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‘This war for men’s minds’: the birth of a human science in Cold War America

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Abstract

The past decade has seen an explosion of work on the history of the human sciences during the Cold War. This work, however, does not engage with one of the leading human sciences of the period: linguistics. This article begins to rectify this knowledge gap by investigating the influence of linguistics and its concept of study, language, on American public, political and intellectual life during the postwar and early Cold War years. I show that language emerged in three frameworks in this period: language as tool, language as weapon, and language as knowledge. As America stepped onto the international stage, language and linguistics were at the forefront: the military poured millions of dollars into machine translation, American diplomats were required to master scores of foreign languages, and schoolchildren were exposed to language-learning on a scale never before seen in the United States. Together, I argue, language and linguistics formed a critical part of the rise of American leadership in the new world order – one that provided communities as dispersed as the military, the diplomatic corps, scientists and language teachers with a powerful way of tackling the problems they faced. To date, linguistics has not been integrated into the broader framework of Cold War human sciences. In this article, I aim to bring both language, as concept, and linguistics, as discipline, into this framework. In doing so, I pave the way for future work on the history of linguistics as a human science.

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In this war for men's minds, obviously the big guns of our armament are competence in languages and linguistics.

(Mortimer Graves, 1951, quoted in Newmeyer, 1986: 56)

Those words, spoken by Mortimer Graves in 1951, capture the enormous strategic importance of language and linguistics in America's battle to lead the free world during the early Cold War. Men's minds would only be won over, politicians and military leaders agreed, if America developed the capacity to communicate with and understand both allies and foes. As America stepped onto the international stage, language and linguistics impacted in political, intellectual and public arenas: the military poured millions of dollars into language-related projects, American diplomats were required to master scores of foreign languages, and schoolchildren were exposed to language-learning on a scale never before seen in the United States. This article explores the emergence of language as tool, weapon and knowledge in postwar and early Cold War America.

The past decade has seen an explosion of work on the history of the human sciences in the postwar and Cold War period. They are the subject of dozens of articles, dissertations, conference panels, edited volumes and journal special issues.¹ In a recent review article, Joel Isaac calls the history of Cold War human sciences 'a genuinely interdisciplinary research field' which has been 'booming' for the past 15 years (Isaac, 2007: 725–6). This work has begun to challenge and shape our perception of the Cold War era – an era in which the human sciences were being defined and redefined as they were applied to domestic and foreign social and political problems.

Three threads dominate the existing postwar human science historiography: disciplinary histories (namely, histories of psychology, economics, anthropology, sociology and political science), area studies histories (namely, accounts of Russian, Slavic, Chinese and Latin American studies) and thematic works (focusing on patronage, controversies, and social critique/social reform).² While the Cold War era was one greatly influenced by a new conception of language and linguistics, these topics are barely explored in this literature. Within the literature, linguistics appears most prominently in Jamie Cohen-Cole's brilliantly titled 2003 dissertation 'Thinking about Thinking in Cold War America' and his 2005 article 'The Reflexivity of Cognitive Science: the Scientist as Model of Human Nature'. Cohen-Cole highlights the impact of Noam Chomsky's linguistics work on the fall of behaviorism and the rise of the cognitive science paradigm. Linguistics also comes to play in studies of postwar psychology (Mandler, 2002; Miller, 2003), the cybernetics and computing movements (Edwards, 1996; Mirowski, 2002), and area studies, where foreign language and translation capacities were key (Adorno, 2006; Engerman, 2006). Throughout this literature, linguistics is treated not as a full, comprehensive discipline of study, but as a supporting resource. These works emphasize three main aspects of postwar linguistics: Chomsky's contributions to psychology, philosophy and formal language theory; the specific role played by other individual linguists in the psychological and area studies communities (namely, Jerry Fodor's and Jerrold Katz's

role in the rise of cognitive psychology and Roman Jakobson's role in Slavic studies at Harvard); and the place of foreign language teaching in area studies. While this treatment of linguistics is entirely reasonable within these works given their big picture interests, it leaves the impression that linguistics played only a supporting role in the postwar era. This is, however, entirely misleading: in the postwar years, linguistics came into its own as a full academic discipline with a vibrant and influential community, and greatly impacted on American public, political and intellectual life. Moreover, linguistics and other human sciences faced similar challenges and underwent parallel transformations through the postwar decades (Martin-Nielsen, 2010). To fully understand and appreciate postwar linguistics, I propose that a different historical perspective is needed: one that treats linguistics head-on.

While linguistics is largely absent from postwar human science historiography, there is a small history of linguistics-specific literature. As it pertains to postwar American linguistics, this literature comprises two phases. In the 1980s, it was dominated by extremes: Whig interpretations of the success of Noam Chomsky's linguistics program (Newmeyer, 1980, 1986), and often bitter accounts of the decline of rival linguistics schools (Gleason, 1988; Hall, 1987). The 1990s brought revisionist histories intended to correct the work of the previous decade (Harris, 1993a; Huck and Goldsmith, 1995; Matthews, 1993). While these works make important contributions, they are narrowly discipline-centric and do not engage with the broader postwar and Cold War human science literature. More recently, a small number of historians of science has begun to integrate the history of linguistics into this broader literature, but this work is still in its infancy (Loring, 2008; Martin-Nielsen, 2009, 2010; Tomalin, 2006).

This article aims to bring both language, as concept, and linguistics, as discipline, into the historiographic fold of the postwar human sciences. It comprises four sections. Section I provides an overview of the state of language and linguistics in America before the second world war. It establishes the background necessary for understanding my arguments. The next three sections investigate the three frameworks of language in postwar and early Cold War America: language as tool (section II), language as weapon (section III) and language as knowledge (section IV). Through a diverse set of lenses from diplomacy to science to machine translation to language-teaching, I show that language and linguistics played a vital role in the rise of American leadership in the new world order. In doing so, I pave the way for future work on the history of linguistics as a human science.

I: Language and Linguistics in pre-Second World War America

In the first half of the 20th century, language and linguistics had little impact in American political, academic and public spheres. Served by an education system with minimal language variety and impacted by the interwar Americanization movement, schoolchildren had few opportunities for foreign language learning. At the same time, linguistics had the status of a pre-professional discipline with little formal structure or independent university presence. This section explores the role and status of language and linguistics in pre-Second World War America, setting the stage for understanding the changes which would dramatically alter both concept and discipline in the postwar years.

Before the Second World War, foreign language teaching in America passed through two distinct phases, one on each side of the Great War. In the early part of the century, the vast majority of students who studied a language other than English learned Latin – a holdover from British colonial rule, during which colleges had required Latin and Greek. Advocates of teaching modern foreign languages battled those who favored classical languages for ‘legitimacy and space’ in the high school system (D. M. Herman, 2002: 5; Leeman, 2007). The result was a moderate take-up of German and French and a very low take-up of Spanish: in 1910, 23.7% of American public high school students were enrolled in German courses; 9.9% in French courses; 0.7% in Spanish courses; and a full 49% in Latin courses (Draper and Hicks, 2002: 5). Importantly, however, the teaching of German, French and Spanish had a decidedly classical flavor: students were taught to read and translate using texts which were considered to embody high culture (such as *Faust* and *Don Quixote*), and curricula placed little emphasis on communication. In this way, historian of education Deborah Herman has noted, the school system ‘ensured that interaction with living representatives of other cultures would not be the goal of classroom learning’ (D. M. Herman, 2002: 8).

In the interwar years, the burgeoning foreign language teaching system in American schools underwent three drastic changes. All of these changes contributed to a decline in foreign language teaching, but for different reasons. First, Latin experienced a steady downward slide as educationalists became increasingly convinced of its irrelevance to modern America. Latin enrollment in public high schools fell from 37.3% in 1915 (immediately after the First World War began) to 22% in 1928 to 16% in 1934 (Draper and Hicks, 2002: 5). Second, German-language teaching collapsed entirely after the United States entered the First World War in 1917 (Benseler *et al.*, 1988, Ross, 1994). Linked in the public mind with German aggression and support for the Central Powers, the German language disappeared from high school curricula: whereas between 1905 and 1915, nearly a quarter of American public high school students were enrolled in German courses, by 1922 the enrollment figure had dropped to just 0.6% of all public high school students (Draper and Hicks, 2002: 5). The following years saw slight increases, but the numbers remained well below their pre-war levels: by 1934, only 2.4% of public high school students were taking German-language courses (*ibid.*).

The third change to hit American foreign language teaching in the interwar period is one immersed in fundamental changes to the nation’s cultural and social fabric. The anxieties of the First World War itself were compounded by a massive wave of immigration which, between 1900 and 1917, brought over 17 million newcomers to America, most of them from southern and eastern Europe. Established Americans, who were primarily of northern European descent, saw the scale of the influx and the provenance of the immigrants as ‘threatening the racial and cultural identity of the United States’ (Leeman, 2007: 5). The resulting nativist backlash had immense impact on the languages taught to schoolchildren. Languages other than English came to be seen as un-American, unpatriotic and unsuitable for classroom use (D. M. Herman, 2002; Leeman, 2007; Tyack, 1974). On the flipside, ‘the English language in and of itself was believed to carry such ideas as democracy and capitalism, thus making encouragement (or coercion) to speak English particularly important to those who felt America’s true culture and nature were being invaded by radicalism and Bolshevism’

(D. M. Herman, 2002: 10). Through the interwar period, Americanization programs promoted English-language-only education in order to assimilate immigrants and fragment communities of foreign language speakers. More strongly, many states banned foreign language instruction outright in both public and private schools (Benseler *et al.*, 1988; D. M. Herman, 2002). The result was a steep decline in the availability of foreign language education: between 1922 and 1934, the percentage of public high school students enrolled in Spanish courses fell from 11.3% to 6.2%, and in French from 15.5% to 10.9% (Draper and Hicks, 2002: 5). Together, these three changes meant that foreign language courses were difficult to come by and surrounded by suspicion in the interwar period. The choices for students were few and far between.

This dearth of foreign language teaching was especially frustrating to William Moulton, a linguist and an expert in Germanic languages who spent his career at Cornell and Princeton. In his 1962 address to the Ninth International Congress of Linguists (held in Cambridge, Massachusetts), Moulton complained that, in the interwar era, ‘there was very little foreign language learning going on [in America]’, and the ‘schools and colleges of the nation [produced] few persons with a practical control of the familiar languages’ (Moulton, 1970: 82–4). ‘In the high schools, relatively few pupils studied a foreign language; and of those who did, relatively few kept it up for more than two years’, he continued: ‘[p]upils who were learning French, for example, often dropped it after two years of study because, as was the common phrase, “I’ve already had French”’ (ibid.: 82–3). Moulton’s comments add a third dimension to the picture: not only was the language selection essentially limited to French and Spanish, and not only were foreign languages deemed unpatriotic by nativist Americans, but also those students who managed to study a foreign language did so only for a very short period of time.

If language was a relatively docile beast in pre-Second World War America, then linguistics – the study of language – was equally placid. While it was used in anthropology, literature studies, classics and analytic philosophy, linguistics enjoyed few of the hallmarks of a professional discipline: there were no university linguistics departments or degrees, few national meetings and conferences, and linguists had little independence in academia.³ In the late 1920s, Archibald Hill of the University of Texas at Austin recalls, linguistics was subordinate to English: it was something that ‘had to be gotten out of the way before a real study of texts could begin’, and universities typically employed ‘one linguist, and heaven knows, no more’ (Hill, 1979: 73). These pioneering linguists had little training in their discipline of choice, and often took positions in related disciplines from literature to philosophy to anthropology. ‘If I try to summarize the kind of education I had been given’, continues Hill (1902–92), who studied at Stanford and Yale, ‘it must be said that linguistics was slighted. There were no departments or even programs with that name. I managed to sneak in as much linguistics as I could, but I would have been deeply grateful for a lot more’ (Hill, 1979: 72). For Stanford sociolinguist Charles Ferguson (1921–98), who trained at the University of Pennsylvania, there was ‘no department of linguistics and no “major” in linguistics, either undergraduate or graduate’ (Ferguson, 1998: 45). For others, from Dwight Bolinger to Sydney Lamb (who studied, respectively, at the Universities of Kansas and Wisconsin, and at Yale), linguistics per se was a field of study they became aware of only after years of post-secondary education.

What little support the discipline received in the pre-war years came from the Linguistic Society of America, a professional body formed in 1924 to provide an institutional backbone to a fledgling field of study.⁴ From the outset, the Linguistic Society successfully fostered a sense of community among American linguists – and with community came communication: a year after its inauguration, the Linguistic Society launched a journal, *Language*, which for decades dominated the linguistic journal system in America. The Linguistic Society also encouraged the exchange of ideas through its twice-yearly meetings and its annual Linguistic Institutes. Begun in 1928, Linguistic Institutes were held every summer on a university campus, making available courses and guest lectures to students whose home universities offered little in the way of language study.

Linguistics received a further boost from a father of American structuralism, Leonard Bloomfield, who was determined to build his field of study into a respected scientific discipline. Born in Chicago in 1887, Bloomfield spent his career as a German instructor at the University of Illinois (1913–21), in the Department of German and Linguistics at Ohio State University (1923–40) and, finally, as Sterling Professor of Linguistics at Yale. While his early work focused on German and Tagalog, he soon became interested in Amerindian languages and produced groundbreaking studies of Algonquin (spoken in the Great Lakes region) and Menominee (spoken in north-eastern Wisconsin). It is, however, Bloomfield's contribution to the systematization of linguistics for which he is best known. Beginning in 1914 with the publication of his *An Introduction to the Study of Language*, Bloomfield worked throughout his career to build the study of language into a science – one that treated natural language as a phenomenon conducive to formal study, analysis and understanding, similar to the phenomena studied by physicists and chemists. His linguistics program, 'Descriptivism', and his 1933 textbook *Language* dominated linguistic thought and linguistic learning in America until the early 1950s.⁵ Central to his Descriptivist program was the belief that a logical empiricist and behaviorist philosophy would raise linguistics into the fold of the natural sciences. The resultant method – described by Bloomfield as 'a scientific process [which] abstract[s] from a series of actual speech utterances ... their systematic patterning' – provided the young discipline with an ambitious and relevant research program (Bloomfield, 1927: 218).

Even as the 1920s and 1930s endowed American linguistics with a professional society, a textbook and a research program, still linguists labored under the shadow of a diverse set of disciplines from English to anthropology to classics to philosophy. Linguistics was seen not as a field of study in its own right, but as a tool to be used variously for understanding and preserving Amerindian culture, for studying ancient forms of Greek and Latin, for analysing verse and prose, and for investigating familial connections between language groups. The application-intensive nature of linguistics at this time is clearly seen in the publication record of *Language* for its first 10 years of existence (1925–35): the leading topics are Amerindian languages (12 articles), Latin, Italic and ancient Greek (30 articles), and philological, historical and familial investigations of Indo-European languages (over 50 articles).⁶ The idea of linguistics as an independent field of study had yet to take hold in America.

The pre-professional nature of linguistics in pre-war America was compounded by the isolationism of its practitioners and ideas. At this time, American linguists were little

influenced from outside. While the Prague, Copenhagen and Firthian Schools were making waves in European linguistic circles, their ideas did not cross the ocean to the New World. The self-containment of American linguistics in the first half of the 20th century is widely recognized by commentators. '[N]ew or contrary ideas' mattered to American linguists, wrote P. H. Matthews in his seminal 1993 study, only 'when they arose in response to a problem recognized in America at the time, and come from members of the American community' (Matthews, 1993: 50).

The root cause of this isolation was the very different set of problems faced by linguists in America and in Europe. From the early 19th century on, linguistics research in America was largely embedded in anthropology and directed towards Amerindian languages (Andresen, 1990). In the years following the War of 1812, as Americans headed west, encounters and interactions with Amerindians became commonplace. Beginning with John Pickering's 1823 study of the Cherokee language, assisted by an informant known as David Brown, investigations of Amerindian language and culture became a source of curiosity, intellectual interest and religious purpose.⁷ 'The native Indian population in America presented theoretical research problems and practical administrative problems which required expert linguistic knowledge for their solution', writes Bertil Malmberg: '[p]artly it was necessary for sheer practical reasons (e.g. missionary work) to be able to speak their native languages. Partly it was because the analysis of the Indian languages soon came to be a necessary complement to an integral part of the study of native culture, social structure, religion, myths and traditions' (Malmberg, 1964: 159–60).

Fieldwork in Amerindian communities remained of prime importance through the first half of the 20th century, when it went hand in hand with apprenticeship in the linguistics profession. The leading American linguists of this time – from Franz Boas to Edward Sapir to Leonard Bloomfield – were experts in Amerindian languages and cultures, and intense exposure to these languages was an initiation rite for a generation of linguists. Among others, Charles Hockett began his career with a study of Potawatomi (spoken in the upper Mississippi River region), C. F. Voegelin with Algonquin (Great Lakes region), and Kenneth Pike with Mixteco (central Mexico) (Hockett, 1939; Pike, 1944; Voegelin, 1935). With these priorities, pre-Second World War American linguists concentrated not on theory, but on field methods: linguistics was a matter of elicitation, recording and description, and its practitioners had little time for theoretical argumentation or abstract reasoning. Firmly integrated into Boasian anthropology, this work was essential to debunking the Indo-European-centric assumption of a single historical process for language evolution and to establishing genetic classifications for Amerindian languages (Andresen, 1990; Darnell, 2001; Murray, 1993). The foundation of the Christian organization SIL International in 1934,⁸ followed in 1942 by the Wycliffe Bible Translators, provided an institutional backbone to build on this work, further intensifying efforts to apply linguistics to missionary and Bible translation pursuits (Benthall, 1982; Brend and Pike, 1977; Hvalkof and Aaby, 1981). In its first quarter-century, SIL International trained over 4,500 missionaries and sister workers in linguistic theory, and has for over seven decades been the foremost producer of descriptive language studies in America. Together, fieldwork and missionary pursuits shaped all aspects of pre-war American linguistics.

The focus of American linguists on the description and analysis of previously unwritten languages among native populations was in stark contrast to the pursuits of European linguists at the same time. In Great Britain and on the continent, linguists concentrated on semiotics, functional linguistics and historical language analysis. This bifurcation of interests, underpinned by a bifurcation of task and culture, led to the isolation and self-containment of American linguistics through the 20th century.

In the decades preceding the Second World War, neither language nor linguistics played a significant role in American public or academic life. The concept of language did not loom on the American conscience, and the associated discipline enjoyed little recognition in academia. This situation was to change rapidly and dramatically during the Second World War, when American linguistics rose to prominence as a strategic and independent professional discipline. In the postwar and early Cold War years, language grew to greatly influence American public, intellectual and political life. In doing so, it emerged in three frameworks – frameworks that are investigated in the following sections of this paper: language as tool (section II), language as weapon (section III) and language as knowledge (section IV).

II: Language as Tool

In the postwar and early Cold War climate – one that emphasized international cooperation and one in which America sought a leading role – the linguistic isolationism of the pre-war years quickly came to be seen as a weakness. If America was to play a central role in the new world order, politicians, diplomats and scientists all agreed, it would need to be able to communicate and cooperate with allies around the world. This was an era in which language came to be seen and wielded as a tool – a tool for America’s diplomatic and scientific interlocutors, a tool necessary for securing America’s coveted place as the leader of free nations. This section explores the influence of ‘language as tool’ on America’s ability to reach beyond its borders and establish an international presence.

In 1939, before America’s involvement in the war, Mortimer Graves – then the executive secretary of the American Council of Learned Societies (ACLS) – voiced the need for America and Americans to develop competence, and quickly, in foreign languages. The paucity of foreign language teaching in American schools, he argued, meant that Americans lacked the ability to function in languages other than English (Moulton, 1970). As a private and non-profit federation of scholarly organizations in the humanities and social sciences, the American Council of Learned Societies had long been involved in linguistics: in the 1920s the council supported the effort of linguists to ‘secure an adequate record of Indian languages and dialects’, and it funded the first Linguistic Society of America Linguistic Institute, held at Yale in 1928 (ACLS, 1928: 53). With additional funding from the Rockefeller Foundation – the most significant patron of American social science and medicine between the two world wars – Graves created the Intensive Language Program, which aimed to expand the expertise of American linguists from Amerindian languages to the potentially strategic languages of the world, and to spread this expertise through language instruction. The Intensive Language Program gained its first linguists in 1941 and, within two years, was offering ‘no less than 56 courses, in 26 languages, at 18 universities, involving a total of some 700 students’ (Moulton, 1970: 85).

Graves's concerns about the lack of linguistic capacity among young Americans soon came to be shared by the American military. In the spring of 1943, the military piggybacked on the Intensive Language Program and greatly expanded its efforts in Washington and New York City.⁹ Linguists already in the draft were pulled from their duties and put to work on language-related problems, and linguists not yet involved in the war effort were brought into the Intensive Language Program. They worked on developing language-learning materials, dictionaries and phrase books for a plethora of languages identified by the military as being of immediate or potential importance to Allied security and intelligence. Within a year of the launch of the joint civilian–military effort, 15,000 members of the American armed forces were being trained in over 27 languages on more than 50 university campuses across the country (Moulton, 1970: 85). This language instruction aimed to develop practical language ability in the shortest time-frame possible, for immediate use by officers heading overseas and for future use in postwar activities.

Linguists tackled their language-teaching work with the same methods they had successfully employed for decades in their analysis of Amerindian languages: faced with an unfamiliar language, they were able 'very quickly to prepare preliminary analyses [and] phonemic transcriptions', and to translate these tools into classroom materials (Gleason, 1965: 49). Time and confidence were indeed of the essence: when he was assigned to teach conversational Chinese to officers en route to join General Stillwell's campaign in China, Charles Hockett had no knowledge of Chinese languages. 'I had had training in linguistics and in those days we were claiming that that was enough', he wrote in a 1980 autobiographical piece: 'we could learn the language faster than our linguistically unsophisticated students could, and thus keep ahead of them' (Hockett, 1979: 103). Closer to home, and representative of the sweeping variety of work faced by linguists during the war, Robert Hall spent the war years analysing Melanesian Pidgin English, preparing language-learning materials for Spanish, Italian and French, and supervising the army's Italian-language teaching program at Yale (Hall, 1991a: 177–9).

The war effort mobilized a vast majority of working linguists in 1940s America: of the 96 participants at the Linguistic Society of America's 1944 annual meeting, approximately 80 were actively engaged in 'militarily crucial work' and being paid by the American Council of Learned Societies or directly by the government (Joos, 1970: 131). Giants in the field, including Fred Lukoff, Morris Swadesh, Fred Householder and Leonard Bloomfield himself, worked on languages ranging from Japanese to Norwegian to Moroccan Arabic. As American linguists worked together towards common goals for the first time, a strong professional community began to take shape. After the war, when linguists returned to their home institutions, they retained these connections: no longer were they isolated and without a sense of common purpose.

Throughout the war linguists faced 'very heavy pressure' to produce results – and results they did produce (Hall, 1991b: 159). The 1940s were a decade of intensive growth and, in the early years of the decade, American linguists 'stockpiled linguistic experience at an incredible rate' (Twadell, 1959: 147–8). During the war, American linguists proved their value and, in the following years, they became the go-to experts on language-related matters from machine translation to second language instruction to strategic linguistic analysis. No longer second-class in relation to anthropology

or literature, linguistics also began to distinguish itself on the academic scene. For the first time, outsiders recognized and valued the work of American linguists: the American military and the US government grew to see language and linguistics as tools vital to winning the war and establishing order in the postwar world.

In the postwar and early Cold War years, the attitudes and expectations fostered by the Intensive Language Program were taken up by the Department of State, which came to see language and linguistics as essential tools for American diplomats. The Department of State began to invest in language in 1946 with the establishment of language-training facilities at the newly founded Foreign Service Institute, located in Washington. It was in the diplomatic realm that 'language as tool' reached its apex.

The first director of Language Study at the Foreign Service Institute, linguist Henry Lee Smith Jr, came highly recommended from his wartime language-teaching work with the army. For the final two years of the war, the (then Major) Smith headed the Education Branch of Army Special Services. He led a group of linguists, including Bernard Bloch, Mary Haas, Robert Hall, Einar Haugen, Charles Hockett and others, in the development of language-learning materials for soldiers and officers. They trained thousands of soldiers and officers headed for enemy territory in dozens of languages. These linguists 'design[ed] a program which would produce a practical speaking knowledge in as a short a time as possible' – a program focusing on spoken language capability and a program that valued language as a tool to be learned and actively employed (Moulton, 1970: 85).

When he moved to the Foreign Service Institute immediately after the war, Smith quickly hired half a dozen prominent linguists, some of whom had previously worked under him in the army. George Trager, Robert Stockwell, Charles Ferguson, Nicholas Bodman, Charles Bidwell and others were attracted by terms that allowed them to combine language-teaching with basic linguistic research. Indeed, these linguists contributed to basic linguistic research through this period: Smith and Trager's *An Outline of English Structure*, for example, was written while the authors were working at the Foreign Service Institute. Because of the dual teaching and research opportunities, for Stockwell (who taught Spanish at the Institute from 1952 to 1956) and others, the institute offered 'wonderful years' of interaction with fellow linguists and fellow citizens (Stockwell, 1998: 234).

At the Foreign Service Institute, American diplomats were taught a variety of languages including Arabic, Spanish, Chinese, Serbo-Croatian and Russian. Parallel language-teaching programs were also set up at embassies and missions around the world. The most extensive of these, founded by linguist John Echols in 1950, taught German to State Department employees posted in Germany (Moulton, 1950). The result was a great improvement in the language competency of the American diplomatic corps, and the solidification of language as a productive and profitable tool in international interactions.

The American scientific community also adopted language as a tool for targeted communication: in an era when America was desperate both to ameliorate its stature as a leader of cooperation in the free world and to increase its scientific capacity, the ability of American scientists to interact with foreign partners was essential. The problem of language came to a head when, following the lifting of the American forces' ban on international mail from Japan in mid-1948, American and Japanese theoretical physicists began corresponding.¹⁰ Unable to communicate in Japanese, but reluctant to impose his

native English, Purdue University's Frederick Belinfante chose to explain his research in Esperanto, 'a neutral language' selected as 'a matter of politeness' (Belinfante's personal correspondence in Kaiser, 2005: 129). Later, when Freeman Dyson met with three Soviet physicists at the University of Rochester in 1956, he was 'pleased that the Russian he had studied could be put to good use' (ibid.: 162). American oil companies also recruited linguists to teach their employees languages including Spanish and Arabic. At the Arabian American Oil Company's training center in Lebanon, linguists led by J. Milton Cowan developed a set of textbooks focused on Arabic dialects (Cowan, 1959). The need for American scientists to interact socially and professionally with foreign colleagues further increased as international meetings from the Atoms for Peace conference to the Pugwash nuclear debates created an international forum for science.

In the postwar and early Cold War years, language emerged as a highly valued tool for America's diplomats and scientists. No longer were foreign languages viewed with trepidation and disinterest: language and cultural sensitivity were now considered necessary. The diplomatic and scientific communities treated foreign languages as a key tool for integrating America into the new international order. The rise of 'language as tool' represents a stark break from the pre-war years, and a strong commitment to American-led internationalism.

III: Language as Weapon

As hostilities broke out in Europe, and especially as the war came closer to home with the 1941 attack on Pearl Harbor, the American military began to attach strategic importance to language. Soon, the military invested heavily in language-related projects from machine translation to code-breaking to information retrieval. Early successes stimulated interest and, as the Cold War opened, the military saw language as a covert and strategically powerful weapon – one that, if properly used, could be crucial to the success of the West. This section explores the construction of 'language as weapon' in the context of machine translation.

With the Second World War, linguistics funding passed from philanthropic bodies such as the Rockefeller Foundation and the Carnegie Corporation to the American military, and the following decades marked the beginning of massive government investment in linguistics. 'In this war for men's minds', said Mortimer Graves in 1951, 'obviously the big guns of our armament are competence in languages and linguistics' – a view amply supported by postwar and early Cold War funding decisions (Mortimer Graves in Newmeyer, 1986: 56). Linguistics and other language research groups across the country enjoyed support from, among others, the army (Signal Corps), the navy (Office of Naval Research), the air force (Office of Scientific Research and Operations Applications Laboratory, Air Research and Development Command), the National Science Foundation and the National Institutes of Health, as well as private organizations such as the Social Science Research Council. Tellingly, linguistics was one of the first non-traditional sciences to be supported by the National Science Foundation in the early 1950s.¹¹

The defining linguistics project of the postwar and early Cold War years was machine translation. While America was desperate for 'ready, undelayed access to scientific

information written in the languages of the several scientifically creative cultures of our day', as machine translation pioneer Leon Dostert said in 1957, the number of Americans capable of rapidly and accurately translating foreign languages into English was much too small to keep pace with the scientific output of foreign nations (Dostert, 1957: 82). Rather than training more human resources, the chosen solution was to apply 'the supremacy of the U.S. in computer technology and financial resources' to develop machine translation methods (Bar-Hillel, 1964: 7). In one of the first uses of computers for non-numerical tasks, the American military injected over 20 million dollars into machine translation efforts between the end of the war and the mid-1960s.

Through the 1950s, machine translation laboratories were established at universities and in the private sector across the country. At locations from MIT to Berkeley to Georgetown University, and from private companies to the non-profit think tank RAND, researchers aimed to improve America's intelligence capabilities through automatic translation. This work was continually motivated by reported machine translation successes in the Soviet Union, including a purportedly successful English-to-Russian translation at the Institute of Precision Mechanics and Computer Technology of the USSR Academy of Sciences in 1956. The launch of Sputnik a year later sparked America's science-funding bodies into action, and guaranteed the continuation of military support for machine translation efforts for years to come.¹²

The premise of postwar machine translation was to equip a computer with a set of formal rules which, when applied to an input text in one language (usually Russian or German), would produce an output translation in another language (usually English). These rules worked not by deciphering the meaning of the input text, but by using knowledge of syntactic structure to build an output translation. Here, an understanding of syntax was critical for recognizing the various components of sentences, identifying constituent function, resolving ambiguities and building context – or, as Georgetown University's Paul Garvin put it at the 1960 National Symposium on Machine Translation, for 'recogniz[ing] and appropriately record[ing] the boundaries and functions of the various components of the sentences' (Garvin, 1972[1965]: 83). It was soon realized that the syntactic difficulties 'standing in the way of the development of translating machines would be more serious than the technical computer difficulties' (Yngve, 1974: 4). Accordingly, American linguists turned their attention to the development of formal rule-based syntactic theories, and to the computerization of those theories.¹³ The most important successes of the era include the elaboration of rich constituent structure methods at MIT (led by Victor Yngve and Gilbert Harman), the mixed constituency/transformational program at the University of Texas at Austin (led by Wayne Tosh), and the development of fusion processes at Georgetown University (led by Paul Garvin).¹⁴

The military viewed machine translation techniques as a type of weapon – one that was quiet and unobtrusive, but which still offered great intelligence potential.¹⁵ In a war where spies and propagandists populated the front lines, the ability to read the enemy's communications in a timely manner was imperative – and, in this non-traditional battle environment, language emerged as essential for advancing the American cause. The concept of language had come a long way from its pre-war anonymity.

It was not only machine translators who enjoyed vast amounts of funding in the post-war and early Cold War years: linguists of all stripes and colors found themselves funded

as never before. This led to immense disciplinary growth in linguistics and, indeed, to the establishment of linguistics as an independent and robust academic discipline in America. The 1950s and 1960s saw disciplinary growth in linguistics on all fronts: membership and interest in professional societies blossomed; conferences and symposia became commonplace; and departments and programs were established at universities across the country. At the Linguistic Society of America, membership ballooned from just over 800 in 1950 to nearly 2,000 in 1960 to over 4,300 in 1970 (LSA, 1957–70). In these years, focused conferences were held on subjects ranging from language universals to syntactic theory to machine translation. At the influential Georgetown Round Table Meetings on Linguistics and Language Study, held annually at Georgetown University from 1950 on, participation increased from just over 170 registrants in 1959 to over 400 a decade later (GRTM, 1955–71). The profession was, indeed, booming.

On the university scene, growth was just as rampant. As linguistics came into its own, departments were founded at universities across America. Beginning immediately after the war, the first such department was established in 1946 at the University of Pennsylvania, and was soon followed by new linguistics departments at Berkeley (1953), MIT (1961), Indiana (1964), Illinois (1965), the University of Texas at Austin (1965), UCLA (1966) and Ohio State (1966), among others. In 1962, fewer than 30 American universities offered degrees or concentrations in linguistics. By 1965, this number had doubled; a year later, nearly 100 institutions offered linguistics degrees; and by 1970 prospective linguistics students could choose from degree programs at more than 135 American universities (Grognet, 1973: 1450). While in the 1940s ‘only a handful of persons’ held PhDs in linguistics, between 1955 and 1970 American universities conferred more than 750 doctoral degrees in linguistics (Joos, 1968: v). In the same time period, more than 2,300 students earned masters’ degrees in linguistics, and 1,200 students earned bachelors’ degrees in the subject.

This great expansion of linguistics in American academia was enabled by the massive funding injected by the American military and civilian government organizations. This funding, University of Chicago linguist James McCawley recalls, ‘made it possible for many universities to start linguistics programs that otherwise would not have been started or would not have been started so early, or to expand existing programs much further than they would otherwise have been expanded’ (McCawley, 1979: 233). The establishment of a linguistics department at Austin in 1965, for example, has been described by Winfred Lehmann as ‘almost an impossible event at the conservative University of Texas’, and one wholly due to government funding (Lehmann, 1979: 188). The study of language had, within two decades of the Second World War, captured the imaginations of universities across the country.

In the postwar and early Cold War years, funding decisions built language into a very different sort of weapon for the American military, and established linguistics as a fully professional academic discipline in America. ‘Language as weapon’ provided a key method of information-gathering in what was a ‘cold’ war – a method that exemplifies the American faith in their technological superiority. More broadly, the discipline of linguistics shed its pre-professional roots and, by the late 1960s, was fully integrated into the American university system.

IV: Language as Knowledge

The launch of Sputnik on 4 October 1957 stimulated massive government investment in the American education system – and, specifically, in language-teaching. In the years after the launch, educationalists and politicians alike highlighted the need to teach American children to use the English language properly and to increase foreign language capacity among young adults. They turned to academia, asking what theoretical linguists could offer to American classrooms. Language emerged in a new framework: that of knowledge. Language knowledge grew into a highly valued commodity – one promoted by politicians, implemented by teachers, and clamored for by parents and students. This section explores the influence of ‘language as knowledge’ on the American public, and especially the young public, in the postwar and early Cold War period.

Even before the Soviet Union took America by surprise in 1957, American teachers and educationalists had a long-standing interest in bringing linguistics to the classroom. Through the 1950s, they debated the possibility of using theoretical syntax to improve the reading and writing capabilities of America’s elementary school students, and the composition skills of high school and college students. In this decade, language-teaching methodology was based on what were called traditional grammar and structural grammar. Traditional grammar referred to schoolbook sentence-parsing using building-block, or parts-of-speech, concepts such as subject, predicate and verb. It included the classification of words and groups of words into parts-of-speech categories, conjugation tables for verbs, and an emphasis on prescription (that is, the ‘correct’ use of language). Structural grammar referred to Descriptivist, or Bloomfieldian, linguistics. In the classroom, Descriptivism was strongly influenced by Charles Carpenter Fries’s *The Structure of English: An Introduction to the Construction of English Sentences* (1952), which is known for its use of the labels ‘Class I words’, ‘Class II words’, etc., for sets of words corresponding approximately to the traditional categories of nouns, verbs, etc. This approach to linguistics was an integral part of American structuralism: motivated by the pioneering work of Ferdinand de Saussure and, later, Leonard Bloomfield, it assumed that language was imbued with systematic structural characteristics, and that these characteristics could be determined through study.¹⁶ Together, traditional and structural grammar provided language teachers with theoretical frameworks and practical exercises for their classrooms.

The desire to bring theoretical linguistics into the classroom in the 1950s was stimulated by a sense of urgency. While the study of syntax was still in its infancy, said Brown University’s W. Nelson Francis at the 1956 Georgetown Round Table Meeting on Linguistics and Language Study, still it offered the only way forward for language teachers: ‘we cannot wait . . . for further theoretical breakthrough before we make practical and pedagogical use of syntax’, he told his audience. ‘Those of us who are faced with the daily necessity of teaching something about the structure of language, not only to prospective linguists and teachers, but also to freshman writers of themes and sophomore students of poetry, must have some kind of system to work with’ (Francis, 1956: 36–7). An interim syntax was needed for the classroom, he emphasized, regardless of whether academic linguists had achieved consensus on theoretical matters. By the early 1960s, Francis’s call had been taken up by teachers and educationalists across America.

At professional association meetings, in journals and in teaching newsletters, language teachers debated the merits of applying theoretical linguistics in their classrooms. Leading the movement was the National Council of Teachers of English and its influential journal, *The English Journal*. Through the 1960s, *The English Journal* regularly devoted space to weighing the pros and cons of syntactic theories for language-teaching, publishing over 30 articles on the subject in the decade and devoting its May 1963 issue to 'Linguistics in the Classroom'.

This rising interest in linguistics was underpinned by high stakes in the classroom. In the 1960s, American teachers were facing 'the impact of two explosions', wrote Albert Marckwardt, a professor of English at Princeton and the 1962 president of the Linguistic Society of America: 'an explosion of population and an explosion of knowledge' (Marckwardt, 1968: 3). The first of these meant that class sizes were continually expanding, causing teachers constantly to seek new resources to deal with the increasing number of students. Improvements in teaching methodology and applications of academic ideas were eagerly looked to, to ease and simplify teaching in face of the new stresses. Even those who were wary of the speed at which academic linguistic theories were changing were drawn to the tools they offered. The perceived instability of academic linguistics was a concern to the educational community in the 1960s: in their view, Noam Chomsky's transformational grammar, which quickly gained a significant academic following after its enunciation in the late 1950s, had burst onto the scene too quickly.¹⁷ Teachers and educationalists feared that it, too, would soon be replaced by yet another theory. Still, teachers felt increasingly pressured to 'come to grips with ... new concepts and new approaches', and they turned to academic theories to deal with the population explosion of the decade (Marckwardt, 1968: 3).

Marckwardt's explosion of knowledge added a second layer of political and public pressure on teachers – pressure which pushed them to bring new language knowledge to the classroom. Within a year of the Sputnik launch of 1957, Congress passed the National Defense Education Act, designed to rectify the knowledge gap between America and the Soviet Union by improving the capabilities of American students in three areas of strategic importance: mathematics, sciences and foreign languages. The Act represents a landmark in political relations: it was the first time the national government intervened in education, an area previously under the mandate of state governments. The inclusion of language as an area of importance drew nationwide attention to America's language deficit. Armed with new funding and supported by professional development opportunities, teachers responded. High school language courses, previously largely restricted to English, began to experiment with a multitude of languages from Arabic to Chinese to Swahili (Gleason, 1965: 483). At the university level, too, the early 1960s saw a dramatic increase in the teaching of foreign languages. 'Universities which once were satisfied with half a dozen may now be teaching thirty or more', wrote the Hartford Seminary Foundation's H. A. Gleason in 1965 and, by his count, over 100 languages were regularly available at universities across the country in that year (ibid.: 43). By the mid-1960s, American language teachers agreed that linguistics could 'contribute importantly to ... improvements in the way in which students use language (i.e., in reading, writing, speaking, listening), along with a knowledge of how to go about learning that which is yet to be learned' – a drastic change from the pre-war

decades, when language and linguistics were all but absent from the classroom (Postman and Weingartner, 1966: 29; original emphasis). Indeed, addressing the language-teaching profession in the middle of the decade, Gleason exclaimed that '[i]nterest in linguistics among English teachers has risen phenomenally in the last few years. The subject is in the air at every professional meeting – sometimes earnestly advocated, sometimes bitterly combated, often provoking questions, almost always somewhere in the background of any debate on the language section of the curriculum' (Gleason, 1965: v).

While language teachers agreed on the need to adopt academic linguistic ideas, there was no unanimity of views on the theoretical tools best suited to the classroom. This lack of consensus reflected the situation on the university scene: while Noam Chomsky's transformational grammar established a dominating presence in American academic linguistics by the mid-1960s, it faced competition from rival syntactic theories including, most importantly, stratificational grammar (led by Sydney Lamb at Berkeley and Yale) and enhanced versions of Descriptivist grammar (also called constituency grammar). These three theories all aimed to explain the structure of natural language, but they adopted very different theoretical tools, philosophical frameworks and methodologies. The competition between them defines a key era of linguistic thought in America.¹⁸ With one eye on the unsettled academic scene, the language-teaching profession split over the applicability and value of transformational grammar for its work: one pole of opinion, represented by Indiana University's Owen Thomas, believed that transformational grammar 'could be applied systematically to the teaching of grammar, not only in the secondary school but with equal effectiveness in the elementary school' (Thomas, 1962: 95). At the opposite pole, represented by the University of Hawaii's Mark Lester, transformational grammar was seen as too complex and too far removed from the practicalities of language teaching to 'justify ... the time expended on the grammar' (Lester, 1970: 197). In practice, language teachers often dismantled academic linguistic theories and reassembled them into mixed tool-boxes suitable for the classroom setting. The most common combination featured structural (or Descriptivist) linguistics and transformational grammar. 'The point is that neither system, descriptive or transformational, is necessarily better than the other', wrote the San José State College's Michael Grady in *The English Journal*: '[i]f one wishes to know the order of words of the favorite sentence types of English, the simplest way of gaining information is to learn its descriptive notation, [but] [i]f one wishes to learn more about the genesis of the particular pattern, one must study its generative-transformational aspects' (Grady, 1968: 872). This mix-and-match approach to syntactic ideas was due in part to the wariness with which educationalists and language teachers viewed the academic world: academic linguists 'are only just beginning to study and argue about syntax', wrote second-language teacher Ann Nichols in 1965, and hence language teachers have 'prudently rejected the opportunity to be burned' by divesting their energies among a selection of linguistic theories (Nichols, 1965: vi).

The 'language as knowledge' framework stimulated by the National Defense Education Act affected not only the activities and practices of language teachers, but also the expectations and desires of students. Language majors at universities across America signed up for introductory courses in linguistics and language structure, providing newly

founded linguistics departments with a second market. Knowledge of a foreign language soon came to be seen as necessary for anyone interested in making a difference for America in the new world order. '[T]he American who aspires to anything other than menial participation in the life of the nineteen seventies and eighties will need some sort of control of three or four or half a dozen languages, Asian or African as well as European', wrote Mortimer Graves in 1959 – a belief picked up and acted upon by students in the following decades (Graves, 1959: 4–6). What had in the pre-war years been considered 'a luxury for the academically talented', in the early Cold War came to be 'essential for everyone': knowledge of foreign languages was necessary for America and Americans (Gleason, 1965: 482).

Conclusions

Prior to the Second World War, neither language, as concept, nor linguistics, as discipline, significantly impacted on American public, political, or intellectual life. This situation changed drastically in the postwar and early Cold War years. In this period, language emerged in tool-, weapon- and knowledge-oriented frameworks. At the same time, linguistics grew into a robust and independent academic discipline. Together, language and linguistics formed a critical element of the rise of American leadership in the new world order – one which provided communities as dispersed as the military, the diplomatic corps, scientists and language teachers with a powerful way of tackling the problems they faced. In what was indeed a 'war for men's minds', that most fascinating element of the human mind – language – played a leading role.

This article begins to bring linguistics into the historiographic fold of the postwar human sciences. In doing so, it shows how the history of linguistics can, and should, be written to satisfy recent calls for cultural contextualization, open periodization and cross-disciplinary integration in the literature (Backhouse and Fontaine, forthcoming; Isaac, 2007). To be fully understood, postwar linguistics needs to be linked to broader social, cultural and political movements including shifting public opinions on the value of foreign-language teaching and political reaction to the launch of Sputnik and other major Cold War milestones. Further, while linguistics came into its own as a full professional discipline in America in the postwar era, this story can only be appreciated if it is coupled to pre-Second World War and wartime developments. These include, most importantly, the interdependence of linguistics and anthropology and the isolation of American linguistics from European counterparts in the first half of the 20th century, and the elevation of linguists to the status of go-to experts during the war. Finally, a full historiography of the postwar human sciences will require integration across related disciplines. This article identifies specific ways of initiating this integration by bringing linguistics to bear on some of the major themes in the existing literature (namely, social science patronage, interaction with military and intelligence organizations, and formalization movements). As a 'missing piece' of the postwar human science puzzle, linguistics has much to teach us, and its story is slowly but surely coming into the mainstream.

Notes

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1. For dissertations see (among others) Cohen-Cole, 2003; Isaac, 2006; Martin-Nielsen, 2009; for conference panels see the ‘Cooperation, Convergence and Conflict in Cold War Social Science’ session at the 2008 Three Societies conference (Oxford, UK), the ‘Cold War Social Science’ panel at the 2009 International Congress of History of Science and Technology (Budapest, Hungary), and the annual Ecole Normale Supérieure de Cachon’s history of the social sciences workshops (2004–present, France); for edited volumes see Backhouse and Fontaine, forthcoming; Cravens and Solovey, forthcoming; and for journal special issues see ‘Science in the Cold War’ (*Social Studies of Science*, April 2001) and ‘The Human Sciences and Cold War America’ (*Journal of the History of the Behavioral Sciences*, forthcoming in 2011).
2. A selection of these works includes Baars, 1986; Brick, 1998; Cohen-Cole, 2005, 2007; Collins, 2000; Crowther-Heyck, 2005, 2006; Engerman, 2006; Farr and Seidelman, 1993; Geiger, 1988; Isaac, 2006, 2009; Larsen, 1992; Mandler, 2002; Mirowski, 2002; Ross, 1992; Simpson, 1998; Solovey, 2001, 2004, forthcoming.
3. For a detailed study of the pre-professionalism of linguistics in early 20th-century America, see Martin-Nielsen, 2009.
4. There is, as of yet, no comprehensive history of the Linguistic Society of America. Short histories can be found in Andresen, 1990 (ch. 5); Falk and Joseph, 1994; Hill, 1991.
5. Bloomfield’s linguistics program is well covered in Andresen, 1990; Matthews, 1993.
6. This was first noted by P. H. Matthews (Matthews, 1993: 11).
7. See Andresen, 1990 for a study of 19th-century American linguistics.
8. ‘SIL’ originally stood for the ‘Summer Institute of Linguistics’. The organization now goes by the name ‘SIL International’. It is entirely separate from the similarly named summer Linguistic Institutes offered annually by the Linguistic Society of America.
9. See Hall, 1991b and Martin-Nielsen, 2009 for studies of linguistics and the American military during the Second World War.
10. Communication between Japanese and American scientists is discussed in Kaiser, 2005.
11. In the past two decades, a large body of work on postwar social science patronage has been written (Crowther-Heyck, 2006; Larsen, 1992; Simpson, 1998; Solovey, forthcoming; among others). While it is beyond the scope of this study to engage with this work in detail, it is important to note that the existing literature identifies a number of important issues that have not yet been brought to bear on linguistics. These include the attitude of the National Science Foundation towards the social sciences (linguistics stands out as one of the first non-traditional sciences to be supported by the foundation); the impact of military patronage on the professional identity of social scientists (linguists, especially at MIT, were heavily funded by the military through the 1950s and 1960s, and were relatively comfortable with this situation through most of that period); and the adoption of ‘natural science techniques’ by social scientists in the hopes of securing funding (linguists were among the front runners in the application of scientific techniques and philosophies to human behavior in the 1950s).
12. One of the central themes of the existing postwar human science historiography is the relationship between social scientists and American military and intelligence bodies – and,

- specifically, the social science community's reaction to the Project Camelot controversy (E. Herman, 1998; Simpson, 1994; Solovey, 2001; among others). While American linguists had little involvement in Project Camelot itself, they still had a complex relationship with the military through the postwar decades. As well as receiving military funding, linguists oriented their basic and applied research to military and intelligence ends. Further, as linguists grew uncomfortable with military patronage and American foreign policy more broadly at the end of the 1960s, their frustrations spilled over into linguistic data itself (see Harris, 1993a, 1993b on the 'Linguistics Wars'). Military patronage was also a key source of contention between rival linguistics schools, and critics of Noam Chomsky's linguistics program argue that heavy military investment gave Chomsky and his MIT colleagues an unfair advantage (Koerner, 2002; McCawley, 1979; Murray, 1993).
13. It is important to highlight the curious role played by formalization, mathematization and computerization in postwar American linguistics. In line with other social scientists, many linguists believed that formal mathematical techniques were key to the success of the natural sciences – and they desired to bring these techniques to natural language. Their attitude is neatly summed up by William Cooper's comment that '[t]he situation in linguistics is not much different from physics or some other science: if only a simple intuitive approach is to be used, mathematics is dispensable; but where rigor is needed, so is mathematics' (Cooper, 1974[1963]: 11). However, the relationship between linguists and mathematics is a strange one: despite their enthusiasm for all things mathematical, the vast majority of postwar linguists were untrained in mathematics and unfamiliar with the most important advance in mathematical linguistics of the time – that is, Noam Chomsky's work on formal language theory (Martin-Nielsen, 2009: 220 ff.). Formalization and mathematization have been widely studied in the postwar human science historiography (Crowther-Heyck, 2005, especially ch. 3; Mirowski, 2002; Solovey, 2004), and this is one of the few areas in which linguistics has been partially integrated (Martin-Nielsen, 2009; Tomalin, 2006).
 14. Detailed studies of these three machine translation projects can be found in Hutchins, 1979, 1986, 2000; Martin-Nielsen, 2009. Briefly, the three projects aimed to optimize syntactic theories for machine translation purposes. While they all used constituency grammar (the dominant interwar syntactic theory in America, strongly associated with Leonard Bloomfield) as a basis, they expanded and ameliorated this theory in different ways. In particular, Paul Garvin's fusion processes (Georgetown University) led directly to SYSTRAN, which has – owing to its selection and implementation by the Commission of the European Communities in the 1970s – been described by historian of machine translation W. John Hutchins as the most successful machine translation project of the postwar period (Hutchins, 1979: 32).
 15. In addition to machine translation, American military and intelligence organizations also invested in the language-centric areas of cryptography, communications theory and psychoacoustics through the Cold War. This research, which brought together linguists, electrical engineers and early computer scientists, was centered at MIT's Research Laboratory of Electronics (the successor to the famous wartime Radiation Laboratory) and Harvard's Psychoacoustic Laboratory (renamed the Laboratory of Psychophysics in 1962). It has been studied by, among others, Edwards, 1996; Geiger, 1993; Mindell, 2002.
 16. For further detail on structuralism and linguistics in America, Dell Hymes and John Fought's seminal study is highly recommended (Hymes and Fought, 1975).

17. Launched in 1957 with the publication of Noam Chomsky's *Syntactic Structures*, transformational grammar has (in various incarnations) dominated North American linguistic thought for the past half-century. As it was first enunciated, the chief tenets of the theory are an anti-behaviorist philosophy; a hypothesis-testing scientific method which allows for the positing of unobservables; a two-level theoretical approach to syntax (comprising a constituency, or phrase-structure, level and a transformational level); and a commitment to the innateness and universality of human grammar (Chomsky, 1957, 1965). Transformational grammar has been extensively studied in the literature. Within the history of linguistics, see Huck and Goldsmith, 1995; Martin-Nielsen, 2009; Matthews, 1993; Tomalin, 2006; among others. For broader treatments, including the influence of transformational grammar on psychology and philosophy of science, see Boden, 2006; Cohen-Cole, 2003, 2005, 2007; Crowther-Heyck, 2005 (especially ch. 11); Fodor, 2000; Miller, 2003; among others.
18. Of these three syntactic theories, there is a large body of literature on transformational grammar, a reasonable amount of literature on constituency grammar, and very little literature on stratificational grammar. The neglect of this last theory, which is intimately connected with neurolinguistics and cognitive networks, is both surprising and unfortunate in light of its importance and longevity on the American linguistics scene. For a comprehensive study of the competition between these three theories, see Martin-Nielsen, 2009. For studies dealing with individual theories, see Graffi, 2001 (constituency and transformational grammars); Matthews, 1993 (constituency and transformational grammars); Newmeyer, 1980 (transformational grammar).

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