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Towards Understanding Chemical-Warfare Weapons Proliferation

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Introduction (*)

Chemical-warfare weapons (CWW) (1) proliferation began topping the security agenda during the past decade and was, in the words of one analyst, *"rapidly becoming the most serious threat to world peace"*. (2) The newly perceived threat led to an explosion of learned and not-so-learned analyses. Yet, virtually nobody deemed it necessary to define what actually constitutes CWW proliferation. Such an observation is even more striking because these authors discuss the attraction of CWW under certain circumstances as well as the number and identity of states suggested by officials based on classified, and therefore essentially unverifiable, information. Moreover, they often propose policy alternatives to counter the developing threat. Must we therefore assume a common understanding or consensus of what proliferation is? The debate originated and evolved in a highly ideologized environment of growing political pressure as well as heavy opposition in the United States to resume CWW production. East-West relations had deteriorated significantly. US allegations of chemical and biological warfare (CBW) activities by the Soviet Union and its client states were either taken as proof of wilful Soviet deceit in international relations and disarmament negotiations or met with considerable scepticism. The coincidence of US allegations of CBW in Third World conflicts and the domestic debate to begin the production of binary chemical munitions was not lost on Europe either, resulting in much suspicion regarding Washington's agenda. (3) It is hardly conceivable that such a climate of opposing views could nurture any common understanding of the proliferation phenomenon.

Yet such an assumption appears to exist. CWW proliferation is usually understood to be a flow of precursor chemicals, high technology and expertise from North to South, from industrial to industrialising countries. The notion describes a lateral spread from one area to another, affecting new areas at an increasing speed. (4) Set in these terms, the word 'proliferation' is entirely consistent with dictionary definitions. The 1968 Nuclear Non-Proliferation Treaty (NPT) demarcated the semantic field in international relations and security. Articles I and II defined the direction of the proliferation flow: from possessor states to nonpossessor states. The preamble attached the negative connotation absent in dictionary definitions by stating that the proliferation of nuclear weapons *"would seriously enhance the*

danger of nuclear war" and therefore posed a serious risk to international security in general. Developing countries later complained that the nuclear powers displayed no serious intent to disarm as required by the NPT while they had to forswear the acquisition of such weapons and only had very conditional access to nuclear technology. This contributed to the further conceptual narrowing down of the direction of the flow form industrial to industrialising countries, from North to South. The rational has since been extended by the Missile Technology Control Regime (MTCR) which explicitly wishes *"to limit the risks of nuclear proliferation by controlling transfers that could make a contribution to nuclear weapons delivery systems other than manned aircraft."* A US statement of 16th April 1987 announcing the agreement stressed that *"adherence of all states to these guidelines [is] in the interest of international peace and security"*. (5)

The notions and concepts from the NPT have been transposed to the CWW proliferation debate without much critical appraisal whether the two processes are in fact comparable. This conceptual leap is clear from the ways in which Western governments have imposed export controls on key chemical compounds from 1984 onwards, gradually expanding the list, and later extending the restrictions to dual-use technology and even materials required for biological weapons programmes. In 1985, some industrialised countries also organised themselves into a suppliers' club, the so-called Australia Group. Despite some initial efforts towards modelling it after the London Nuclear Suppliers' Group (NSG), (6) the Australia Group has remained an informal consulting and coordinating platform whose members had to enact new legislation individually. This policy choice to stem the spread of chemical weaponry in analogy with CoCom and NSG export controls carries a strong suggestion that the processes involved are similar. But, are they?

The present paper argues that if CWW is viewed as a lateral spread, then different moments in the CW history will reveal different processes, different actors, different political motives, and different policy choices. Today's predominantly supply-side discussion of the phenomenon explains much of its perception. Proposed policy options to counter the threat - essentially self-imposed restrictions on the supply - confirm the existing analytical bias and actually contribute to reinforcing threat perceptions emanating from proliferation. An alternate approach focusing on the demand side allows to define proliferation as a domestic armament dynamic in which the importation of strategic commodities is but one way for a country to build up an unconventional capability. Such a definition brings the debate within the scope of existing theories regarding international relations and armament dynamics, thus demystifying proliferation as a novel or different threat. Moreover, it will bridge the conceptual gap between the policy goals of antiproliferation and disarmament regimes. The Chemical Weapons Convention (CWC) can certainly be portrayed as aiming at deproliferation.

CWW proliferation as a security issue

CWW proliferation as it is discussed today is the outcome of more than two decades of issue creation. The spectre was first raised shortly after the signing of the Nuclear Non-Proliferation Treaty (NPT) as part of the opposition to the American use of chemical herbicides in Southeast Asia. (7) Interestingly, speculation about nuclear-weapons proliferation was also started by 'outsiders' after Hiroshima, although there was an immediate clear distinction between those who viewed the developments in apocalyptical terms and those who envisaged a desired stable situation based on mutual deterrence in a world of nuclear powers. (8) It thus seems that the present debates on proliferation originated from a major event that prompted intellectual polemic even before the development took place or policy makers and other 'insiders' decided that it was a security issue. The debate's origin was instrumental to its further development. The original dichotomy in the nuclear discussion helps to explain why as late as the early eighties nuclear proliferation could still be advanced as beneficial to world security (9) and why a decade later the ideological and theoretical polemic still rages on. (10) The NPT nonetheless framed the chemical and biological weapons proliferation debate: the spread was undesirable. Consequently, to our knowledge, no author - barring one exception (11) - has advocated the spread of CWW. (12)

During the seventies, a new dimension was added to the CWW proliferation debate. From within the US military establishment some were acting to reverse President Nixon's decision to halt CWW production. They developed multiple thrusts, three of which have a direct bearing on the present discussion. On the one hand, they claimed that the USSR was attaching growing importance to military operations in a chemically contaminated environment following the discovery that Soviet-made tanks captured during the 1973 Yom Kippur war had overpressurised crew cabins. Distrust was to rise as dÚtente was crumbling. On the other hand, there were an increasing number of claims that Soviet proxies in the developing world, including Vietnam, Ethiopia and Angola, had obtained toxic substances from the Soviet Union and were actually using them. Even the Soviet Union itself was reported to have employed CW agents in Afghanistan. Whatever the veracity of these reports, they served those who had a vested institutional interest in renewed American CWW production well. Finally, the Reagan Administration's great preoccupation with terrorism inevitably lead to scenarios in which subnational groups or individuals could pose a direct threat to US interests at home and abroad. (13) In fact, this was but a variation on a theme developed by Matthew Meselson in his Congressional testimonies between 1969 and 1971. (14) He then expressed fear that American troops in Southeast Asia would be exposed to great peril if their continued use of CW agents would lead to less-sophisticated forces or guerrilla fighters acquiring and employing such weapons against them. Using the same incident to argue opposite views was not an uncommon phenomenon. Indeed, by the time the United Nations conclusively demonstrated that CW was an integral part of the 1st Gulf War, both proponents and opponents of America's chemical rearmament programme had added proliferation-threat scenarios to

their list of arguments. In essence, both groups departed from fundamentally different basic assumptions. Advocates of CW rearmament programmes believed - for ideological rather than factual reasons - that the Soviet Union and its clients states were engaging in CW and concluded that they were weakening international constraints, a development that the West had to deter. (15) Opponents, on the other hand, questioned the validity of the allegations and feared that Western rearmament would lead to proliferation into regions as yet free of such weapons. They placed much greater faith in disarmament negotiations to avert the threat. Even if the allegations were true, a speedy conclusion of an international disarmament treaty would be a better safeguard against the erosion of international constraints than yet another arms race. (16)

The confirmation in 1984 of Iraq's systematic chemical attacks firmly established CWW proliferation as a separate security issue that required specific policy decisions not only in the USA, but also in other Western countries and even in the CMEA member states. Taking the precedent of the NPT, export controls - first on chemicals, later on dual-use technology, and most recently on components necessary for biological warfare (BW) - were the instruments of choice. The need for international coordination led to several Western industrial countries organizing themselves in what would later be known as the Australia Group. Within that framework they have since 1985 exchanged intelligence regarding actual and potential proliferators and suggested legislative measures. The deliberations remained informal so that each individual participating country still had to draft and enact the export controls, or indeed, retained the freedom to take no action. The major problems with such an arrangement are of course the limited number of participating countries and the virtual absence of representatives of the developing world. Moreover, as the considerable German involvement in the construction of a Libyan CWW production plant near Rabta and general Western embroilment in Iraq's chemical and biological programmes have shown, participation in the Australia Group does not exclude the possibility of Western industrialized countries playing an important role in CWW programmes of other states.

The 2nd Gulf War and the subsequent UNSCOM inspections amplified concerns regarding industrialising countries' advanced armament programmes. These have propelled missiles to the forefront of threats. Before the Kuwait crisis, the MTCR primarily wanted to deny countries with nuclear ambitions or capability advanced delivery means. The United States and some Western allies at best viewed it as an extra instrument for strengthening the nuclear nonproliferation regime. Countries only seeking an advanced conventional, chemical, or biological capacity, however, were technically legitimate purchasers of such technology according to the MTCR guidelines. (17) In unstable regions, such as the Middle East, advanced missile systems were viewed as promoting crisis instability because their enhanced counterforce and countervalue properties invited preemptive strikes. Moreover, the extending ranges of missiles risked expanding the geographic boundaries of any future conflict. (18) The petering out of the Cold War focused attention on so-called out-of-area threats to

Europe and the USA. Besides terrorists, missiles were the only instruments of war that could strike at the Western heartlands. The demise of the Warsaw Treaty Organisation (WTO) and the 2nd Gulf War, as well as the ensuing shift of threat perceptions influenced both the content and the nature of the proliferation debate. The means of delivery had become just as threatening as the payload.

The non-use of CWW during Desert Storm appeared to have sealed their fate as totally obsolete in the face of modern technology. They became an adjunct to the ballistic missile threat. However, mated to missiles - especially after UNSCOM inspectors' confirmation that Iraq had constructed crude chemical warheads for the Al-Husseyn missile - CWW found a new lease of life as a weapon with high strategic potential. The images of the Israelis sheltering in their safe room every time the sirens wailed added credibility to such a vision.

At this point, the threat assessments of missiles with chemical payloads split in diametrically opposing views. Analysts working mainly on CW matters argue that the combination is fairly ineffective and probably holds its greatest value as a weapon of terror as long as it is not used. They add that conventional warheads would produce higher casualty rates especially if the attacked had provided chemical defences for the civilian population. (19) Others defining missile proliferation as the central issue allocate a high strategic value to the combination with chemical warheads. Their conclusions can be very leading. Steve Fetter, in an article in International Security, concluded that *"it should not be surprising if the future of missile proliferation points in the direction of chemical and biological weaponry, since for many states these are the only weapons that could constitute a strategic threat or a strategic deterrent."* (20) With such a new line of reasoning it comes as little surprise that in the past two years a country such as Saudi Arabia suddenly features on the list of CWW proliferators. (21)

It is fair to state that at present the impact of analyses departing from missile proliferation is dominant. Perceptions in West Europe and the United States enhance it. Since the demise of the Soviet Union, NATO and the WEU are alliances in search of a threat. The only possible direct threat to the West can come from missiles or terrorists and both are currently seen as important vectors for chemical and biological warfare agents. (22) In other words, a large-scale CBW threat can only come from hostile developing countries with a sophisticated missile capability. However, given these countries' current technological abilities, missiles act as threat multipliers - euphemistically called "force multipliers" - serving the institutional interests of some.

Different times, different meanings

Military thinking on CW after World War 2 underwent the impact of the advent of the atomic bomb and when a CWW proliferation threat was perceived to emerge the debate did not escape the influence of the NPT discussion. However, modern CW predates the first nuclear

explosion by three decades. Nations had to deal with the threat both in times of war and peace. If the general assumption of CWW proliferation, namely the lateral spread of precursor chemicals, technology, and expertise from possessor states to nonpossessors, is applied to different eras in the history of CW, then some divergent underlying mechanisms emerge.

Historically, the development of chemical and nuclear armament was fundamentally different. Whereas early German and American research into nuclear energy was driven by the quest for the atomic bomb, modern CW agents were rather a derivative of a 100-year development in the chemical industry. Chemical weapons are known to have been used since antiquity and novel strategies to exploit the toxic characteristics of some compounds were proposed at different times, especially when defences and fortifications posed a challenge to existing weaponry. CW as it is understood today, however, is a typical product of the second industrial revolution which originated from an increasingly utilitarian application of scientific principles driven by an economic rationale during the second half of the previous century. The foundations for this revolution were laid more or less simultaneously in several countries, including Great Britain, France, Germany and the United States, that then already belonged to the industrial centre. Some of the compounds that were to become notorious during World War 1 (WW1) had been discovered over a century earlier. (23) The real challenge was their production on an industrial scale once their utility in other processes had been established, a capability only achieved towards the end of the 19th century. (24) For diverse reasons - including access to overseas raw materials and the search for alternatives - the chemical industry developed at markedly different rates in those countries.

It comes as little surprise that new thoughts about military application of novel toxic compounds emerged in those countries with a fledgling chemical industry. Two British officers floated such ideas at different times in the last century. (25) The presentation of deadly gases as high-technology weaponry in many military science-fiction novels in different countries around the turn of the century - for instance, H. G. Wells' The War of the Worlds - reflected the chemical industry's growing impact on societies. Such developments occurred relatively independently in the different countries. The then theoretical possibility of employing novel toxic substances as a potentially decisive weapon of war, as well as past experiences, must have caused sufficient alarm for the powers to include prohibitions against such use in several international treaties and draft treaties. (26)

WW1 would of course prove to be the real stimulus for focused military-oriented research into chemical compounds with the prime purpose of exploiting their poisonous characteristics against humans or their habitat. However, it cannot be excluded that without the Great War there would have been no advancement towards CW capabilities. The French had tear-gas cartridges for riot control on the eve of the hostilities. (27) Gas defences too initially benefited from prior experiences in mining and the civilian industry, although the different conditions of CW would lead to a specific gas mask development

process.

History of CWW Proliferation Viewed as a Lateral Spread		
1.	Emergence of a chemical industrial base in the centre	
2.	CWW proliferation within the centre • Exchange of production capacity, knowledge, etc. ... • Direct sales or transfers of munition to other governments	**1st Generation**
3.	CWW proliferation to the periphery • Transfer of production capacity to countries in the immediate periphery • Transfer of CWW to the colonies for use by the colonial powers	
4.	CWW proliferation in the periphery • Reproduction of the industrial base in the periphery • Trivialisation of technology	**2nd Generation**
5.	CWW proliferation within the periphery	**3rd Generation**

This brief overview shows that military considerations played little if any role in the development of chemistry and the chemical industry. Throughout the 19th century and the first years of the 20th century scientific knowledge spread to a certain extent among the most advanced nations. It is less likely, however, that information about industrial production processes permeated the frontiers on any significant scale given the great rivalries between the leading powers and protectionist economic policies. Consequently, on the eve of WW1 some important preconditions for CW were present in the industrialised countries, although some marked differences in technological advancement and industrial expansion existed between the rivalling powers. Once those countries at the threshold of a CW capability moved to establish a research and production base dedicated to purposefully acquiring such weaponry and erected a bureaucracy and decision-making procedures with as prime purpose organizing CW employment and defence, proliferation began. Reviewing the history of modern CW, three generations of CWW proliferation can be distinguished. (28) [See Table]

Characteristic of *1st generation proliferation* is direct and conscious governmental involvement in the dealings. The spread of CW capabilities must therefore be considered as an integral part of a government's foreign and security policy. As a consequence of WW1, which involved the countries in the industrial centre, the proliferation process began immediately after the first large-scale German chlorine attack of 22nd April 1915. The exchange of production capacity regarding chlorine and phosgene between respectively Great Britain

and France was essential to their early CW efforts. (29) The prewar commercial and industrial utility of the compounds under consideration for offensive CW meant that private firms initially played an important role in the Allied drive for retaliation. However, governmental and military bureaucracies almost instantly took over organisational control over the CW venture and, after the war, established a specialized research and production base under their authority. (30) During the last two war years when production capacity could finally meet military requirements, France and Britain were able to sell gas munition to smaller powers such as Belgium to assist in its building-up of a retaliatory and later offensive capability. Such a capability can also be acquired or augmented if authorities decide to incorporate captured enemy dumps into their arsenals. Large sections on the use of German *T-Stoff* shells in Belgian field manuals of the time testify to such occurrences. (31) The spread of CW defences and the results of research and development followed similar patterns. Countries that lacked the ability to produce gas masks domestically or at short notice, such as Belgium and the United States, obtained them from France and Great Britain. Information and data on CW offense and defence were regularly transmitted to the allies. Military and civilian representatives attended important field trials and both scientists, military specialists, and bureaucrats produced huge volumes of reports on CW which they sometimes shared at interallied conferences or at other occasions.

After the Armistice, a variation of these proliferation patterns occurred. On the one hand, the countries in the industrial centre transferred the production capacity to their immediate periphery. An example was the reported French delivery of an entire filling facility for CW agents to Melilla in Spanish Morocco before 1921. (32) France, however, refused to sell state-of-the-art agents such as mustard gas, for which Spain eventually turned to Germany. Dr. Stoltenberg, who led his private company and whom the Allies had instructed to destroy German chemical munition, headed in close collaboration with the German military and diplomatic corps the enterprise to build the *Fabrica Nacional de Productos Quimicos* at La Maranosa near Madrid. The Germans reportedly had to provide skilled labour for the construction of the large-scale plant. (33) Such a venture was undertaken despite the Versailles Treaty and could not have escaped the notice of the French and the British. The interesting part to the story is that both Allies let the Germans carry on because it served their respective interests in their rivalries over colonies in Africa. (34) The episode foreshadowed Western acquiescence in Iraq's chemical attacks against Iran.

Spain was but one country in whose CW armament drive Germany was involved. From 1923 onwards, Germany exported technology, components and provided assistance to Italy, Yugoslavia, Turkey, Sweden, and countries as far away as Brazil, China, and Japan. One of the largest collaborative efforts was with the Soviet Union, which allowed both countries to develop a domestic CW capability. The illicitness of Germany's actions resided solely in articles 170 and 171 of the Versailles Treaty, not in any particular prohibition on CW armament or a generally accepted norm against such activities. Both

articles not only forbade CWW manufacture in Germany, but also their importation. Moreover, Article 171 distinguished explicitly between CW agents and their delivery means on the one hand, and the materials necessary for their production and storage on the other. The Allied victors deemed any reference to exportation unnecessary presumably because the article's basic objective - a comprehensive production ban - precluded such a probability.

The drafters of the Versailles Treaty of course had no intention of establishing a CWW nonproliferation regime. It was a condition imposed on the vanquished and did not affect the victors. Among Allied and neutral countries, such trading was apparently perfectly legal. Belgium, having declared itself neutral again, sought a limited CW capability in the 1930s and bought the thiodiglycol for mustard gas production from the French government. Moreover, some European powers may have promoted the proliferation of CWW among allies and neutral countries as part of a European security framework. Balancing the CW threat rather than dispensing with it was a major motive underlying the 1925 Geneva Protocol. When it became apparent that the League of Nations' conference *"for the supervision of the international trade in arms and ammunition and in implements of war"* was heading for failure, a US proposal to prohibit all international trade in toxic weapons was rejected on grounds that it would discriminate against states unable to manufacture toxic weapons of their own. (35) The conference ultimately compromised over a ban on their use. Interestingly, during these negotiations in the late spring of 1925 France was aiding Spain's CW effort in its Moroccan war. Both countries were participants at the League of Nations' conference and eventually signed the Geneva Protocol. (36) The formal argument in favour of proliferation may therefore have legitimised an ongoing process or safeguarded particular economic interests.

Italy's colonial war in Abyssinia in 1935-36 points to a final variant of 1st generation CWW proliferation to the periphery: their introduction into the colonies and possible abandonment by the colonial power. After WW1, gas was believed by some to be an effective weapon to control inaccessible rebellious territories. The British, for example, used or had gas at their disposal in Mesopotamia, Afghanistan and India. The Netherlands manufactured mustard agent at Batujajar near Bandung on West Java in 1940 and 1941. (37) There are few indications that these powers left militarily significant stocks behind which were later incorporated in the arsenals of the independent country's armed forces. However, to our knowledge, no research has focused on whether peoples that were once subjected to chemical threats or attacks by their colonial rulers are today more open to acquire a CW capability. During the Yemen civil war in the sixties, the Egyptians reportedly used CWW retrieved from British stocks abandoned after WW2. (38)

Aspects of 1st generation proliferation have continued until today. For instance, the Canadian, British and US chemical warfare establishments, who had worked closely together during WW2, formalized their collaboration in the so-called Tripartite Agreement of

1947. This joint effort on offense and defence continued until the early 1990s. (39) The licensing by the US Department of State's Office of Munitions Control of export applications for tear gas guns, grenades, launchers, and launching cartridges to Israel is just one example of continuous 1st generation-like transfers, which happened to be noticed because of the Israeli Defence Force's (IDF) employment of CS during the Intifada. (40)

Second generation CWW proliferation is the phenomenon of much of today's debate. Private companies rather than governments act as suppliers not of ready-to-fire chemical munition or complete production and filling plants but of individual components, technology, and expertise. Most of those transactions were initially not illegal. However, after the UN confirmed Iraq's use of CW agents, Western governments began enacting legislation to prevent their nationals from participating in other countries' CW armament programmes. This led to the establishment of complex international networks to conceal the true nature of the transactions and circumvent export controls. On the one hand, supplying companies subcontracted other firms for specific parts of the project thus hiding their true purpose and set up false companies abroad as shipping addresses to fool customs. On the other, the proliferating country placed its orders with companies in different countries to limit the number of people fully aware of the regime's true intent. Reconstruction of the network Libya had set up for building its factory at Rabta showed that it sought expertise and technology from companies all over the world. (41)

The Japanese Steel Works (Nihon Seijo) supplied lathes and air guns for an equipment factory and Toshiba an electrical power station in the belief the Libyans were constructing a desalination plant. VEB Stahlbau Plauen from the former German Democratic Republic furnished steel constructions. A computer was obtained from the Florida based Harris Company. Thyssen and Karl Kolb, two West German firms at the time already being investigated for their part in Iraq's chemical warfare programme, also participated. Imhausen Chemie, however, played the pivotal role for installing the actual production system. It placed important orders with other firms that were apparently unaware of the final destination. Salzgitter Industriebau GmbH - a state-owned enterprise - initially denied having drawn up the plans for Rabta, but admitted to having delivered pipes and electrical equipment for a pharmaceutical production unit between 1984 and 1987. Imhausen had ordered the equipment for a subsidiary in Hong Kong. Later it emerged both companies had held several meetings, discussing the constructions in Libya. Teves GmbH, a subsidiary of the American multinational I.T.T. that had supplied cooling equipment, also claimed Hong Kong was the final destination. So did many other firms involved.

In fact, Imhausen had set up a double project in Hong Kong and Rabta, both called Pharma 150. The German company actually built a factory on the Yeun Long Industrial Estate in Hong Kong, although it only served as a cover for other activities. An early important indication that the Rabta plant was indeed a chemical-weapons production site followed from the declaration by the Frankfurt based

company John Zink that it had exported an incinerator for superfluous gases ordered by Ishan Barbouti International Engineering to Hong Kong. Ishan Barbouti, who appeared to have close ties with Colonel Qadhafi, owned branches in most industrial countries, which were often nothing but letter box addresses. Between 1985 and 1987, Barbouti placed large orders with several German building companies, whose representatives were convinced these were intended for metal works. The materials were shipped to Rabta over Rotterdam and Antwerp. Especially in Belgium, weak transit regulations meant that Imhausen and its associates could easily defeat German customs by involving Antwerp-based shippers. Subsequent court cases in Germany have established that some companies were not aware of the true destination or purpose of the orders.

Despite all the international attention drawn to the Rabta plant in 1989 and 1990, which according to some reports forced Tripoli to make the installation look more like a civilian pharmaceutical plant and at one point was said to have been destroyed by a mysterious fire, (42) efforts to construct another CW production facility at Tarhunah, 65 kilometres southeast of Tripoli, appear to involve non-Western expertise and labour. (43) If true, it suggests that developing countries no longer require major Western assistance for their CW programmes effectively defeating existing export control regimes. Although it attended the 1993 Paris signing ceremony Libya ultimately refrained from signing the CWC there. Analyses of Iraq's CW armament efforts show equally intricate acquisition endeavours. (44)

Third generation CWW proliferation, finally, describes a process by which countries in the developing world expand their technological, R&D and industrial base into other Third World nations. In other words, the transfer takes place within the periphery. The industrialised world is no longer involved and can therefore exert only very limited - if any - control over the development. From a Western viewpoint, this would herald the final defeat of export controls. So far, no firm evidence exists about whether this type of CWW proliferation is occurring in any concerted form. Some transactions to suspected countries, mostly involving the shipment of precursors, have nonetheless surfaced. In one example, the Indian company United Phosphorous shipped 90 tons of trimethyl phosphite - a CWC schedule 3 precursor also figuring on the Australia Group Export Control List with possible use in G-agent production - to the Setma Limited company in Syria. The first half had reached its destination in May 1992; the second half was intercepted by Cypriot authorities at Germany's request. The Indian company nevertheless declared it would not halt its shipments unless it received firm evidence that it was not used for its stated purpose of pesticide production. Bonn was here able to intervene because the German conveyors had not obtained a German export license, which is required even if they carry cargo from elsewhere. (45) This came two years after another Indian company's delivery of thionyl chloride, a precursor to mustard gas, to Iran using Dubai to avoid attracting international attention. (46) In another case, Singapore seized eight chemical reactor vessels bound for Libya in June 1993, which according to British and US intelligence officials could have been used to mix corrosive nerve

agents in the plant at Tarhunah. Tripoli had ordered the reactors from Malaysia. Despite British warnings, Malaysian authorities were not persuaded that they had any military value. The seizure was possible because of the UN embargo on military goods against Libya for its presumed role in the 1988 bombing of the Pan Am airliner over Lockerbie. (47) In two of the cases special circumstances allowed the West to take action. The controversy surrounding the Chinese ship Yinhe allegedly carrying thiodiglycol and thionyl chloride - respectively schedule 2 and 3 precursors to mustard gas - to Iran during the summer of 1993 points to the West's great dependence on accurate intelligence reports and limited scope for action. Washington had no legal basis for inspecting or seizing the vessel. Some countries in the Gulf, notably Bahrain, Kuwait, and the UAE, refused the Yinhe access to their ports because they did not wish to antagonise Iran by cooperating with US inspections. Eventually, Chinese and US assisted Saudi inspectors declared that the ship was not carrying any of the compounds. Although US officials later declared that under the CWC they would have been able to demand a challenge inspection, (48) it remains an intelligence mistake they cannot afford to make too often. (49)

These couple of as yet isolated cases reveal that the supplying states do not participate in existing international consultations to stem the spread of chemical weapons and at best have minimal export regulations, which, in any case, have not been coordinated with those of industrialised states. They are also largely immune to external political pressure. Moreover, such orders may constitute an important source of foreign currency, which only increases that country's protection of the trade. During the negotiations, the regimes often displayed much scepticism regarding the CWC for a variety of reasons. Countries as China, India, Iran, and Malaysia signed the convention at the 1993 Paris ceremony. A distinct possibility therefore exists that the new international regime may prove to be the best guarantee against any further nefarious developments.

Analytical problems

Today's discussion of CWW proliferation as a lateral spread thus essentially deals with 2nd generation patterns. The spectacular nature of new revelations and the preoccupation with strengthening export controls conceals that even in the worst case of US intelligence estimates only about 13% of the world's independent nations are in one way or another believed to have engaged in some form CW armament dynamic. This is still less than the 17% reliably known possessors during WW1 and 19% on the eve of WW2, but higher than most of the time since 1945. (50) These comparisons may be misleading because the intelligence reports in the public domain do not define CW capability. Such an approach, moreover, ignores that some nations may have renounced seeking an offensive CW arsenal. In other words, despite an apparently rising trend, the mix of CW capable states may vary at different times.

Second generation differs from first generation proliferation in that the supplying actors are no longer governments pursuing security or other national interests but private companies seeking profits. International security and domestic export-led economic growth together with liberalisation of international trade have become national policy goals at odds with each other. Export controls are more or less the only means by which a government can regain some degree of control over transactions that affect its general foreign policy goals. However, one can surmise that to enforce restrictions going against a domestic agenda of job creation and a fundamental ideology of free trading, a government must define a serious threat to the country's national security interests. Reviewing the Imhausen-Rabta case, one can postulate that a right-wing administration advocating market economics must emphasise threat perceptions to legitimise controls, (51) whereas a left-of-centre government favouring more direct state intervention in economic policies can claim moral grounds for such restrictions. Similarly, countries with a global role and an interventionist tradition, such as the USA or the United Kingdom, will be more receptive to arguments about direct external threats, than countries that only see a limited overseas military role for themselves, such as the Federal Republic of Germany.

Thus, in the FRG's export-oriented climate high unemployment statistics during the first half of the 80s increased pressure on the Federal Government to ease up on arms export restrictions. Budget constraints also led to a sharp decline of domestic orders for weaponry. The strict interpretation of the regulations under Chancellor Brandt during the 70s was abandoned near the end of Schmidt's tenure in 1982. (52) The German arms industry, which became closely interconnected and thus more powerful and competitive after a series of takeovers, forced Chancellor Kohl into relaxing export controls even further. It mainly argued the preservation of jobs and technological progress in key military areas. Federal ministers nevertheless still considered these laws to be very restrictive and in the interest of the West German economy:

> *"Our position is clear! We shall stick to our restrictive weapons export. This conforms to our historical responsibilities and the ethical foundation of our foreign policy and it conforms to our economic interests. An extensive weapons export policy - which means primarily arms transfers to the Middle East - would harm our international relations and would put jobs in Germany at risk. We are now the prime exporter of civil products to the Middle East. We would lose a part of these markets if we were to go into arms sales. [...]"* (53)

The statement - made two years before the Rabta controversy came to a head - is illustrative of competing policy priorities in a government. Meanwhile, the Rabta case and UNSCOM inspections in Iraq have enlightened the world on the nature of much of the civil products the FRG has exported to the Middle East - indications of which the federal government conveniently chose to ignore for many years despite warnings from intelligence services. (54)

If export controls are but a means for a government to regain some control over a security development that negatively affects other foreign policy goals then competing domestic priorities, as well as the fact that only a limited number of countries enforce such regulations, will ensure that they ultimately fail. The issue becomes even further complicated if a particular industrial sector succeeds in convincing policy makers that their activities are in the national interest. In the worst of cases, this may lead to governments simply paying lip service to export controls and make them active actors in the proliferation. (55) Moreover, many developing countries acquire as part of their legitimate industrialisation programmes growing levels of autonomous knowledge, expertise and technology. This implies that if such countries also wish to acquire a CW capability they are able to start their development and production processes at increasingly lower levels of specialisation. As a direct consequence, the industrialised states will have to submit a growing number of materials and technology to an export licensing system if they wish to retain an equal effect, which in the long term will prove untenable [See Figure 1].

Area 1 contains precursors and key precursors for CW agents, as well as technologies with specific or possible application in the production. The export controls several Western states have enforced are at level E, of which it is hoped that the threshold for specialised applications to manufacture chemical munitions in Third World countries is sufficiently high. However, as a consequence of industrialisation and other directly related societal aspects such as schooling, developing countries are able to expand their own industrial and technological base. They thus achieve the ability to develop the more specialised processes and intermediate materials indigenously. Regarding CWW production, this development (D D) means that, for example, Third World countries can produce precursors that figure on export control lists domestically and to this end import other chemicals with much broader civil applications in area 2. These chemicals will, moreover, trigger less suspicion in the exporting country because the direct link with an armaments programme is less evident. A similar trend is possible with technology and knowledge. If an exporting country wishes to continue countering proliferation with export controls, then it must of necessity shift the threshold to E' bringing more goods into the export licensing system. Such a move also broadens the base of the types of commodities a government must subject to export controls. Such a list-based policy will cause three different kinds of practical problems. First, the promulgation of new laws and export regulations only make sense if the authorities are also prepared to augment the administrative cadres accordingly. The broader the base to be scrutinised, the costlier the implementation of an export control philosophy becomes. For many West European countries such an option runs counter to the imperative necessity to cut public spending, which, again, raises the question of long-term workability of export control policies. Second, such a course would affect a country's trade relations adversely, especially if its direct competitors maintain less stringent restrictions. The trend will therefore be a search for the lowest common denominator among supplier countries. The German chemical industry, for example, repeatedly voiced strong criticism of

the strict export regulations enforced after the Rabta case, claiming that companies voluntarily renounced lucrative deals because of them all the while knowing that foreign competitors would fill the order. It therefore preferred common regulations in the EC or OECD context and endorsed the CWC as its entry into force would remove many of the trade barriers it faced. (56) Meanwhile, the Federal government is already considering easing export restrictions under pressure of the deep-cutting recession and cost of unification. In Belgium, on the other hand, comprehensive armaments export legislation cannot be fully implemented because of different economic interests between the Flemish and Walloon regions. Whatever the reasons, the more export controls affect items in area 3 the more widespread opposition to them from economic sectors will become and delegitimise nonproliferation policies. Third, many a developing country will perceive broader export restrictions as a new barrier to its legitimate economic and industrial development erected by the industrialised world. But, because of the lesser sophistication of the ingredients a proliferator will need, the range of potential suppliers from which it can obtain them increases significantly. And as referred to earlier, the number of states participating in antiproliferation fora is limited. The proliferator can also spread its purchases over more countries so that the indications for a chemical armaments programme will become more difficult to ascertain. (57)

Figure 1 Widening CWW export controls

Supply-side nonproliferation policies determine to a large extent the manner in which 2nd generation CWW proliferation is perceived. The focus remains on individual countries, purchasing networks, the role of suppliers, and export controls, and, as such, distracts from the overall context in which proliferation is believed to be developing. First, all countries allegedly trying to acquire a CW capability are among the most advanced and richer industrialising nations, an observation that places the description of CWW as the poor man's atomic bomb in perspective. These countries, and many others, have in fact reproduced the industrial and technological preconditions, which, almost eight decades earlier, had allowed the industrial centre to launch CW. In other words, the potential for a CW armament is spreading. However, for those countries in the periphery actually embarking on such a programme, chemical weaponry still represents state-of-the-art military technology requiring a dedicated effort to overcome many obstacles. The importation of technology, expertise, and precursors, which at present accompany such efforts, testifies to this. Thus, the technological barrier may partly explain why so few nations have committed themselves to CW armament. On the other hand, countries which have advanced beyond accomplishments of the 2nd industrial revolution appear far less interested in chemical weaponry. This may explain why most industrialised nations essentially lost their interest and why few reports of CWW proliferation in the Asian Pacific rim are available.

Second, the current analytical approach to proliferation ignores the question why in a geopolitical region certain countries move towards a CW capability and others do not. In the Middle East, for instance, why do countries such as Egypt, Iran, Iraq, Israel, Libya, and Syria systematically figure on the list of proliferators, whereas others such as Jordan, Kuwait, Qatar, Saudi Arabia, and the UAE do not appear to display any interest in CW armament? Each of these countries faces comparable external threats from many directions so that the standard explanation in realist schools of thought is unsatisfactory. At first sight, all countries in the first list, except Israel, experienced revolutions; those in the second are relatively stable conservative monarchies. A regime's need for internal legitimacy through international prestige may therefore be an added incentive to acquire chemical weapons. Another distinguishing characteristic between both groups is the former's fundamental dissatisfaction with the geopolitical status quo, which may be a parameter of a regime's need for either internal or external legitimacy. Further scientific research will have to investigate how such and perhaps other demand-side determinants influence decisions whether to acquire a CW capability.

Second generation proliferation is thus an extremely complex phenomenon, which is still little understood because it is occurring in the present and both the scope and consequences are unclear. Comparison with the 1st generation, however, reveals some important features. It takes place in the periphery where the industrial base of the centre is being reproduced at a time of increasing trivialisation of technology. Within this general context, potential access to a CW capability has broadened and where a regime actually wishes to pursue such military capability, private companies rather than governments act as suppliers. Paradoxically, an offensive CW capability appears to hold the greatest attraction for countries that do not possess the research and development base nor the production capacity, while nations possessing the technology and doing the research seem to have lost interest. (58) This implies that proliferation and deproliferation occur simultaneously.

Defining CWW proliferation

The notion CWW proliferation may thus refer to different things depending on the time, actors, and context. The major question asked today is whether current antiproliferation measures - mostly national export control legislation - suffice to stem the threat. However, the policy concept defines much of the problem and also suggests a remedy to the exclusion of other insights and options. Export controls consist of restrictions on supply, but do not address demand. Consequently, a whole area of research and insight is being ignored. Yet, most policy-makers and analysts agree that supply-side antiproliferation measures only buy temporary relief and will ultimately fail. Implicitly, they accept that the lateral spread of CWW is continuous and believe that the Australia Group or a similar body will never be able to found an antiproliferation regime.

The Chemical Weapons Convention (CWC) is therefore often seen as a panacea. The global disarmament regime commits states to destroy and not to acquire CWW stocks. The new atmosphere of confidence will allow the industrialised world to lift the burdensome export restrictions and industrialising countries will gain virtually unlimited access to chemical compounds and technologies. However, the CWC is not an antiproliferation treaty and in each of the three generations of CWW proliferation there are certain aspects it does not explicitly address or ignores completely. Without a clear definition of CWW proliferation, both the distinct characteristics of each generation and the manifestation of some elements of past and future mechanisms today could suggest some erroneous conclusions about weaknesses in the convention.

Most of the debate about CWW proliferation conjures up a continuum starting with transfers from industrialized countries to the proliferator, and ending with the latter's acquisition of a CW capability. In some instances, a formal reference is made to a political decision by the proliferating state or the security circumstances in which such a decision has been taken. Without any study in depth of the domestic decision process, the political environment remains static, a condition not normally associated with decision-making. Consequently, no opinion is expressed about the nature of the political environment in which the process evolves. The implication is that once the initial decision has been taken CWW acquisition proceeds along a linear course towards its predetermined end, namely probable - or at least possible - use. Underlying it is an impression of automatism, which, of course, enhances any threat perception already present. Analysis of the US binary weapons programme and the little information available regarding Iraq, however, strongly suggest a far more complex process. The path towards a CWW capability is phased and consequently the outcome of sets of decisions. The question is rather whether these decisions create the political environment or whether they are the result of a reaction to it.

The exclusion of the environment reduces the discussion to fixing the point on the continuum beyond which a state becomes CW capable. Different criteria result in different lists of suspect countries. By projecting proliferation as a continuum, the debate ignores that the recipient country's quest for a CW capability is but an armament dynamic. In the absence of a domestic industrial base, obtaining chemicals, technology and knowledge from abroad is the second best option short of directly buying chemical ammunition. Viewed as such, the importation of these commodities is but one - albeit possibly the fastest - way of structuring the domestic armament dynamic. Proliferation thus deals less with the transfer of these commodities than with the organisation of the domestic political and military decision processes and their implementation. We therefore propose the following definition:

- CWW proliferation occurs when a political entity decides to acquire a CW capability where such a capability does not yet exist provided this decision is followed by a CWW armament dynamic.

- CWW deproliferation occurs as soon as the political commitment to that decision ceases to be renewed or if that political entity explicitly reverses that decision.

The armament dynamic within the proliferating country is the central part of the definition. This opens the way to apply the broad body of theoretical analysis developed over the past decades to the phenomenon. Although the different schools still have to provide a satisfactory overall explanation of the armament process, approaching proliferation in this way has at least two advantages. First, it demystifies the phenomenon as an entirely novel security threat. Although it possesses specific characteristics, it shares many more with armament and decision-making patterns studied in the industrialised world. Second, it breaks with the automatism between the initial decision to acquire a CW capability and the actual deployment or use of such munitions. By introducing deproliferation, it allows for reversals of decisions at any stage in the armament process. Dissenting views and opposing forces always play a role in decision-making. Indeed, insight into the political culture of a nation already goes a long way towards explaining some characteristics central in the current proliferation debate. (59)

Under this definition, the CWC undeniably aims at deproliferation. Accession and ratification constitute an unequivocal decision by a state party possessing or in the process of acquiring chemical weapons to abandon any intent of using, or further developing, producing, and stocking such weapons. Moreover, the fresh international norm the Convention will establish - if successful - may contribute to the deproliferation in non-state parties by weakening political commitments to CW armament programmes. The treaty also prescribes rules of conduct for states parties regarding non-states parties, which, among others, forbid any assistance in a CW armament programme. On the other hand, the CWC wishes to abolish any inequalities inherent in export control systems between member states and to enhance their economic and technological development without any discrimination. It therefore comes as little surprise that the treaty contains numerous references directly or indirectly related to CWW proliferation.

The CWC's confidence in the deproliferation regime is great. By firmly rejecting any hampering of economic and technological development of states parties as well as supporting international cooperation in the field of chemical activities, it stimulates the reproduction of the scientific, technological and industrial preconditions for CW armament programmes. The convention, therefore, does not consider the mere presence of the preconditions in a particular country as (part of) a threat to international security. This is the logical outcome of the clear policy decision states parties have made when acceding to the treaty. It is also a prerequisite for treating countries equal with respect to their economic interests under the CWC regime. Such confidence is, of course, the unintended, yet fortunate effect of one of the CWC's balances to overcome developing countries' apprehension that the convention would repeat the NPT's mistakes by shrining the industrial nations' lead and denying the rest

of the world similar development. The convention nonetheless supplements its deproliferation regime with some antiproliferation measures, for instance, by imposing a strict set of export regulations based on the three schedules of chemicals it defines as part of the verification regime.

Concluding remarks

CWW proliferation as it is discussed today may in fact refer to different processes and security policies depending on the context. National antiproliferation measures, whether coordinated in an international framework or not, address only that part of the issue that is readily visible to governments in the industrialised countries, namely the transfer of goods, technology, knowledge, and information to regimes in the developing world. However, increased global access to them and the trivialisation of technology, as well as competing domestic agendas in the developed world, ensure the failure of such policies.

Self-imposed supply-side restrictions to stem the spread of chemical weaponry are but the outcome of incremental policy-making modelled after the NPT regime. The solution has an important impact on the way the problem is viewed and leads to bean-counting exercises, a prerequisite for legitimising the export controls in an environment of free trade ideology. The most important consequence is the disregard of motives of certain regimes to acquire chemical weaponry.

The CWC, as a treaty aiming at deproliferation, holds the best promises for reducing chemical threats worldwide by building an environment of confidence and security. Some of the instruments it will employ, apart from verification, are aid and assistance in the area of CW defences and in case of an attack, and equal access to dual-use chemicals and technologies for all states parties. In that sense, the CWC will influence the demand-side with positive incentives.

In the Middle East, the UNSCOM reports on Iraq after its defeat in the second Gulf war have conveyed a message of failure of Western export controls rather than one of determination to halt expansionist regimes in their tracks. This has reinforced the belief that self-reliance based on a deterrence doctrine is a better security guarantee than a global disarmament regime. The ambiguity regarding capabilities and intentions inherent in deterrence is a major stumbling block even to achieve a regional security order. A major contribution of the CWC as a deproliferation regime may be breaking this deadlock. Indeed, adherence and ratification by all Middle Eastern states would constitute a great help to global and regional confidence-building, thus paving the way for new security-enhancing initiatives.

Notes

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1. The military lexicons of some countries include weapons that work through toxicity as well as items such as smoke and incendiaries under the heading chemical weapons. Chemical-warfare weapons refer only to weapons that work through toxicity, thus including the anti-personnel poison-agent weapons, harassing agents (e.g. tear gas), and anti-crop agents (e.g. herbicides). After J. P. Perry Robinson, "Chemical Weapons Proliferation in the Middle East", in E. Karsh, M.S. Navias and P. Sabin, eds., Non-Conventional-Weapons Proliferation in the Middle East. Tackling the Spread of Nuclear, Chemical and Biological Capabilities, (Oxford: Clarendon Press, 1993), p. 69.
2. A. H. Cordesman, "No End of a Lesson? Iraq and the Issue of Arms Transfers," The RUSI Journal 136:1 (Spring 1991), p.8.
3. Deployment plans for US binary munition resulted in heated political debates in some European NATO member states, including the Federal Republic of Germany, and almost led to the collapse of the coalition government in Belgium in 1986. [J. Badelt, Chemische KriegfÄhrung - Chemische AbrÄstung: Die Bundesrepublik Deutschland und das Pariser Chemiewaffen-Äbereinkommen, (Berlin:Berlin Verlag, 1994). J. P. Zanders, "The Debate on Binary Chemical Weapons in Belgium: The Act of 11 April 1962 Revisited," Vredesonderzoek 7, (Brussels, Vrije Universiteit Brussel, December 1992).] This controversy coincided with other antagonistic US and NATO policies, including the installation of intermediate-range nuclear missiles in Europe, the unilateral adoption of the highly destructive AirLand Battle doctrine by US forces and sustained talk in Washington about winnable limited nuclear war on the European continent.
4. The alarming rate is reflected in the Congressional testimonies of intelligence community officials. During the sixties seven countries were thought of having an offensive CW capability. The figure doubled in the next decade, increased to over twenty by the end of the eighties, and was predicted to reach thirty by the end of the century. [J. P. Perry Robinson, "The Supply-Side Control of the Spread of Chemical Weapons," in J. F. Rioux, ed., Limiting the Proliferation of Weapons: The Role of Supply-Side Strategies, (Ottawa: Carleton University Press, 1992), pp.57-59. K. C. Bailey, "Problems with a Chemical Weapons Ban," Orbis 36:2 (Spring 1992), p.240 + n.3.]
5. Documents as reproduced in: Findlay, Trevor, ed., Chemical Weapons and Missile Proliferation: With Implications for the Asia/Pacific Region, (Boulder, Co.:Lynne Rienner Publishers, 1991), Appendix III.
6. See L. A. Dunn, "Chemical Weapons Arms Control," Survival 31:3 (May/June 1989), p.219, for a late plea on using the expertise of nuclear export controls to stem CWW proliferation.
7. See for instance the Congressional testimonies as reproduced in

M.S. Meselson, "Behind the Nixon Policy for Chemical and Biological Warfare [Senate Committee on Foreign Relations, Hearing of 30th April 1969]," The Bulletin of the Atomic Scientists 24:1 (January 1970), at pp. 27, 32 and 34; in M.S. Meselson, "Tear Gas in Vietnam and the Return of Poison Gas [Defense Subcommittee, Senate Appropriations Committee, Hearing held in May 1970]", The Bulletin of the Atomic Scientists 27:3 (March 1971), at p.19; and in M.S. Meselson, "Gas Warfare and the Geneva Protocol of 1925 [Senate Committee on Foreign Relations, 26th March 1971]", The Bulletin of the Atomic Scientists 28:2 (February 1972), at pp.36-37. The sequence saw an increased stress on threats emanating from the proliferation of CW readiness. See also M.S. Meselson, "Chemical and Biological Weapons", in Herbert F. York, ed., Arms Control. Readings from Scientific American (San Francisco: W. H. Freeman & Company, 1973) at p.313. The point was also taken up by UK scientist J. P. Perry Robinson at a symposium held on 1 April 1974. (Julian P. Perry Robinson, "Some Implications of Binary Nerve Gas Weapons", in The Department of Chemistry and Public Affairs, eds., Chemical Weapons and U.S. Public Policy, (Washington, D.C.: American Chemical Society, November 1977), p. 12.

8. L. Freedman, "The Proliferation Problem and the New World Order", in E. Karsh, M.S. Navias and P. Sabin, eds., op.cit., p. 165.
9. cf. K. Waltz, "The Spread of Nuclear Weapons: More May Be Better", Adelphi Papers 171 (London: IISS, Autumn 1981).
10. See, for instance, the contributions in: Z. S. Davis, B. Frankel, eds., The Proliferation Puzzle: Why Nuclear Weapons Spread (and What Results)", Security Studies, 2:3/4 (Spring/Summer 1993).
11. D. Feith, "Three Obstacles to Effective Implementation of Chemical-Weapons Control", in K. M. Jensen, D. Wurmser, eds., Is It Feasible to Negotiate Chemical and Biological Weapons Control?, Dialogues from Public Workshops 4 (Washington, D.C.: United States Institute of Peace, 1990), pp. 36-39. Based on the thought that "no country in history has initiated chemical warfare against an enemy that had, at the time, a retaliatory capability" (p.37) he concluded that *"The most effective way to influence the cost-benefit analysis of initiating chemical warfare - which is to say the most effective way available right now to address the chemical-weapons problem - is for potential victims to have the ability to retaliate in kind, and to prepare their forces with defensive gear, medical capabilities, and detection equipment. That, to my mind, is a much more effective means than an arms- control treaty, given the unfortunately primitive state in which international law exists, rendering it, for all practical purposes, impotent to deal with violations.*
"The military route promises the greatest chance of addressing violations and reducing the danger that they pose to us and to others. Does that mean that proliferation is a good thing or a bad thing? The answer is: It depends on the country. If a country that is fundamentally law abiding, a country on our side - such

as Britain - were to obtain a chemical-weapons capability, I believe the danger of initiation of chemical warfare in the world would be reduced. If countries such as Libya, Syria, Iraq, and the Soviet Union were to obtain or increase their chemical-weapons capabilities, that would be a bad thing because the chances of chemical warfare in the world would be increased." (p. 38)

12. Many authors have of course advocated the spread of CW defences because these reduce any military advantage an attacker might hope to gain from CWW use significantly and therefore the overall attractiveness CWW might hold for potential proliferators. Article X of the Chemical Weapons Convention endorses such a view.
13. Cf. J. D. Douglass Jr., N. C. Livingstone, America the Vulnerable. The Threat of Chemical and Biological Warfare, (Lexington, Ma.:Lexington Books, 1987). H. J. McGeorge II, "The Deadly Mixture: Bugs, Gas, and Terrorists," NBC Defense and Technology International 1:2 (May 1986), pp.56-61. For an early view on how novel binary munitions may thwart terrorist and criminal designs, F. R. Frank, "Binary Chemical Munitions and the Proliferation of Chemical Warfare Capabilities" in The Department of Chemistry and Public Affairs, eds., Binary Weapons and the Problem of Chemical Disarmament, (Washington, D.C.: American Chemical Society, December 1977), pp.11-12.
14. See note 7.
15. E.g. M. Hamm, "Deterring Chemical War: The Reagan Formula," Backgrounder 272, (Washington, D.C.:The Heritage Foundation, 15 June 1983), 21p. M. Hamm, "Deterrence, Chemical Warfare, and Arms Control," Orbis (Spring 1985), pp. 119-163. M. Hamm, "Biochemical Warfare: Deterrence vs. Arms Control," Contemporary Review (March 1985), pp.127-134. J. Hemsley, The Soviet Biochemical Threat to NATO: The Neglected Issue, RUSI Defence Studies Series (Basingstoke: MacMillan, 1987); A. H. Hoeber, The Chemistry of Defeat: Asymmetries in U.S. and Soviet Chemical Warfare Postures. (Cambridge, Ma.:Institute for Foreign Policy Analysis, December 1981). A. H. Hoeber, J. D. Douglass Jr., "The Neglected Threat of Chemical Warfare," International Security, 3:1 (Summer 1978), pp. 55-82.
16. E.g. P. Herby, "Beyond Partial Measures," in J. P. Zanders, E. Remacle, eds., Chemical Weapons Proliferation. Policy Issues Pending an International Treaty. Proceedings of the 2nd Annual Conference on Chemical Warfare. (Brussels: Centrum voor Polemologie, Vrije Universiteit Brussel, 1991), pp. 93-102. J. P. Perry Robinson, "Chemical Weapons Prolifera-tion: Security Risks", in J. P. Zanders, E. Remacle, eds., op.cit. pp. 69-92.
17. K. C. Bailey, "Ballistic Missile Proliferation: Can It Be Reversed?" Orbis 35:1 (Winter 1991), p.10.
18. M. A. Heller, "Ballistic Missile Proliferation: Coping with It in the Middle East," Orbis 35:1 (Winter 1991).
19. See for instance M. Meselson in: C. Moss Helms; M. Meselson; B. Roberts, Chemical Weapons and Security in the Middle East, Proceedings from a Congressional Briefing, (Washington,

D.C.:American Association for the Advancement of Science, 11 September 1990), at p. 16.

20. S. Fetter, "Ballistic Missiles and Weapons of Mass Destruction," International Security 16:1 (Summer 1991), p. 41.
21. K. C. Bailey, "Problems with a Chemical Weapons Ban", op.cit., p.240.
22. G. S. Pearson, "Biological Weapons: Their Nature and Arms Control," in E. Karsh, M. S. Navias and P. Sabin, eds., op.cit, pp. 99-134. J. E. Stern, Will Terrorists Turn to Poison? Orbis 37:3 (Summer 1993), pp. 393-412.
23. Chlorine at the end of the 18th century; phosgene in 1812. The blistering action of mustard gas had already been described around 1880.
24. L. F. Haber, The Poisonous Cloud. Chemical Warfare in the First World War, (Oxford:Clarendon Press, 1986), pp.15-16.
25. Ibid., p.15; D. Richter, Chemical Soldiers. British Gas Warfare in World War I. (Lawrence:University Press of Kansas, 1992), pp.15-16.
26. The Declaration of St Petersburg of 1868 to the Effect of Prohibiting the Use of Certain Projectiles in Wartime; The International Declaration concerning the Laws and Customs of War (Brussels Conference, 1874); the Annex to the Hague Conventions of 1899 and 1907.
27. Regarding fact and fiction, as well as reported research proposals in Great Britain, France, and Germany, see L. F. Haber, op.cit., pp. 19-21.
28. Under generation is understood a certain set of proliferation characteristics which occurred for the first time at a certain stage in the history of CW, but which may be reproduced later at different locations without necessarily following the historical order.
29. Throughout his book, L. F. Haber, op.cit., details many of the examples in this paragraph.
30. Germany until 1945 remained the exception. However, regarding proliferation both the military and governmental agencies remained the key actors.
31. J. P. Zanders, "The Destruction of Old Chemical Munition in Belgium," paper delivered to the conference The Challenge of Old Chemical Scrap-Munition and Toxic Armament Wastes held at the Wehrwissenschaftliche Dienststelle der Bundeswehr fÄr ABC-Schutz, Munster (FRG), organised by the Stockholm International Peace Research Institute, 18-21 October 1993.
32. R. Kunz; R. D. MÄller, Giftgas gegen Abd el Krim. Deutschland, Spanien und der Gaskrieg in Spanisch-Marokko 1922-1927, Einzelschriften zur MilitÉrgeschichte 34 (Freiburg:Verlag Rombach, 1990), chapter iv.
33. Peacetime daily production was to be 1 ton of mustard gas, 1.5 tons of phosgene, and 1.25 tons of Dick (ethyldichloroarsine). The plant included the corresponding filling facilities for shells, bombs, and grenades. (Ibid., p.68.)
34. Ibid., p.69. Great Britain in particular wished to retain control over the Straits of Gibraltar and supported Spain's colonial war because in case of defeat France would dominate over the whole of Morocco.

35. J. P. Perry Robinson, "Origins of the Chemical Weapons Convention," in B. Morel, K. Olson, eds., Shadows and Substance: The Chemical Weapons Convention, (Boulder, Co.:Westview Press, 1993), p.39.
36. R. Kunz, R. D. MÄller, op.cit., pp. 23 + 59.
37. M. van Zelm, "Verification of the Destruction of CW Agents. The Obong Operation," in H. G. Brauch, ed., Verification and Arms Control: Implications for European Security, The Results of the Sixth AFES-PRESS Conference, Part 1: Abstracts and Discussions. AFES-PRESS Report 35 (Mosbach, FRG, 1990). The Netherlands destroyed the remainder of the stock between 1978 and 1979 at the request of the Indonesian government.
38. Other theories on the origin of Egyptian CWW exist, but strong doubts about their validity persist. See: SIPRI, Chemical and Biological Warfare, Volume I: The Rise of CB Weapons, (Stockholm:Almqvist & Wiksell, 1971), p. 161; SIPRI, Chemical and Biological Warfare, Volume V: The Prevention of CBW, (Stockholm:Almqvist & Wiksell, 1971), p. 227.
39. R. Harris, J. Paxman, A Higher Form of Killing. The Secret Story of Gas and Germ Warfare, (U.K.:Triad/Granada, 1983), pp.173-183. Hansard (Commons), Vol. 202, nž43, col. 16, Written Answers, 20 January 1992 (As quoted in the Chemical Weapons Convention Bulletin 15 (March 1992), p. 14, lemma 20 January 1992).
40. United States General Accounting Office, Israel: Use of U.S.-Manufactured Tear Gas in the Occupied Territories, GAO/NSIAD-89-128 (Washington, D.C.:GAO April 1989).
41. For detailed analysis, see J. P. Zanders, "Mechanisms behind the Imhausen-Rabta Affair," in J. P. Zanders, E. Remacle, eds., op.cit., pp. 3-40.
42. A. H. Cordesman, After the Storm. The Changing Military Balance in the Middle East, (Boulder, Co.:Westview Press, 1993), p.152.
43. A. Darwish, "Libya Building Poison-Gas Plant," The Independent, 16 February 1993, p. 9. D. Jehl, "Libya Building a Poison Gas Factory, U.S. Intelligence Says," International Herald Tribune, 19 February 1993, p. 7. (-), "Thais Prepare for U.S. Attack on Libyan Plants," International Herald Tribune, 5 October 1993, p. 6. (-), "Thais Won't Be Expelled, Libyan Says," International Herald Tribune, 24 November 1993, p. 5.
44. A. Wellmann, Weiterverbreitung chemischer Waffen: Zum Beispiel Irak. Beschaffung und Einsatz chemischer Waffen durch den Irak 1980-1990, Arbeitspapiere der Berghof-Stiftung fÄr Konfliktforschung 44 (Berlin:Berghof-Stiftung fÄr Konfliktforschung, 1991), pp.16-29.
45.
    - Bonn stoppt Giftgas-Frachter. Frankfurter Rundschau, 10 August 1992.
    - Bonn lÉ¤t Frachter mit Giftgas-Chemikalien Stoppen. Frankfurter Allgemeine Zeitung, 10 August 1992, p. 2.
    - Poison Gas for Syria Is Intercepted. International Herald Tribune, 10 August 1992, p.2. Arms Control Reporter, 1992, p. 704.E-2.66.
46. K. C. Bailey, Doomsday Weapons in the Hands of Many. The

Arms Control Challenge of the '90s, (Urbana and Chicago:University of Illinois Press, 1991), pp. 61-62.

47. Arms Control Reporter, 1993, p.704.E-2.94; M. Richardson, "U.S. Asks Asians to Help Curb Weapons," International Herald Tribune, 27 July 1993, pp. 1+4.
48. If China and Iran - presently signatories - become state parties to the CWC, it is doubtful that the USA would be able to trigger a challenge inspection simply on the basis of the transaction. Schedule 2 chemicals can according to Part VII, Ű31 of the Verification Annex be transferred to or received by other states parties. Contrary to the provisions relating to Schedule 1 chemicals (Part VI), no quantitative limits or reporting requirements for such transactions are included. Installations producing or processing such compounds above specified quantities must be declared and are subject to verification and inspection routines. Schedule 3 chemicals may even be transferred to states not party to the CWC provided the recipient country certifies that these will not be used for purposes prohibited by the convention following the requirements in Part VII, Ű26.
49. N. Kristof, "China Accuses U.S. of Halting Ship, Denies It Carries War Chemicals," International Herald Tribune, 9 August 1993, p. 2.
    - "China Assails U.S. on Suspect Ship, International Herald Tribune, 12 August 1993, p. 2. Editorial, "Poison Gas on the Way?," International Herald Tribune, 12 August 1993, p. 4. L. Weymouth, "Link China's Trade Status to Arms Sales, Not Rights," International Herald Tribune, 13 August 1993, p. 6.
    - "U.S. Says Suspect Ship Is near Iran," International Herald Tribune, 17 August 1993, p. 2.
    - "Saudis Await 'Arms' Ship," The Independent, 26 August 1993, p. 15. J. Mann, "U.S. Dispute with China Deepening to Hostility," International Herald Tribune, 27 August 1993, pp. 1+4. P. Reeves, "US and China Set to Clash after Sanctions," The Independent, 27 August 1993, p. 9. Arms Control Reporter, 1993, pp. 704.E-2.101-103.
50. J. P. Perry Robinson, "Origins of the Chemical Weapons Convention", op.cit., table 4.3.
51. A realist school of thought will most likely influence such a government's security policies, accentuating the prominence of external security threats in the discourse.
52. M. Brzoska, "Behind the German Export Scandals," The Bulletin of the Atomic Scientists, 45:6 (July 1989), p. 33.
53. From a press-release by Foreign Minister Genscher, 19 January 1987, as quoted in Stichworte zur Sicherheitspolitik, Presse- und Informationsdienst der Bundesregierung, (Bonn, February 1987), p. 48.
54. Unterrichtung durch die Bundesregierung, Bericht der Bundesregierung an den Deutschen Bundestag Äber eine műgliche Beteiligung deutscher Firmen an einer C-Waffen-Produktion in Libyen. 11. Wahlperiode, Drucksache 11/3995 (Bonn:Deutscher Bundestag, 15 February 1989), 15p.
55. Such active governmental involvement certainly blurs the

distinction between 1st and 2nd generation proliferation, which, in any case, should be considered ideal types. Acquiescence in private companies' involvement in the Libyan Rabta project explains to a large extent the German government's reluctance to take action after the initial American complaints. Some of these firms had already been linked to Iraq's CW programme. Such duplicity is also illustrated by the prosecution of the UK based company Matrix-Churchill for delivering tools and machinery to Iraq despite governmental knowledge that executives were informants for the British intelligence services. The fuzziness between the three ideal types underscores our basic argument that the traditional approach to the proliferation issue misses many of the actors, their role and motives.

56. D. Männig, "At the Conclusion of the Chemical Weapons Convention: Some Recent Issues Concerning the Chemical Industry," in B. Morel, K. Olson, eds., op.cit., pp.134-135. The author also points to similar costs from strict environmental legislation which exceed limits imposed in neighbouring countries.
57. The broad consensus regarding the eventual failure of list-based export controls and the ever rising financial and political costs of its implementation have led to policy ideas to introduce "catch-all" controls. In Figure 1, these would coincide with the base line of area 3 and could be seen as a measure to preempt rather than follow the progression along D D. Such generic controls, however, would involve other areas such as, for example, "intangible technology transfers", that is knowledge taken back by foreign students to their home country. In the U.K., the idea that universities would have to vet foreign applicants caused a considerable degree of controversy.
58. J. P. Perry Robinson, "Chemical Weapons Proliferation in the Middle East," op.cit., p. 47.
59. The definition will be difficult to make operational from a policy analyst's point of view. It cannot answer a question like 'who has taken the decision when'. However, it is meant as an instrument to gain deeper understanding of a process and not as one for bean-counting countries in the developing world. Nevertheless, future research applying the results of theoretical analysis of armament dynamics may allow for greater differentiation.
