deal of scepticism and criticism from researchers who disputed the technical feasibility of the anti-ballistic missile system and questioned its strategic effects, costs, and geo-political consequences (Kistiakowsky 1989: 144; Wilson 1989: 46; Long 1986: 48). There was also increasing concern about the priority accorded to military-related R&D to the detriment of other research programs and the lack of resources directed to the pursuit of alternatives to the militarization of security, for example 'arms control and international negotiation' (Long 1986: 48).

The rapid increases in defence spending, particularly on research and development following SDI, meant a substantial additional source of research funds was available for university scientists. Yet, there were serious concerns on university campuses arising from the way in which those administering the programme had approached universities. The accusation was made that it 'smacks of a mixture of bribery and coercion'; in addition, there were fears that some well-regarded scientists preoccupied with a careerist pursuit of research funding had sacrificed academic integrity and 'knowingly exaggerated the feasibility' of SDI, leading critical academics to boycott SDI funded research projects (Kaysen 1989: 38; Abrams 1989: 28; Wilson 1989: 46).

The imposition of neoliberal policies on higher education in the United States has led to reduced levels of funding and rising student debt, the imposition of market mechanisms on universities, the erosion or undermining of faculty self-governance, and 'the intrusion of the national security state' (Giroux 2014: 138). Comparable consequences are an increasing feature of higher education in the United Kingdom, where neoliberal policies have led to students paying fees, taking out loans, and incurring debt as they study; the introduction of bureaucratic auditing of research, teaching, and staff; governmental demands that university institutions provide training and skills, to enhance the employability prospects of students; and, in addition, that universities operate as part of the nation state's security surveillance

apparatus by keeping check of the whereabouts of foreign students for the UK Border Agency (Grayson 2012).

The essential critical public contribution of higher education to a thriving democratic culture and polity in the United States and the United Kingdom is being undermined in multiple respects by anti-democratic financial and political forces and pressures deriving from militarism and neoliberalism (Giroux 2007: 2008). Reductions in public funding and provision for higher education in the course of the neoliberal retrenchment of the public sector, which has included selling off state assets, outsourcing public services, and the promotion of privatization, has shifted a significant share of the costs of university education on to students, now designated as consumers in the marketplace for commodified knowledge products, training, and skills in pursuit of employability status in an increasingly digitalized, informational, machine-centric capitalism, which is displacing human expertise and employment with intelligent machines (Brynjolfsson and McAfee 2014; Frey and Osborne 2013). **(6)**

Higher education has been recast as the institutional nexus for (i) producing highly qualified labour power ready for inclusion in corporate enterprises integral to a digitalized, informational, neoliberal capitalist economy and (ii) generating 'marketable' research to meet the requirements and satisfy the vested interests of funding agencies, end-users, and corporations preoccupied with 'impact' within the unquestioned parameters and established practices of the prevailing systemic organization of social and economic life. With higher education no longer publicly funded through taxation to the extent that it once was, a significant proportion of the costs are now 'privatized', off loaded on to students who on completion of their studies shoulder an unsustainable burden of debt. In the neoliberal ordering of higher education in the United States, college and university student debt in 2013 was approaching on average $28,400 on graduation and in the United Kingdom it was estimated that 'the average loan issued per student over the life of their course is £40,286' (The Institute for College Access and Success 2014: 1; Crawford et al 2014: 23: 51).

But while a reduction in the public sector is a fundamental feature of neoliberalism, the state continues to resource and defend 'the institutions of business ownership and [sustain if not enhance] the ability to project military power' (Cypher 2007). There is a symbiotic relationship between neoliberalism and militarism in the United States, both embody particular worldviews, draw on educational institutions and practices, and disseminate discursive formations to legitimate the governmental techniques, modes of subjectivity, and (sub)versions of citizenship and rationality they contrive to establish as hegemonic (Giroux 2008: 58). Forms of neoliberal subjectivity, the constitution of individuals as 'subjects of "human capital"' (Read 2009: 25), have long been constituted within the system of higher education in the United States and the military has had a growing presence and rising profile on university campuses from at least the mid-nineteenth century, but it is only with the increasing securitization of the state following the events of 9/11 that 'the university has ... become an intense site of militarization' (Giroux 2008: 58).

The military has an established presence in US higher education and on university campuses in the United States and around the world (Turse 2004). There are approaching 150 specifically military designated educational institutions in the United States, including the following:

> the National Defense University system (NDU): the National War College, the Industrial College of the Armed Forces, the School for National Security Executive Education, the Joint Forces Staff College, and the Information Resources Management College ... the Defense Acquisition University, the Joint Military Intelligence College **...** the Defense Language Institute Foreign Language Center, the Naval Postgraduate School, the Naval War College, Air University, the Air Force Institute of Technology, the Marine Corps University and the Uniformed Services University of the Health Sciences (Turse 2004).

Then there are the numerous public and private higher education institutions in receipt of DoD research funding, offering courses suitable for military personnel and tailoring programmes of study designed for students seeking employment in the various 'departments and agencies associated with the warfare state' (Giroux 207: 19). The latter, the civilian higher education institutions, which have become increasingly militarized, far outweigh the DoD institutions and service academies in 'size, scope and cost' (Turse 2004). In their report on DoD research the AAU state that such forms of investment in basic research in universities have produced a range of innovations including lasers, infrared technologies, and various composite materials. The AAU notes how dependent the DoD is on universities and colleges to conduct research, with more than 350 institutions involved in some capacity, and how significant DoD funding is in some fields. For example,

> DoD is the leading federal sponsor of university engineering research. DoD provides: 90% of all federal obligations for mechanical engineering; 64% for electrical engineering; 71% for aeronautical engineering; 46% for astronautical engineering; and 38% for metallurgy and material engineering (Association of American Universities 2013).

Given the scale of military funding in higher education, which in addition to engineering is significant in a number of other fields, including computer sciences, oceanography, and following the Minerva Initiative, the social sciences, it follows that the DoD can 'bend universities ever more easily to its will' and exert influence to determine 'the sorts of research that get undertaken and the sorts that don't' (Turse 2004).

The Minerva Initiative was launched in 2008 to fund social science research on a range of key strategic themes and issues and in 2014 the range of projects being funded included research on 'civil conflict under different climate change scenarios', 'the origin, characteristics and implications of mass movements', 'assessment of social disequilibrium and security threats', 'energy and environmental drivers of stress and conflict', and 'assessment of state stability' (Department of Defense 2014b). **(7)** The projects funded, which bring together 'universities, research institutions and individual scholars', are on 'specific topic areas *determined by the Secretary of Defense'* (Department of Defense 2015, emphasis added). The programme of research is designed to provide officials and policy-makers with understanding of the complex and varied forces which might bear on local/internal and global US strategic interests. In 2014 a *Guardian* reporter investigating the latest round of funding associated with the Initiative sought clarification from the US DoD as to why they were commissioning projects on political protest movements and social activism around the world,

specifically what was the connection between radical causes promoted by NGOs and US national security. The response from Minerva's Programme Director was as follows:

> Department of Defense takes seriously its role in the security of the United States, its citizens, and US allies and partners. While every security challenge does not cause conflict, and every conflict does not involve the US military, Minerva helps fund basic social science research that helps increase the Department of Defense's understanding of what causes instability and insecurity around the world. By better understanding these conflicts and their causes beforehand, the Department of Defense can better prepare for the dynamic future security environment (cited in Ahmed 2014).

One project led by Cornell University, but supervised by the US Air Office of Scientific Research, had as its focus 'the dynamics of social movement mobilization and contagions' and sought to derive an understanding of the 'critical mass (tipping point) of social contagions' through analysis of 'digital traces', including Twitter posts and conversations, on the revolutionary events in Egypt (2011), the fuel subsidy crisis in Nigeria (2012), and 'the 2013 Gazi park protests in Turkey' (Ahmed 2014).

Ahmed (2014) describes how social science is being 'militarized to develop "operational tools" to target peaceful activists and protest movements'. In a comparable manner, Price (2011) offers a critical analysis of the militarisation and securitisation of anthropology in the United States, in particular the influence the CIA has within university campuses and the ways in which anthropology has been appropriated for counterinsurgency purposes and deployed in current wars and conflicts in Afghanistan and Iraq**. (8)** In short, Price (2011: 5) provides further evidence of the ways in which the political economy of US higher education is increasingly articulated with 'the dominant militarized economy that supports American society'. The increasing intrusion of military and intelligence agencies into US university campuses leads Price (2011: 53: 55) to argue that academic values and practices and the integrity of academic disciplines are under threat as 'academics have become compliant appendages of the state'.

The forms of articulation between US military agencies and US universities are now complex and varied. The DoD not only offers significant research funding to US universities and colleges but, in turn, through agencies such as the National Security Agency, establishes specialized schools and centres on other campuses which are then able to compete for funding. In 2003-2004 in the region of '36 civilian schools and 4 military learning centers' were designated Centers of Academic Excellence in Information Assurance Education, including 'Stanford University ... the University of California at Davis and the University of Nebraska at Omaha, and lesser-known institutions like New Mexico Tech, West Virginia's James Madison University and Vermont's Norwich University' (Turse 2004).

UK universities, military funding, and collaboration

It is not only US universities that have received US military research funding. University institutions in Australia, Germany, the United Kingdom, and several other countries have also been awarded funding by the US DoD (Department of Defense 2014a; Naumann 2013; Schwager and Rahn 2014). Towards the end of 2006, it was estimated that the DoD had

military-related research contracts with 946 universities and colleges in the United States and with 161 universities in 33 other countries around the world (Bogart 2007). In the United Kingdom in the period from 1979-2015, while neoliberal economic policies of successive administrations led to relative reductions in direct government funding of higher education, funding for research from military sources and weapons establishments increased (Beale et al 2007; Parkinson 2012; Smith 2012; Langley 2013).

Reflecting on the transformations in the United States following 9/11, Giroux (2008: 60) comments that 'militarization ... has become naturalized, serving as a powerful pedagogical force that shapes our lives, memories and daily experiences, while erasing everything critical and emancipatory about history, justice, solidarity and the meaning of democracy'. Something comparable has occurred in the United Kingdom as military matters have been 'repositioned at the centre of national life' and military-related research funding from government and the armaments industry has become more prominent within higher education institutions (Ware 2012; Langley et al 2007; Langley 2005).

In the period 2001-2006, a study of 26 UK universities found that there were 1,900 military research projects with an estimated total value of £725 million and, furthermore, 'that the military has, in particular, built up strong levels of influence over science, engineering and technology departments' (Beale et al 2007: 4-5). In circumstances under which universities have been exposed to relative reductions in funding, directly or indirectly publicly financed military research has proven to be appealing to both institutions and academic researchers, especially where, within institutions, managerially induced pressure to pursue external sources of research funding has made '"research-grant capture" … often more important than the actual research being done' (Docherty 2015: 24). The current conditions in higher education, particularly in relation to research, make the prospect of research funding from the institution of the military and/or the defence industry very appealing, but not without significant consequences for institutions and academic research staff involved. As one professor of engineering critically commented on the impact of the research audits (RAE 1986-2008; REF 2014-date) to which universities and research staff have been subjected in the course of cycles of rationing of scarce research resources:

> *The UK university RAE is all powerful and encourages all academics to go for any funding no matter where it comes from (the 'feeding frenzy').* If you turn down research funding, then you are automatically weakening your department's prospective RAE performance and letting down your colleagues. *The RAE definitely undermines research ethics in this respect* (cited in Beale et al 2007:8, emphasis added).

The Ministry of Defence and corporations such as BAE Systems have a variety of military-related research contracts available for compliant universities to pursue, in competition with other institutions in the sector, frequently in conjunction with appropriate research councils in engineering and the physical sciences. Military research funded projects 'often confer prestige on the researcher and the institution as a whole' and provide the means for universities and academic researchers to strive to maintain, if not enhance, their position in the proliferating rankings of research intensive universities, but, in turn 'the logic of productivity and competition' and perpetual pressure to monetize research and think and act

entrepreneurially to increase the prospect of securing new research grant revenue streams, has significantly detrimental consequences for research ethics (Beale et al 2007: 38-9; Inglis 2014).

In the period 2008-2011, leading universities in the United Kingdom received £23.6 million '[d]irect UK government military funding' and £62.8 million, ostensibly from private corporations (e.g. Rolls Royce £36.8 million; BAE Systems £10.6 million; QinetiQ £3.25 million), but most of the corporate funding was at source 'ultimately government funding, through research and development (R&D) contracts from the Ministry of Defence and other government agencies' (Smith 2012). The universities receiving the highest military-related research funds were Imperial College (£15.2 million), Sheffield (£13.8 million), (Cambridge £13.8 million), Oxford (£9+million), Bristol (£6.5 million), Nottingham (just under £6 million), Kings College (£5.3 million), York (£3.9 million), Southampton (£3.8 million) and Newcastle (£2 million) (Smith 2012).

A significant additional source of military-related university research funding has been from the Atomic Weapons Establishment (AWE), specifically 'through its Technical Outreach programme of scientific research and collaboration', which has increasingly close connections with scientific, engineering, and technology researchers in UK universities (Langley 2013: 5). AWE is owned by AWE plc, which is a consortium of Jacobs Engineering Group, Lockheed Martin UK, and Serco. AWE sites are owned by the UK government which also has a golden share in AWE plc. Five universities, Bristol, Cambridge, Cranfield, Heriott-Watt, and Imperial College, are designated 'strategic partners' with AWE and are involved in wider research programmes and receive long-term funding, but another 45 universities, many of which have had separate sources of funding from the Department of Defence and other parts of the military sector, have also received funding from AWE since 2010 (Langley 2013: 16: 39). **(9)** While AWE research may have potential value for peaceful purposes as well as military use in respect of the development of weapons of mass destruction, there are ethical and logistical concerns about the risks to which academic researchers are exposing themselves in accepting funding to conduct research on highly sensitive and controversial matters (Nuclear Information Service 2014). The funding of UK university research from the DoD through AWE has been described as 'widespread' (Langley 2013: 34). In the region of half of all UK university institutions are 'engaged in activities with research potentially linked to nuclear weapons' and this has raised concerns about the influence exerted over research ethos, accountability, and ethics, and fears that staff with heavy military-based research portfolios will not have sufficient time to conduct research 'more clearly in the public good' (Langley 2013: 34: 39-40).

The research agenda in UK universities increasingly is driven by the influence of commercial interests and the military sector. The commercialization of universities in the United Kingdom, deriving from neoliberal economic policies of successive political administrations from the 1970s, has decreased 'funding for "blue-skies" research' and led to the fostering of initiatives with government and commercial wings of the military sector contributing significantly to changes in both 'the role and the identity of universities' (Langley 2013: 64; see also Motluk 1996). Research in UK universities is now subject to the increasing influence

of economic expectations, 'commercial end-points', and corporate interests, as well as the growing involvement of the military sector, but the significance of the latter is not confined to the United Kingdom, as Langley (2013: 66) notes:

> The voice of the military sector (government and commercial) is frequently heard in setting research and teaching priorities in the UK, USA and in other countries of the European Union, often above those with a different view. As well as hoping to frame the security agenda at the national level, this voice colours research, training and teaching programmes across departments in many UK universities.

The Research Impact agenda, integral to the Research Excellence Framework (REF) auditing exercise to which UK universities are periodically subjected, is another less obvious manifestation of the growing influence of military and commercial-industrial interests over higher education and university research. In 2009 the newly established UK Department of Business, Innovation and Skills (BIS) expressed the view that, given the excellence of research in UK universities, consideration needed to be given to 'the ways in which research can make greater social and economic impact' (2009: 3). BIS demanded that universities 'contribute to economic growth, both through the knowledge they generate and through preparing our people for the world of modern work' (2009: 12) and in due course the concerns articulated led to a research impact 'reach and significance' assessment element of 20% being included in the REF 2014 research audit.

The research impact agenda incorporated into the REF has been identified as 'one of the more overt manifestations of the neoliberal corporate takeover of UK universities' and as yet another sign of the concealed presence of the military sector in higher education (O'Dowd 2014). In preparation for REF 2014, the Higher Education Funding Council for England (HEFCE) commissioned RAND to conduct an international review of how research agencies assessed impact and to identify 'challenges, lessons and observations' of relevance to the development of 'a framework for assessing research impact' in UK universities (Grant et al 2010: ix).

Project RAND first emerged in December 1945 in the United States and in 1946 was under special contract to the Douglas Aircraft Company before becoming a Federally Funded Research and Development Center in 1947 (Campbell 2004; Hruby et al 2011). In 1948 RAND evolved into a non-profit organization which, in their words, would 'promote scientific, educational, and charitable purposes, all for the public welfare and security of the United States of America', but the objective of connecting military planning with research and development decisions has remained prominent on the organization's agenda (RAND Corporation n.d (a)). RAND has a strong and consistent track record in military research, with the US Air Force a longstanding contractor, and while it now conducts research across a spectrum that includes energy, health, education, justice, and the environment, it has a strong continuing commitment to international and military affairs, and has been described as '[North] America's university of imperialism' (Chalmers 2008).

RAND symbolizes the complexity of military-industrial interconnections. It started off as an organization developing new weapons systems for the military, but subsequently extended its reach into other fields, including university science research, politics and economics and it has received substantial financial support from the US Air Force and the Ford Foundation.

The military research and development innovations presided over by RAND personnel include spy satellites, the intercontinental ballistic missile system, and communications systems advances 'that could survive a nuclear attack' and which contributed significantly to 'the development of the internet and digital circuits' (Chalmers 2008). The RAND organization has also been closely associated with key figures who have been prominent members of the US 'power elite', for example RAND corporation trustees have included Donald Rumsfeld (1977-2001) a Secretary of Defense in two US administrations (1975-1977 under Gerald Ford and 2001-2006 under George W Bush) and Condoleezza Rice (Trustee 1991-1997) National Security Advisor (2001-2005 under George W Bush) and Secretary of State (2005-2009 under George W Bush) and the corporation's group of influential nuclear war strategists included James Schlesinger (1963-69) who went on to serve as Secretary of Defense (1973-75 under Richard Nixon and Gerald Ford) and Secretary of Energy (1977-79 under Jimmy Carter). The individual credited with being 'the best known of all RAND researchers', the person credited with a number of nuclear war strategies, including the (re)location of air bases for nuclear bombers, 'second strike capability', 'counter-force strategy' and 'fail-safe procedures', was Albert Wohlstetter (RAND senior policy analyst 1951-63, subsequently a RAND consultant) who also worked in US higher education and 'taught at the University of California, Los Angeles, and the University of California, Berkeley, in the early 1960's and at the University of Chicago from 1964 to 1980' where he chaired the PhD dissertation committee of Paul Wolfowitz who went on to hold a number of offices of state including Deputy Secretary of Defense (2001-2005 under George W Bush) (Pace 1997).

The global reach of RAND is extensive. While the corporation is based in North America and Europe, its 1,700 staff members are drawn from 47 countries. The research it conducts is sponsored by a number of agencies, but the greatest share is accounted for by government bodies and includes funding through the Office of the US Secretary of Defense and other national security agencies, US Department of Health and Human Services and related agencies, the US Air Force and the US Army. In the financial year 2013, RAND received $263.1 million, of which 54% derived from three military-related sources of funding, namely Department of Defense ($63 million), US Air Force ($36.5 million) and US Army ($33.1 million) (RAND corporation n.d. (b)).

The contribution of RAND to developments in UK higher education, exemplified by its production of reports on bibliometrics and research impact for HEFCE in respect of the REF, as well as the marketing of two analysis and advice packages to assist universities to identify 'impactful research' in their preparations for the audit through an 'ImpactFinder methodology', is presented as bringing 'an extensive knowledge base of the university sector, the research funding landscape, and cutting-edge research evaluation techniques to the university and REF preparations' (RAND Europe 2012). **(10)** In practice RAND, a neoliberal military-industrial complex research organization, is a significant beneficiary of the research impact process as it derives revenue, 'public money', from universities purchasing its services and it gains 'unrivalled access to the publicly-funded intellectual output of every United Kingdom and European university that signs up with it' (O'Dowd 2014).

Concluding remarks: military, industrial, and academic complexities

Interconnections between the military, industry, and higher education institutions are complex and multiple. Within the United States and Europe the influence of the military and commercial corporations on universities and academic research continues to attract attention and criticism. Concern has been expressed about both the involvement of university academic staff in military-related research, including work that 'supports the maintenance and development of weapons of mass destruction', and the fact that publicly resourced university research is contributing substantially to the 'commercial interests of private corporations' (McCoy 2014; International Network of Engineers and Scientists for Global Responsibility 2012; Giroux 2007; Langley 2013: 2005; Parkinson 2012).

The institution of the university is under siege. It has been subjected to restructuring and corporate forms of management and confronted with the demand that the needs of the economy and the business world should be accorded priority. The core values of the university have been compromised by marketization and a culture of consumption in which higher education has become increasingly enmeshed (Bailey and Freedman 2011; Readings 1996). With the neoliberalization of higher education, in particular the increasing emphasis placed upon the pursuit of external sources of research funding and need to demonstrate research impact, the institution of the university has been drawn ever closer to industry, the corporate world, and the security state, so much so that it is now situated within 'an increasingly powerful military-industrial-academic complex' (Giroux 2007: 4). The neoliberal corporatized university is in the business of contributing to the generation of (bio)technological innovations, which reflect the growing unmanned, automated, remote-controlled combat, command, and control requirements of the military, as well as the labour-saving, numerically controlled, robotic and bio-technological manufacturing and service sector equivalents conducive to increasing levels of capital accumulation sought by commercial corporations (Giroux 2014: 192-3). As it does this the institution of the university is simultaneously required to recognise its neoliberal responsibility to function as a market-orientated teaching and training organization, directed to deliver enhanced employability prospects to its student-consumer graduates who are destined to enter occupations in a digital capitalist economy, where continuing developments in computerisation and artificial intelligence are making work and employment increasingly precarious (Beck 2000; Schiller 2000; Frey and Osborne 2013; Brynjolfsson and McAfee 2014).

Signs of the changing conditions and demands to which higher education has been exposed led Jacques Derrida (1983: 3) to ponder on the *raison d'être* of the university, its 'meaning and mission ... [and] destination'. A major debate has been in process for some time now on 'the subject of research and teaching, and on the role the university may play in this arena' (Derrida 1983: 11). In particular consideration has been focussed on the '"orientation" of research', specifically the utilitarian matter of the application or impact of research, and this has become a concern in 'all the highly industrialized countries', and is now 'centered ... on multi-national military-industrial complexes or techno-economic networks, or rather

international technomilitary networks that are apparently multi- or trans-national in form' (Derrida 1983: 11).

With increasing frequency the direction of research is being influenced and shaped, if not determined, by factors extraneous to the field of knowledge and beyond the institution of the university. In UK universities, what is researched and how research is conducted are matters increasingly influenced, if not governed, by a fiscally driven, thematic shaping of research designed to fit funding agendas set by research councils, meet the interests of industry, corporations, the security state and military, and provide appropriate impact narratives to satisfy external research audits. In short, increasingly research is 'organized in an authoritarian fashion in view of its utilization' (Derrida 1983: 11).

A distinction between 'basic' and 'end-oriented' research is now difficult to maintain and, while this is not new, 'never before has so-called basic scientific research been so deeply committed to aims that are at the same time military aims' (Derrida 1983: 12). The growing militarization of academic research across disciplinary fields, from the natural sciences to the social sciences, undermines not only the institution of the university and academic freedom, but also the prospect of enhancing understanding between people and contributing to the achievement of a 'peaceful, sustainable and just world' (International Network of Engineers and Scientists for Global Responsibility 2011). Research in universities needs to be challenging and countering the military-industrial complex, rather than colluding with it to promote military and corporate interests.

Notes:

(1) US government economic policies that devote significant fiscal resources to the institution of the military – for example, to fund wars and associated missions – maintain bases and personnel, promote procurement, as well as to underwrite scientific and technological research and development, have served not only to enhance defensive and offensive capacity, but also to stimulate economic growth. What has become known as 'military Keynesianism' has been a persistent feature of successive US administrations, both Democrat and Republican (Custers 2010).

(2) The term military-industrial complex is employed by Winfield Riefler (1947) in reference to the specific nation states engaged in conflict in the Second World War, especially the United States, and the resources required to function effectively: 'assortment of factories, industrial manpower and technical skills ... access to the foodstuffs necessary to sustain its civilian population and its armed forces, and … the various raw materials required for a minimum level of civilian consumption and a maximum output of munitions of war'.

(3) Chomsky (2004) makes reference to Republicans during Ronald Regan's Presidency pumping federal funds into the economy to 'reindustrialize America', IBM utilizing public funds, and government sponsored research contributing significantly to the emergence of bio-tech companies and adds:

> So Eisenhower's military-industrial complex is not quite what is generally interpreted. In part, yes, it's military. But a main function of the military, or the National Institutes of Health, or the rest of the federal system, is to provide some device to socialize costs, get the public to pay the costs, to take the risks. Ultimately, if anything comes out, you put it into private pockets. And, again, this has to be done in a way that protects state power and private power from the domestic enemy. You have to say it's to defend ourselves against Grenada or Russia or Guatemala or somebody. If you get people frightened enough, they won't notice that their taxes are going into creating the profits of IBM and Merck twenty years from now. Why not tell them the truth? Because then they might not make these decisions.

(4) On February 22nd 1993, DARPA was once again designated ARPA and on February 10th 1996, 'Public Law 104-106, under Title IX of the Fiscal Year 1996 Defense Authorization Act, directed the name be changed back to DARPA' (ARPA-DARPA: The Name Chronicles. http://www.darpa.mil/about/history/arpa-darpa__the_name_chronicles.aspx accessed 31/3/15)

(5) The societal impact of military research in universities also remains a contentious matter, an issue that raises questions not only about the funding of university research and the influence that may be exerted by the particular priorities associated with military interests, but also broader concerns about the impact of university research per se (Wilson 1989; Kistiakowsky 1989; Ahmed 2014; Department of Defense 2014a: 2014b).

(6) The formative technological roots of an increasingly digitalized informational machine-centric capitalism can be traced back to the Second World War and military sponsorship of research in the fields of communication and control of information, specifically in electronics, servomechanisms, and computers (Noble 1983: 1984). As Joseph Weizenbaum observed in the late 1970s,

> [t]he computer in its modern form was born from the womb of the military. As with so much other modern technology of the same parentage, almost every technological advance in the computer field, including those motivated by the demands of the military, has had its residual payoff-fallout – in the civilian sector (1979: 455).

(7) The Minerva Initiative resembles, in some respects at least, an earlier, ill-fated, and controversial social science research initiative, Project Camelot, which emerged in 1963 from the US Army's Office of Research and Development and involved American University's Special Operations Research Office (SORO), which had been established with Army funding to conduct 'social science research for the Army' on potential circumstances in which troops might be deployed in particular regions of US interest (Nisbet 1966: 45). The specific objective of Project Camelot was to conduct research on 'conditions of social unrest, riots and insurrection' (Nisbet 1966: 46), to identify the symptoms of societal breakdown and measures that might be taken to counter and/or deal with social breakdown. The designated geopolitical areas of interest for the research were 'Latin America, the Middle East, the Far East, Western Europe and Africa' (Nisbet 1966: 45-6). However, the project was terminated from Washington by Presidential directive when news of it emerged in Chile and fears were aroused about the impact of 'Government sponsored foreign area research' on international relations (Nisbet 1966: 49: 1971; Horowitz 1967).

(8) From 2007, an experimental Pentagon program, the Human Terrain System, embedded anthropologists and other social scientists in American combat units in Afghanistan and Iraq. In September that year, 'Defense Secretary Robert M. Gates authorized a $40 million expansion of the program ... [to] assign teams of anthropologists and social scientists to each of the 26 American combat brigades in Iraq and Afghanistan' (Rohde 2007).

(9) UK universities receiving funding from AWE, including the strategic partner universities (Langley 2013: 17).

University	Calendar Year 2010	Calendar Year 2011	To the end of June 2012	Grand Total
Aston University			1,670.00	1,670.00
Birmingham City University (UCE)	53,495.00	35,040.00	5,140.00	93,675.00
Brunel University	12,134.00	2,240.00		14,374.00
Cardiff University	(21,000.00)	19,422.50	(12,300.00)	(13,877.50)
Coventry University	1,332.80	2,265.00	2,300.40	5,898.20
Cranfield University	1,289,567.17	1,482,707.94	565,390.27	3,337,665.38
Cranfield University (Bedford)	136,900.00	120,617.90	10,000.00	267,517.90
De Montfort University	2,470.00	1,588.00		4,058.00
Durham University	10,000.00		(7,300.00)	2,700.00
Heriot-Watt University	324,335.67	227,787.56	155,737.00	707,860.23
IC Consultants Ltd	56,540.00	22,837.84	3,750.00	83,127.84
Imperial College	2,965,888.38	3,061,680.40	1,710,566.35	7,738,135.13
Keele University	23,319.00	39,254.50	29,662.50	92,236.00
Kings College London	7,140.00	1,955.00	1,875.00	10,970.00
London Metropolitan University	800.00	2,540.00		3,340.00
Loughborough University	15,750.00	76,379.50	57,171.50	149,301.00
Loughborogh University Enterprises Limited	3,712.86			3,712.86
Queen Mary's College		1,000.00		1,000.00
Queens University Belfast	171,708.60	5,000.00		176,708.60
South Bank University	4,095.00	8,138.00	(1,800.00)	10,433.00
Southampton Solent University	17,255.00	25,862.60	209.49	43,327.09
Thames Valley University (TVU)	910.00	(1,040.00)	(300.00)	(430.00)
The Open University	1,502.00	9,261.00	13,175.00	23,938.00
University College London	45,118.68	54,264.32	30,424.25	129,807.25
University Court of the University Of St Andrews	154,250.54	193,354.50	151,118.25	498,723.29
University of Bath	45,812.63	91,805.18	61,393.83	199,011.64
University of Birmingham	139,941.00	38,454.46	23,712.00	202,107.46
University of Brighton	1,913.00	3,033.00		4,946.00
University of Bristol	439,277.25	536,462.19	334,104.19	1,309,843.63
University of Cambridge	755,026.95	753,821.13	455,902.65	1,964,750.73
University of Edinburgh	74,183.32	150,368.92	129,367.33	353,919.57
University of Greenwich	1,346.90	934.38		2,281.28
University of Huddersfield Enterprises Ltd	2,764.00			2,764.00
University of Lancaster	4,995.00	4,995.00		9,990.00
University of Leeds	10,195.00	12,000.00	1,380.03	23,575.03
University of Leicester	161,326.00	69,972.00	37,827.79	269,125.79
University of Liverpool	236,346.00	36,293.00	69,992.00	342,631.00
University of Manchester	211,861.13	472,702.53	57,016.67	741,580.33
University of Newcastle		1,923.02	500.00	2,423.02
University of Nottingham	5,590.51	9,739.06		15,329.57
University of Oxford	230,234.20	248,437.10	53,619.83	532,291.13
University of Portsmouth Higher Education Corp.	10,556.00	13,955.25	5,208.50	29,719.75
University of Porstmouth Training Limited	3,960.00	1,230.00		5,190.00
University of Reading	54,586.00	10,626.40	6,477.60	71,690.00
University of Salford	42,245.65	33,796.52	16,898.26	92,940.43
University of Sheffield	23,600.00	6,200.00	(1,600.00)	28,200.00
University of Southampton	266,475.65	319,091.30	313,704.90	899,271.85
University of Strathclyde	189,950.48	69,570.00	25,297.87	284,818.35
University of Surrey	156,994.44	87,015.95	73,724.66	317,735.05
University of the West of England	(938.00)	(932.00)	1,874.00	4.00
University of Wales Swansea	7,900.00	800.00		8,700.00
University of Warwick	188,194.00	159,664.76	163,264.23	511,122.99
University of York		20,000.00	34,558.99	54,558.99
Westminster University	2,050.00	(375.00)		1,675.00

Table 1: UK Universities receiving funds from AWE for research.

(10) In 2012 RAND Europe conducted a small scale pilot study of universities in Australia to assess research impact. See Morgan Jones M, Castel-Clarke S, Manville C, Gunashekar S, and Grant J *Assessing Research Impact: An International Review of the Excellence in Innovation for Australia Trial* http://www.rand.org/content/dam/rand/pubs/research_reports/RR200/RR278/RAND_RR278.pdf 25/2/15.

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