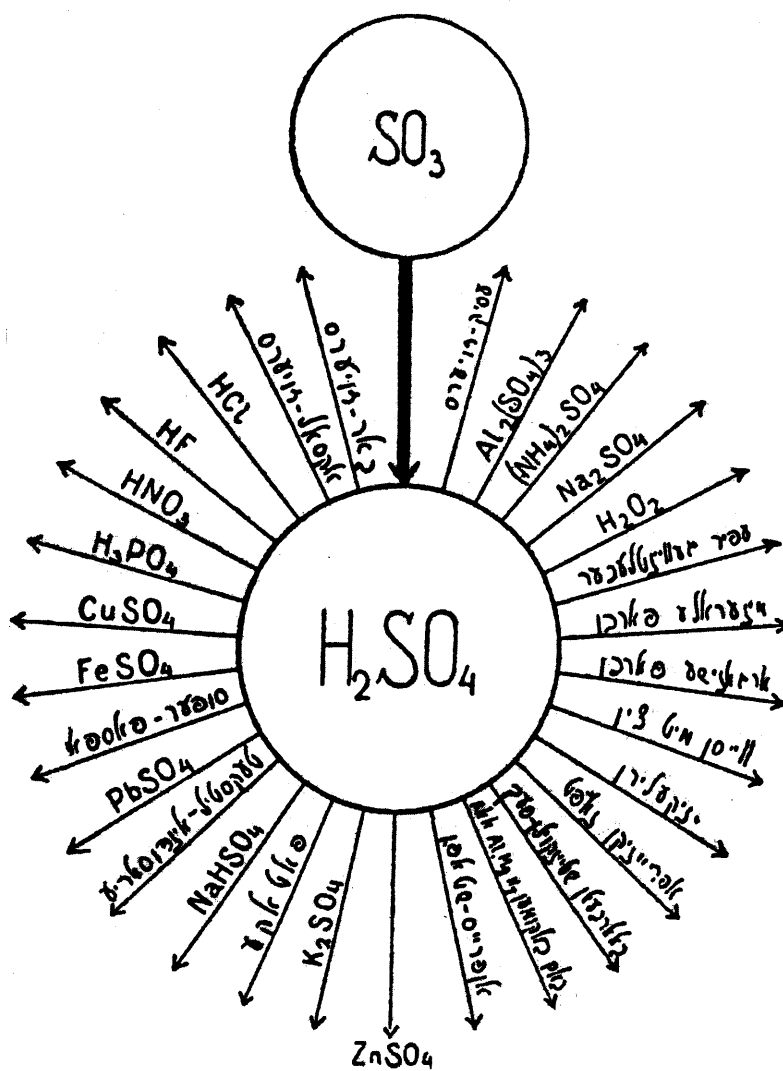


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KHEMYE: CHEMICAL LITERATURE IN YIDDISH

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English, along with a few other languages (*e.g.*, German, French, Russian, Japanese, and Chinese), is the primary vehicle for transmitting chemical knowledge and discoveries today. Yet languages are not neutral carriers of information; the very act of choosing a language for instruction implies an educational, ethnic, and perhaps even a social class among the users. Given the impetus and the means, any language is capable of explaining complex scientific phenomena. This article aims to provide a modest history of the chemical literature, confined to the 20th century, written in a lesser-known language, Yiddish, now considered endangered.

Yiddish's origins, dating back about a millennium, are unclear. Linguists are still arguing over the details of where and how it started, but most would agree that medieval southern and west-central Germany are likely candidates. The language of most Central and Eastern European Jews, it flourished in the 19th and early 20th centuries, until Nazi massacres, Stalin's purges, and immigrant assimilationism markedly reduced the present number of native speakers. Yiddish is considered a "fusion language," for it has fused together medieval German dialects, some Slavic vocabulary and grammar, a Hebrew-Aramaic component, and even some words of Romance origins.

The cultural and social milieu that engendered scientific writing in Yiddish began as the 18th-century Western-European Enlightenment gradually filtered

eastward into the Russian Empire during the 19th century. At that time, Jews in the Russian Empire were serfs, peasants, or poorly educated city dwellers. They were, as a rule, not educated in secular or scientific studies, nor even in the local official or semi-official languages of Russian or Polish. Universities held to strict quotas for the number of Jews allowed entry per year. Those few Jews who had traveled to Western Europe brought back with them the wonders of 19th-century natural and social science and accompanying technology (1). Simultaneously, the terrible anti-Semitism of the Russian pogroms from 1881–1897, and France's infamous Dreyfus affair (1894) increased the nationalistic desires of many Jews, culminating in Theodore Herzl's Zionism Congress in 1897. Emigration to the United States rose dramatically, intensifying after further Russian pogroms from 1903–1905. Most immigrants stayed in the largest American cities, such as New York, Boston, Philadelphia, and Baltimore. Their sweatshop working conditions in America and extreme poverty in Russia were dreadful (2). Many joined the socialist and communist movements in order to overthrow the oppressive Russian Imperial and capitalist social orders (3). To improve their lot, many Jews set up educational organizations to instruct their brethren in these new technological wonders and to bring them out of their allegedly superstitious, ignorant environment. Thus, interest among the better-educated Eastern-European Jews developed in socialism, communism, and secular studies—which included science in general, and chemistry in particular.

From this cultural milieu came Yiddish science books. Though the Eastern-European Jews fortunate enough to gain entry to local universities through the strict quota systems learned enough Russian, French, and German to communicate with their fellow scientists, some decided to write for laymen ill-versed in these languages. Many of the authors listed in this article have fallen into obscurity, and details about their lives are unknown. The first known textbook in Yiddish devoted entirely to chemistry was published in 1920 by a chemist (and a member of the American Chemical Society), philanthropist, and devotee of American history, Sol Feinstone (1888–1980) (4). Entitled *Khemye: Tsu Lezen un tsu Lernen* (“Chemistry: To Read and to Learn”) (5), the goal of the work was “to give the Yiddish reader a short, popular treatment on the great chemical science, about which, until now, so little has been written in Yiddish literature.” (See Fig. 1.) Basic concepts, from atoms to molecules, reactions, inorganic and organic chemistry, and even nomenclature, were covered in the 272 pages con-

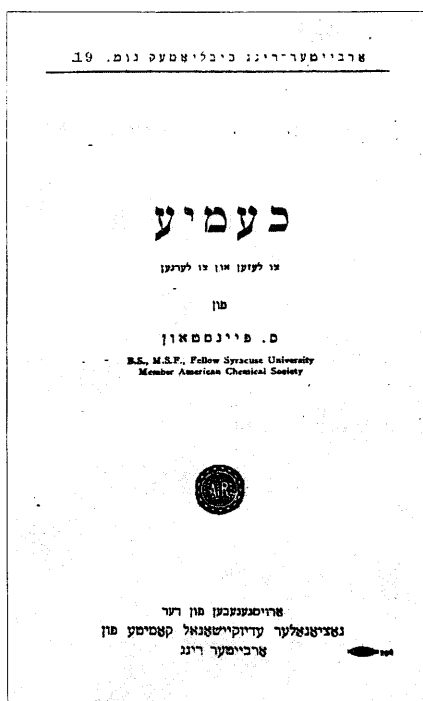


Figure 1. Title page from Sol Feinstone's *Khemye*.

tained in *Khemye* (6). Figure 2 shows Feinstone's sketch of the Hall Process for reducing aluminum. A table of petroleum distillation products appears in Fig. 3. Discussion of reactions involving chlorine is shown in Fig. 4.

Khemye was actually a part of the “*Arbeter-Ring Bibliotek*” (Workmen’s Circle Library) series, published by the Workmen’s Circle, a secular Jewish labor organization devoted to helping immigrant Jewish laborers fit into modern American society. Another of this series was Dr. Abraham Caspe’s *Geologye* (“Geology”) (7). Though not a book about chemistry *per se*, the discussion of minerals, interspersed throughout the geological topics, included their chemical composition (8).

General encyclopedias and volumes devoted to self-education in Yiddish also began to appear, such as the *Folks-Universitet* (“People’s University”) series (9). Major topics—presented as self-contained chapters—included in the three volumes were chemistry, physics, biology, anthropology, and history.

There were teacher’s editions about science in Yiddish as well. Golomb’s *Praktishe Arbet af Natur-Limed*

די טעמפעראטור אין וועלכער דער פראָדוקט דיסטילירט זיך (מעטרישע סיסטעם)	דער נאָמען פון פראָדוקט
ביז 40 גראַד	סימאנען, רינאלען און אנדערע נאָזען
" 70 " 40	פעטראַלעאום עמהער
" 80 " 70	נאָזאָלין
" 100 " 80	פעטראַלעאום בענזין
" 120 " 100	פעטראַלעאום נאָפט
" 150 " 120	פעטראַלין
" 300 " 150	קעראַסין
" אַריבער 300	שווערע אוילען (שמיר)
" אַריבער 300	פאַרמאָסין אויל און וואַקס
שמעלט זיך אָפּ אין רעטארטע	קאָקס

Figure 2. Schematic of the Hall process in Feinstone’s *Khemye*. The caption under the diagram reads, “The electronic flow goes into the cryolite and molten aluminum oxide (ק) through the strips (ש), splits the oxide apart and leaves the box through the wall (ו) and through (—). The molten aluminum pours out through the opening (ע).”

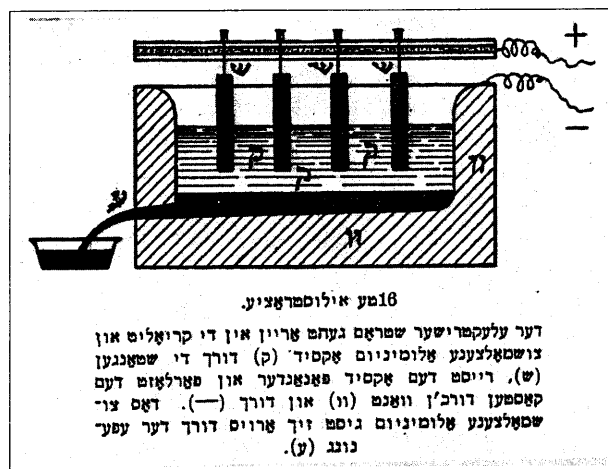


Figure 3. Table of distillation products from crude oil in Feinstone’s *Khemye*. The right column is “The name of the product,” and the left column shows “The temperature at which the product is distilled off (metric system).”

כלאָראַפאָרם און יאָדאָפאָרם

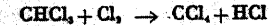
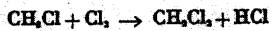
מיר האָבען שוין פריהער באַמערקט, אז אונטער גינסטיגע אומשטענדען קען מען פאַרביימען אַ טייל אָדער אינגאַנצען די אַטאָם-מען פון וואַסערשטאָף אין קויהלען-וואַסער-שטאָפּען אויף אַנדערע עלעמענטען אָדער אויף גרופּען פון עלעמענטען. אז מען ווירקט, צום ביישפּיעל, אויף מעטהאַן, CH_4 , מיט דעם גאַז, Cl_2 , טרייבט ער אַרויס אַן אַטאָם וואַסערשטאָף, H , פון יעדען מאָלעקול עטהאַן און ער פאַרנעמט אַליין דעם פּלאַץ. דער באַפרייטער וואַסערשטאָף פאַראייניגט זיך גלייך מיט אַ ביסעל פון דעם איבער-געבליבענעם Cl_2 און פאַרמירט הידראָ-כלאָר-ווייערע, HCl .



הידראָכלאָר-ווייערע + כלאָר-מעטהאַן \rightarrow כלאָר + מעטהאַן

(כלאָר-מעטהאַן איז אַ קאָרילאָזער גאַז, וואָס ווערט מאַכענעם מאַל באַנוצט פאַר כירורגישע צוועקען.)

דער פּראָצעס געהט צו דער זעלבער צייט אַן ווייטער כּי אַלע פיער אַטאָמען פון H ווערען פאַרביטען דורך כלאָר אַטאָמען. און מען באַקומט כלאָראָפאָרם, $CHCl_3$, און טעטראַ-כלאָר-מע-טהאַן, CCl_4 .



כלאָראָפאָרם, $CHCl_3$, און טעטראַ-כלאָר-מעטהאַן (טעטראַ מיינט פיער) זיינען פאַרבילאָזע, שווערע פליסיגקייטען, וועלכע ווערען פיעל גענוצט אויפצולעזען פעטס, גומי, קאלאפאָניע און ד. גל. כלאָראָפאָרם, $CHCl_3$, איז אויך אַ וויכטיגער אַנאַסטעטיק (פאַרשלעפערונגס-שטאָף). טעטראַ-כלאָר-מעטהאַן, CCl_4 , ווערט אויך געברויכט צו רייניגען פלעקען פון קלייער און אַלס אַ מיטעל אַיינצולעזען אַ פיער.

אַנשטאט כלאָר, Cl_2 , קען מען דעם וואַסערשטאָף פון מעטהאַן אויך פאַרבייטען מיט בראָם, Br_2 , אָדער יאָד, I_2 . ווען דריי אַטאָמען וואַסערשטאָף ווערען פאַרביטען מיט יאָד, באַקומט מען דעם

Figure 4. Reactions with chlorine, from Feinstone's *Khemye*. The heading of this section is "khlороform un yodoform" (chloroform and iodoform).

("Practical Work in Natural Studies") provided a guide for science teachers for laboratory experiments on the metric system, melting and boiling points of various materials, and solutions, as well as a list of necessary materials for the school laboratory (10). Fig. 5 shows Golomb's examples of a cooling curve for water. Golomb's book was a product of the Eastern-European Jewish secular schools, which were quite active between the World Wars.

Perhaps the high point in Yiddish chemistry literature and the most thorough and serious treatment of chemistry in Yiddish was Shmuel Brokhes's 305-page *Khemye: Loytn Laboratorishn Metod* ("Chemistry: According to the Laboratory Method"), written on a high-school senior level (Fig. 6) (11). This textbook was not one written for nonscientists, nor a translation of textbooks from western Europe, but an original Yiddish chemistry textbook, published in Belarus, in the former

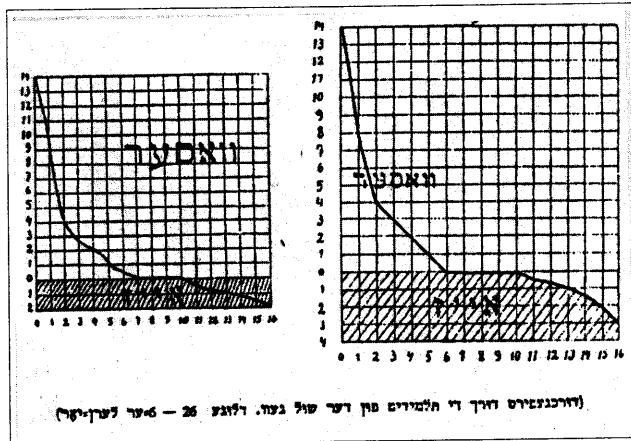


Figure 5. Sixth-year students' cooling-curves of water from *Praktische Arbet*. The handwritten words on the upper part of the graphs are *vaser* ("water"), and at the bottom, *ayz* ("ice").

Soviet Union. Brokhes explained in the preface to the teacher that (11):

This book is constructed according to the laboratory method, and has a technical bent. Everywhere the material is thoroughly taught, offered from practical works that the student himself has to do in the school laboratory.

Brokhes's treatment of the chemistry itself was very descriptive, practical, and nontheoretical, with several paragraphs of explanation followed by a laboratory experiment, repeated a number of times per chapter. Chapters were organized more-or-less according to the important commercial elements and compounds (See Table 1). Fig. 7 is a chart sketching the importance of sulfuric acid. The then new quantum theory was not even mentioned. A small amount of radiochemistry was discussed in a section entitled "radioactivity," beginning with Becquerel's discovery of radioactivity in 1896 and the Curies' isolation of radium. Brokhes mentioned

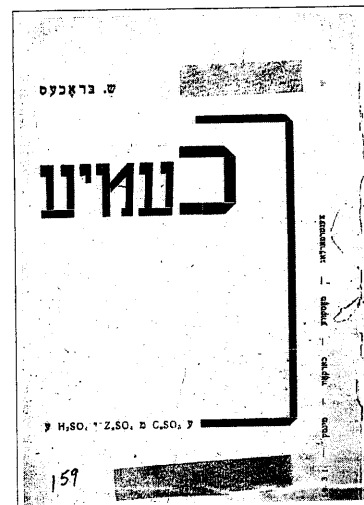


Figure 6. Title page from Brokhes's *Khemye*. Interspersed with the formulae for sulfuric acid, zinc sulfate, and calcium sulfate is the word *khemye* ("chemistry")

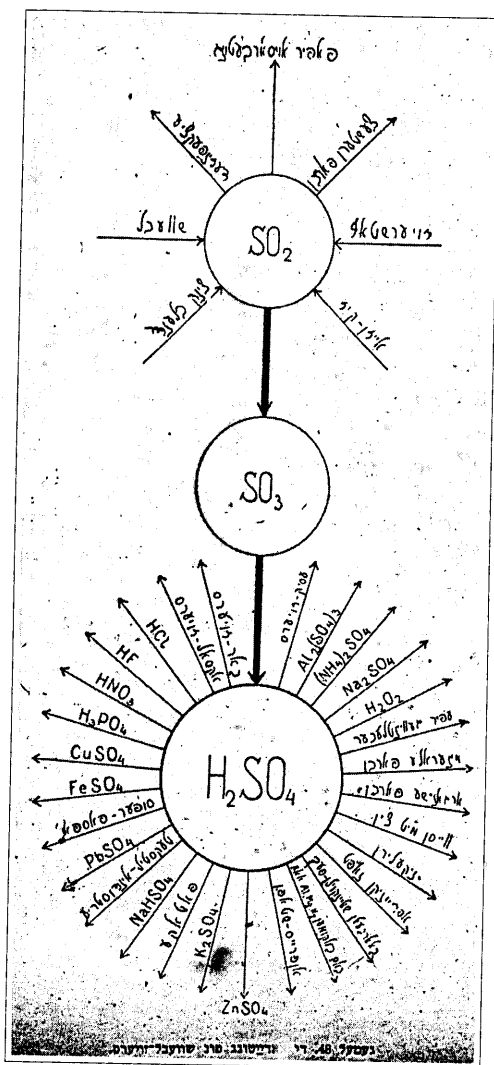


Figure 7. Chart depicting the importance of sulfuric acid, from Brokhes's *Khemye*. Arrows leaving SO_2 point to paper fabrication, dyes, and disinfectants. Arrows entering SO_2 are labeled sulfur, oxygen, iron pyrite, and zinblend.

α , β , and γ -rays, describing α -rays as having the weight of a He atom, β -rays as similar to cathode rays (without further explanation), and γ -rays as similar to light. He noted that U, Ac, and Th are radioactive, with the final decay product being Pb, and that their half-lives are insensitive to pressure, heat, and other common energy sources. Brokhes discussed isotopes of lead (^{206}Pb and ^{208}Pb) and chlorine (^{35}Cl , ^{37}Cl , and he suggests possibly ^{39}Cl) and their relationship to atomic weight. No explanation of radioactivity or isotopes based on the then incomplete knowledge of atomic structure was provided. Perhaps the subject was too controversial, and he intended the astute reader to draw his own conclusions.

Brokhes's textbook was a product of the Soviet educational system, designed to neutralize the peasants' superstitious interests in religion and to instill a materialistic sensibility. Publishing in Yiddish was a logical choice, for most Jews at the time were still poorly educated but fluent in this language. The Jews in early Soviet society were officially considered one of many "peoples" comprising the Soviet Union, so Yiddish became a government accepted medium of secular instruction for Jews for a while. Numerous technical dictionaries and textbooks in Yiddish were published in the 1930s.

The worries of World War I weighed heavily on the Soviet people, for Brokhes also explains that (11)

[B]ecause of the great significance of chemical warfare methods in a wartime, it is necessary to give the students an idea of the most important explosives and poison gases. In this book a separate chapter (XVIII) is given about them.

Indeed, an entire propagandistic chapter devoted to chemical warfare is provided, with the following introduction (11):

What does each citizen of the Soviet Union have to remember? For our entire existence, the capitalists have not stopped preparing for war against us. Many facts reveal that during recent times, in concert with our victories on the socialist front from one side and with the economic crisis in the bourgeois countries from the other side, the relation of the capitalist world to us gets ever more aggravated, therefore the revolutionary ascent of the proletariat and colonial peoples of the world has to take care. It is enough to remind one of the wild hate that is driven against us by the spiritual people of all beliefs under the leadership of the Roman Pope; among them the rabbis are counted separately.

Once Brokhes got past this obligatory socialist drivel, he plowed into the chemistry of explosives. Fig. 8 is a table of various explosive compounds in Yiddish.

Chemical propaganda was by no means an isolated incident to Brokhes's textbook. A contemporaneous book, *Khemisher Kamf* ("Chemical Struggle") (12), gave detailed explanations for nonscientists of how to prepare for the predicted chemical war against socialist peoples. From this book, an illustration of how soldiers suited up for gas attacks would appear is shown in Fig. 9.

Since World War II, unfortunately, interest in Yiddish as a medium for education has severely declined, because most native speakers were killed or have died

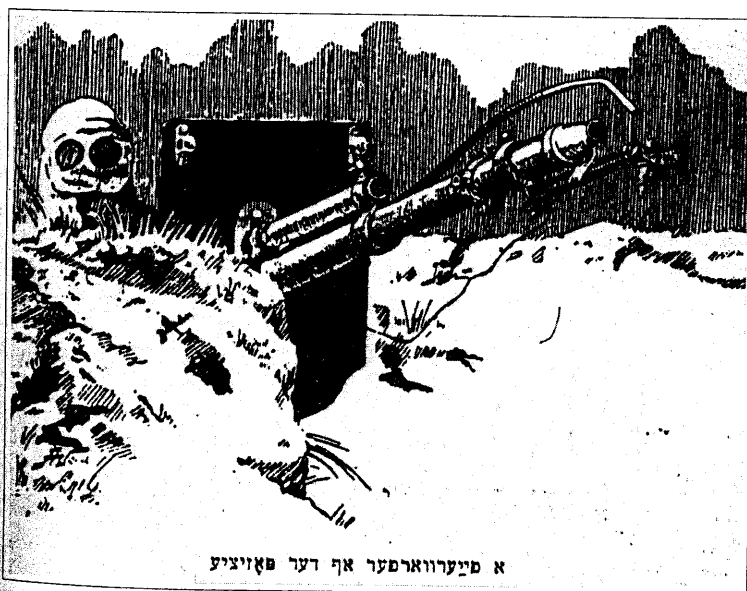
פאָלגנדיקע טאָבעלע גיט א באגריס וועגן די וויכטיקסטע אופרייס־שטאַפן:

נאָם	כעמישער באשטאנד	אנטדעקונג	טון וועלכע שטאַפן ווערט צוגעגרייט	טעמפּעראַטור באַם אופרייסן	דריקונג טון די גאזן באַם פאַר־ברענען 1 קילאָ
יענער־פּוּל־ווער	$Hg(CNO)_2$ S — 10% C — 15%	XIII יאָרהונדערט. די אראבער	KNO_3, S, C	2700°	3400 אטמאָספּער
קנאל־קוועקזילבער	$Hg(CNO)_2$	1799	ספירט, קוועקזילבער, אַזאָט־ווערט	?	4400
ניטראָגליצערין	$C_3H_5(ONO_2)_3$	1846	גליצערין, אַזאָט־ווערט, שוועבל־ווערט	3200°	9800
פיראַקסילין	$C_6H_2O_2(ONO_2)_3$	1845	בעזולזע (וואַסער), אַזאָט־ווערט, שוועבל־ווערט	2600°	9500
פיקרינ־ווערט	$C_6H_2(NO_2)_3OH$	XV יאָר־הונדערט	קאריבאָל־ווערט, אַזאָט־ווערט, שוועבל־ווערט	2400°	8600
טראָטייל	$C_6H_2(NO_2)_3CH_3$	1900	טאַלואַל, אַזאָט־ווערט, שוועבל־ווערט	?	7200

Figure 8. Table of explosives, from Brokhes's *Khemye*. Column headings from right to left: "Name;" "Chemical composition;" "Discovery;" "From which materials is it prepared;" "Temperature upon explosion;" "Pressure of the gases upon burning 1 kilo."

without passing on the language to their children. Literature, including scientific works, continues to appear occasionally, however. The 1960s saw Sol Podolefsky's book *Di Velt fun Visnshaft, un Visnshaftleke Teoryes* ("The World of Science, and Scientific Theories") (13) appear, with numerous short essays on various sci-

entific topics for the layman. Most of these dealt with astronomy, biology, geology, archeology, and cosmogony; but several touched on chemistry, including a not-so-accurate discussion on the structure of the atom (Fig. 10). Other essays explained about fire, hardness of water, diamonds, the discovery of phosphorus, and properties of oxygen and copper.



א פֿלעמ־וואַרפֿער אין דער פּאָזיציע

Figure 9. "A flamethrower in position," from *Khemisher Kampf*.

Recent examples of Yiddish works on chemical subjects are primarily news items. The weekly Yiddish newspaper, *Forverts* ("Forward") publishes general news on various world-wide topics, including scientific discoveries, especially when there are political implications (e.g., the energy crisis, greenhouse effect, genetic engineering.). Examples of recent chemistry-related headlines appearing in the *Forverts* are shown in Fig. 11.

Last sources for Yiddish chemical terminology are, of course, various reference books. Uriel Weinreich's *Modern English-Yiddish Yiddish-English Dictionary* (14), considered the modern standard, includes a small number of relatively common terms, useful in general conversation, such as *brom* ("bromine") and *molekul* ("molecule"). Mordkhe Schaechter's recent dictionary *Trogn, Hobn un Friike*

Kinder-Yorn ("Pregnancy, Childbirth and Early Childhood") (15) includes a few chemically related terms such as *de-en-a* ("DNA"), *haytl* ("membrane"), and *tsinkzayers* ("zinc oxide"). Within the League for Yiddish's quarterly journal *Afn Shvel* ("On the Threshold") is Schaechter's language column, "Laytish Mame-Loshn" ("Proper Mother-Tongue"), in which he explains

correct Yiddish grammar and vocabulary. Occasionally he includes chemistry terminology (16), such as *zayers* (acid), *zayersdikayt* (acidity), and *zayers-regn* (acid rain). On the other hand, Nahum Stutchkoff's massive *Der Oytser fun der Yidisher Shprakh* ("The Thesaurus of the Yiddish Language") (17), arranged very much like an English *Roget's Thesaurus*, includes literally hundreds of terms related to chemistry, ranging from the obsolete *doberiners triadn* ("Dobereiner's Triads") to *daltons gezets vegn teylvayzn druk* ("Dalton's Law of Partial Pressures"), as well as verbs like *filtrirn* ("to filter"), or *sublimirn* ("to sublimate"), and elemental names such as *silitsum* ("silicon") and *bor* ("boron"). (See Fig. 12.)

With the help of several scientifically oriented native Yiddish speakers, I have created a modern chemistry dictionary with about 3,000 words and phrases from *absoluter alkohol* ("absolute alcohol") to *tishboyres* ("fractional number") (18). In addition, to promote the use of chemistry-related terms in the home with children, I co-authored a web-based article in the internet magazine *Der Bavebter Yid* ("The Interconnected Jew") in Yiddish on generating electricity with two dissimilar metal strips inserted into a lemon (19).

דער געבוי פון דעם אטאם

דער קאפ פון א שפילקע קעפל, וואס וועגט אן אכט-טויזנטל פון אן אונץ און די גרויס פון א טויזנטל פון א קוביק אינטש, באשטייט פון א צאל פון 10 ביז 20 בולן אטאמען. דאס איז אזא גוואלדיקע צאל וואס מיר האבן שוין דערויף קיין נאמען ניט. יעדער אטאם האט א צענטראלן נוקלעאום. אדער ניוטראן און א פראטאן ארום וועלכן עס דרייען זיך עלעקטראנען אין פאר-שידענע ארביטס. די גרויס פון ניוטראן איז א סך קלענער ווי דער אטאם אליין. אבער די ארביטס פון די עלעקטראנען זיינען גרויס לויט דער גרויס פון אטאם.

Figure 10. The beginning of an essay on "the structure of the atom" from *Di Velt fun Visnshaft*: "The head of a pin, which weighs an eight-thousandth of an ounce and a thousandth of a cubic inch in size, consists of an amount of 10 to the 20 zeroes atoms. This is such a huge amount that we don't yet have a name for it. Each atom has a central nucleus, or neutron and a proton [sic] around which revolve electrons in different orbits. The size of a neutron is much smaller than the atom itself. But the orbits of the electrons are big according to the size of the atom."

די נאבעל־פרעמעיס פֿאר וויסנשאַפֿט אינעם יאָר 2000
ברען־מאַטעריאַלן פֿאַרן 21סטן יאָרהונדערט
נייע זון־צעלע קאָן ווערן דער וויכטיקסטער ענערגיע־קוואַל

Figure 11. Recent chemistry-related headlines from the *Forverts* newspaper: (top) "The Nobel Prizes for science in the year 2000," Oct. 13, 2000; (middle) "Fuels for the 21st century," July 7, 2000; (bottom) "New solar cell can become the most important energy source," Sept. 20, 1996.

For a language that has been sequestered most of its existence in the Eastern European areas where Jews were forced to live, a legitimate question is whence did Yiddish's chemical vocabulary arise? No definitive study has been done on the etymology of scientific terminology—let alone general word origins—in Yiddish, so some speculation is offered herein. Besides coinages native to Yiddish, probably the primary source is German, for several reasons. Modern *Hochdeutsch* is quite similar to Yiddish, and it was in widespread use in the 19th century as the medium of chemical research and instruction. Furthermore, in the late 19th through early 20th centuries, a style of Yiddish usage (*daytshmerish*) suggesting higher education and social status incorporating much German general vocabulary was in vogue (20). Feinstone's *Khemye* made extensive use of such "*daytshmerisms*" ("Germanicisms"), to the point of being stilted for today's Yiddish speakers. Examples of words from German are names of certain elements, such as *vasershtof* (*Wasserstoff*, hydrogen), *zoyershtof* (*Sauerstoff*, oxygen), and *shtikshtof* (*Stickstoff*, nitrogen). The common name of carbon dioxide in Yiddish is *koyln-zayers* (cf. German *Kohlensäure*, carbonic acid).

A second source of vocabulary is from Slavic languages (Russian, Polish, Serbian, Czech, etc.), because of the geographic proximity. For "rust", Yiddish uses *zhaver* (cf. Russian *rzhavchina*). For "slaked lime," the Yiddish term is *vapne* (Polish *wapno*). "Neutral" is *neytral* in Yiddish (Russian *neytral'niy*), and "flask" is *kolbe* (Polish and Russian *kolba*).

218-217

ולאקדמעטאל, לייטמעטאל און און 204, 205, 218; פלום, שלאק.
 גליון; האסערולאן, אינזולאן, טאןולגליון, שייבולגליון, טאפליעולגליון, פענצטערולגליון, גארטנולגליון, שפייגלולגליון און; ולגאומאסע, ולגאושלאק, ולגאומאסע, ולגאושטויב, קאלך, קאלער, כלגארקע; ליימקאלך, שטיינקאלך, געברענט קאלך; עסעריק (עציק) קאלך; צעמענט, שטיינקייט; טאטירלעכער, הידראוילישער, פארטלענדישער און צע מענט; פארצעליצעמענט; ליים, קאללין, צימאליט, שאמאט, פארצעליט, פלאגס; בע טאן, איינדבעטאן, קאנקריט וואס.
 מעטאל ארבעטער, אייזן ארבעטער, שטאלארבעטער, מעטאליסט, מעטאלאג, יען, גיסער, שמעלצער, קאכער, אמאלטאג מאטאר; איינדקאכער, שטאלקאכער און; מעטאלגיסער, איינדגיסער, שטאלגיסער, ולגאקגיסער און; ולגאושער, ולגאובלעך, זער, ולגאומאכער, ולגאושליפער; קילברע נער, קאלכברענער, האפיק, האפעליניק, מעטאל שרוחער; מעטאלורג.
 ז: צעגין, לזון, טיען, צערינען, צעשווימען; ופארולמכונען צעגין וי שיי, וי האקס, וי פוטער טויך דער וון, וי גיזון (אין מיל), וי זאלזאקסער, וי זוקער אין א גליון טיי; מאכן פליסיק; צעלזון, צעשמעלצן, צע טאפיען, אויפלייזן; גיסן, אפריסן, אויסווסן; מעטאליזירן, לעגירן, אמאלטאזירן, בעסער מעריזירן, גאלוואזירן; האלצעווען, העל צעווען.
 אדי; בלייק, בלימען, בליען; גאלדיק, גאלדן, גילדערן און 5.
 זען און; געלעגער 204, מעטאלגארבעטער 205, כעמיע 218, זען 220.
218. כעמיע
 ס: וויסנשאפטן כעמיע, כימיע; אלגעמינע, אנאליטישע, סעקרעטישע, פייזיקאלישע.

פראקטישע, ארגאנישע, אומארגאנישע (און ארגאנישע) און כעמיע; ביאלאגישע כעמיע, ביאכעמיע; מיקראכעמיע, טערמאכעמיע, געאכעמיע, פארמאקאכעמיע, עלעקטראכעמיע, פאטאכעמיע און; אנטיקלסטור-כעמיע, אנטאכעמיע; וואקאכעמיע; אלכעמיע, אלכימיע.
 מאטעריע, טובסטאנדן, קערפער, שטאף; גרונטשטאף, קדמוןשטאף, יארשטאף.
 ומינים שטאפן אינפלאכע, קאמפליצירטע, איינהיילעכע, גלייכמיסיקע (ולייבאריטיקע) האמאגענע, העטעראגענע, ריינע, צווישנע שטעלטע (צוזאמענגעזעצטע), פאלימארפע, הארטע (סאלידע), פעסטע, קריסטאלישע, קריסטאלישע, פליסיקע, גאזיקע, עלאס טישע, מיטעלאסטישע, פעסטע, טויטע, מינע ראלע, ארגאנישע, אומארגאנישע (אנארגאנישע), געווינלישע, גאספאטערישע און שטאפן.
 פליסיקייטן; מישיקע, מיטמישיקע פליסיקייטן; גאזן 220; מעטאלן; גרינע (ליכטע, רעאקטיווע), שווערע (ווייניקער-ראקטיווע), גאר מיטראקטיווע, איידעלע, מיטאיידעלע, האלד איידעלע מעטאלן; מיטמעטאלן, אמעטאלן, אלקאלישע ערדמעטאלן, אלקאלימעטאלן, סטרוקטור פון ארגאנישע פארבינדונגען; ציקלישע, אינאציקלישע, אליציקלישע, הע טעראציקלישע סטרוקטור; קייטן, ומסקייטן, טאפליבנדונגען, פשוטע (איינפאכע) בינדונגען; אטאםסטרוקטור; עלעקטראן, פראטאן און 104.
 וכעמישע עלעמענטן אוראניום (אוראן), איטעריום, איטרום, אייזן, איידאפיום, אר לניום, אינדיום, אידידיום, אלגאמין, אלר מייזום (אלומין), אמעריקיום, אטימאניום (אטימאן), אסמיום, ארטאן, ארסען, באר, באריום, ביסמוט (ויסמוט), בלע, בעריליום (בעריל), בראם, גארליזיום, גאלד, גאליום, גערמאניום, דיספארוויזיום, האלמיום, האפניום,

Figure 12. Yiddish thesaurus with topic 218, "Chemistry," starting on the lower right, with entries "chemistry; general, analytical, theoretical, physical," continuing on the left column "practical, organic, inorganic, etc. chemistry; biological chemistry, biochemistry; microchemistry, thermochemistry, geochemistry, pharmacology, electrochemistry, photochemistry, etc.; agricultural chemistry, zoochemistry, alchemy..."

The Hebrew-Aramaic component of scientific Yiddish is found in *mashmoesdikeyt* (probability [as in statistics]), *umseyder* (disorder, a combination of Germanic *um-*, "dis-," and *seyder*, "order"), and *makhshir* (instrument, tool, apparatus). The influence of French, the language of culture that the Russian nobility admired, appears occasionally in Yiddish. Two examples are the

second name of nitrogen, *azot* (Russian *azot*, probably from French *azote*), and *nivo* ("level" [height, e.g., of a liquid in a container or energy of electrons], from French *niveau*).

Finally, internationalisms, generally from Latin or Greek, common to many languages beginning with the Renaissance and accelerating during the Industrial Revo-

lution, are found throughout Yiddish, including most element names, organic and inorganic naming conventions, mathematical terms, units for the metric system, subatomic particles, and so forth.

As we have seen, Yiddish has nearly all types of chemical literature: textbooks for the serious student and layman, teacher's guides, newsworthy articles, and reference sources of terminology (21). One important and notable absence is journals in which to report original chemical research.

Considering the general utility of chemical literature in Yiddish, one might examine the population of the present speakers and readers of the language. Estimates of the number of Yiddish speakers in the 1930s ranged from 10.7–11.9 million. By contrast, Birnbaum estimated the number of Yiddish speakers had dropped to 5–6 million by the late 1970s (22). It would not be unreasonable, therefore, to guess, solely on the basis of natural attrition and general lack of transmission of the language to the youth, that the number of Yiddish speakers has been cut in half yet again. According to the 1990 United States Census, Yiddish was the 16th largest language spoken in the USA, with 213,000 speakers over age 5 (23). Though full statistical data have not been released yet, the 2000 United States Census counted nearly 179,000 people over the age of five who spoke Yiddish (24), out of estimates ranging from 5.2–6.1 million Jews in the USA (25, 26), or only about 3 % of the Jewish population. At present, most Jews of Eastern-European descent communicate among themselves in the language where they live (e.g., English, Hebrew, Russian, French, etc.), rather than Yiddish; therefore the need for discussion of matters concerning chemistry is perceived as correspondingly low. Offsetting slightly the general decline in the use of Yiddish, the religiously strict and often isolated Hasidim still use Yiddish as their everyday means of communication; they tend to have larger families. The Census showed that 36,000 children ages 5–17 used Yiddish in the State of New York alone in 2000 (27).

Today, in the European Community, the Yiddish language is under the jurisdiction of the "European Bureau of Lesser Used Languages" (28) and has gained official status as a recognized Jewish language (along with Ladino) in Israel. The Jewish Autonomous Region of Birobidzhan, established in 1934, in remote far eastern Russia near Manchuria, has used Yiddish as an official language since 1935, though no more than roughly 5,000 Jews remain there out of over 200,000 inhabitants. For the past several decades, a growing number of

colleges and universities around the world have offered classes in Yiddish, catering to the small but increasing interest by the young for this thousand-year-old language with much to offer, even in science. Perhaps we will see an increase in the use of Yiddish, as well as with other minority languages, to transmit the excitement of chemistry, a universal topic, in the future. Table 2 gives the first 18 elements from the Periodic Table in Yiddish.

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I wish to thank the late Ezra Stone (the son of Sol Feinstone) and his son Josef Stone, along with the David Library of the American Revolution, in Washington Crossing, PA, for the opportunity to examine the Library's copies of Sol Feinstone's *Khemye*. **NOTE:** Yiddish transcription is according to the YIVO (Institute for Jewish Research, New York) standard.

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