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A Festival of Chemistry Entertainments

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
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ACS SYMPOSIUM SERIES **1153**

A Festival of Chemistry Entertainments

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Sponsored by the
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Foreword

The ACS Symposium Series was first published in 1974 to provide a mechanism for publishing symposia quickly in book form. The purpose of the series is to publish timely, comprehensive books developed from the ACS sponsored symposia based on current scientific research. Occasionally, books are developed from symposia sponsored by other organizations when the topic is of keen interest to the chemistry audience.

Before agreeing to publish a book, the proposed table of contents is reviewed for appropriate and comprehensive coverage and for interest to the audience. Some papers may be excluded to better focus the book; others may be added to provide comprehensiveness. When appropriate, overview or introductory chapters are added. Drafts of chapters are peer-reviewed prior to final acceptance or rejection, and manuscripts are prepared in camera-ready format.

As a rule, only original research papers and original review papers are included in the volumes. Verbatim reproductions of previous published papers are not accepted.

ACS Books Department

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Preface

This collection seeks to perform an act of magic. Imagine the iconic clip of a muscular man hitting a gong at the beginning of a J. Arthur Rank film to announce to viewers that they are entering a different realm. The sound of the gong signals that you are being transported away from the everyday into the world of movies. Elements of chemical whimsy can have the same effect when you encounter them amidst the serious business of science.

Suppose you're looking up articles on iron carbonyls, and you note with pleasure that one of the articles is written by someone named Steel. While browsing a table of contents, you see an article on FAKE molecular orbitals; that is obviously intriguing. You look into it and find out that FAKE is an acronym for Fast Accurate Kinetic Energy. The first is a case of whimsy by accident; the second is whimsy by design. Between these two is a middle ground, illustrated in a paper by Harry B. Gray and a visiting scientist in his laboratory, Zvi Dori. Those attuned to whimsy will immediately recognize that this is a paper by Dori and Gray (Dorian Gray). That sort of thing is the subject of these chapters. Once you become attuned to looking for whimsy, finding it leaves you with a sense of delight that makes the days chores a little less.

This book is a festival of whimsy. At the sound of the gong, enter the festival, and celebrate.

In Chapter 1, Bill Carroll pays homage to Ken Reese, purveyor of whimsy for us for many years on a weekly basis in the form of 'Newscripts' in *Chemical and Engineering News*. For many of us, the back page of *C&EN* was the front page, as we turned to Ken Reese's column first for items that would inform and entertain us.

Chapter 2 is the story of what whimsy lurks in the records of Chemical Abstracts Service. Most people think of CAS as being a somber, very serious, and most unlikely place to find delightfully and sometimes quite wicked and witty thoughts about matters. As an example, some years ago Chem Abstracts issued a book of drawings as a molecular coloring book. One of the illustrations was adamantane, but an adamantane that had been compressed flat in 2 dimensions, creating an interesting pattern of shapes. Not content to suggest only that people color in the shapes, the book's creators instructed the artist to color the forms in such a way that no two adjacent shapes have the same color. This article contains unexpected facts and records found in the deep data mines of CAS.

On three occasions the physician Howard Shapiro, accompanied by his acoustic guitar, sang his paper at ACS meetings. Chapter 3 presents the lyrics along with explanatory notes for several of Howard's musical renditions. References are provided to YouTube links so you may actually hear the music in addition to reading the lyrics and the stories behind them.

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Virginia Orna is a chemist and internationally renowned expert in medieval dyes and pigments; she is also an expert constructor of crossword puzzles. Virginia, who has had puzzles accepted by publications as diverse as CHEMTECH and *The Sunday New York* Times, walks us through the design and completion of chemically based puzzles in Chapter 4. She also answers some of the frequently-asked questions from puzzle-solvers about the art and science of teasing our brains with crosswords.

The world is full of pranks by authors, editors, and even groups of people involved in the production of journals. In Chapter 5, Natalie Foster offers a collection of humorous entries into the chemical literature that include animals as co-authors, jokes that have become part of the folklore of chemistry, and an entire issue of a flagship journal that was devoted to humor.

The American Chemical Society in its machinations is a totally human endeavor that is not immune to humor. Former ACS President Mary L. Good concentrates on politics in Chapter 6, which is more thoughtful than humorous, although her description of Linus Pauling's appearance at the 100th Anniversary of the ACS certainly qualifies as whimsical. The goings-on in the ACS over many decades are a thought-provoking description of what we have done in the past and may provide insight about what we may do in the future.

Chapter 7, the final chapter, is pure Jack, as he mops up the topic of whimsy in chemistry with a potpourri of items from his vast library. Much of Jack's accumulated memorabilia was lost in Hurricane Katrina, but the memory lives on in the literature and folklore of our discipline. As Jack sounds the gong at the end of his chapter, you will be returned to the serious but hopefully not somber world. As you read and watch and study in the future, may you continue to hear the sound of the gong and capture the whimsy.

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Jack Stocker: A One-Man Festival of Chemistry

Chemistry has always boasted an amazing and entertaining set of peripatetic raconteurs who add class, sparkle, and warmth to our national meetings. Derek Davenport, Hubert Alyea, Max Gergel, Howie Peters, Bill Carroll, and Bassam Shakhashiri are but a few members of that cohort. Bowtie-wearing, beret-topped Jack Stocker, however, was chief of this club of colorful characters. In the halls, in the nearby streets, or on the exposition floor of a chemistry meeting, if you saw Jack ambling into view, clad in his green sweater vest, tweed jacket, lapels ladened with buttons and badges, you knew you were about to be treated to an entertaining conversation on chemage (more later), fascinating examples of nomenclature, humorous yarns, and even cutting edge chemistry told with an historical bent.

Sometimes Jack would be passing out membership cards for the International Dull Men's Club ("We Celebrate the Unremarkable"); sometimes it would be slightly ribald badges ("Book Lovers Never Go to Bed Alone"), and sometimes paperbacks on the secrets of New Orleans cooking ("First You Make a Roux"). He

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traveled with pockets and bags full of props, hand-outs and fascinating paperbacks he'd acquired at book shows with each friend's interests in mind. You always left with more than you came with when you encountered Jack at a meeting. Jack was never dull! You treasured every moment in his presence.

Jack was, in fact, a Renaissance man, a chemist with many interests and many friends among academics, book collectors, historians, Mardi Gras krews, and ACS loyalists. Jack made the cover of *C&EN* (21 November 2005) over the headline "Faces of the Storm" about the tragic aftermath of Hurricane Katrina in the infamous Ninth Ward of New Orleans. Most of book-lover Jack's >20,000 volume collection of fantasy and science fiction books was destroyed when Katrina breached the levies. He was hard at work rebuilding his personal library (heavy with genre fiction) when he passed.

Jack was always generous to a fault and had supplied several of his friends with copies of his files and book holdings. Those friends helped him begin the rebuilding of his flood-destroyed library. Jack called his science trivia collection "chemage," a made-up word linking chemistry and garbage, whose creation he attributed to one of one of his young son's response to the question, "What does your father do?" Jack was charmed by his son's insight and for the many years he traveled on the ACS Tour Speaker circuits he entitled his lecture "Chemage."

From 1958 till his retirement in 1991 Jack taught at the University of New Orleans. During his long teaching and research career (organic electrochemistry) he took sabbaticals at Oak Ridge National Labs and at the University of Lund (Sweden). Among Jack's many entertaining stories were his remembrances of turning a decommissioned air base into a new New Orleans' university and helping it grow from granting associate degrees, to undergraduate and graduate degrees, and ultimately to being a broad-based research institution. He was proud of the University of New Orleans for its achievements in chemistry education but he especially enjoyed serving as advisor to the UNO Student Science Fiction and Fantasy Club. The group became known as Survivors of the Big Bang or SOB2.

Elected to the ACS National Council by the Louisiana Section in 1972, Jack held the New Orleans seat until his death. He served in countless local section, regional, and national committee assignments including Nomenclature, Nominations and Elections, Meetings and Expositions, Economic and Professional Affairs, and the Committee on Science. From his personal experience, Jack wrote a procedures manual on how to run a successful regional ACS meeting. For decades it was the definitive reference for countless Chairs of such meetings. Jack himself served as Chair of the Division of the History of Chemistry in 1990. He was elected to the Council Policy Committee and appointed as the ACS Representative to the Chemical Heritage Foundation (CHF) Council. Jack knew the ACS inside and out.

Jack loved history and he especially loved books. He enjoyed participating in the Bolton Society, a bibliophilic group within CHF before which he frequently spoke and where he displayed rare books on chemistry and science fiction from his pre-Katrina collection. Jack organized and chaired a symposium "Chemistry and Science Fiction" at the April 1992 ACS National Meeting in San Francisco. In his paper for that symposium and in the ACS symposium volume he edited, *Chemistry and Science Fiction*, he discussed many of the best examples from his

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collection. At the time of his death he was editing this book on *A Festival of Chemistry Entertainment* derived from a symposium he organized and chaired at the ACS National Meeting in spring 2008 in New Orleans.

A Festival of Chemistry Entertainment is more than the fruit of Jack's last and most successful symposium. It's also a memorial presentation by his friends to Jack and to a subject he held dear – the use of humor and whimsy for the entertainment and education of chemists. Enjoy! Or as Jack would have said, ***laissez les bon temps rouler***!

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Chapter 1

Reese's Pieces: The Best of C&EN Newscripts and K. M. Reese

William F. Carroll Jr.*

Occidental Chemical Corporation
***E-mail: bill_carroll@oxy.com.**

Ken Reese was the heart, soul and wit behind Newscripts, the end-page collection of "Not Exactly the News" that has enjoyed over 70 years as a Chemical and Engineering News staple. This paper collects and comments on excerpts from the author's favorite columns from Newscripts and its predecessors.

When I started my career as a chemist, I had a very difficult time reading the literature. I found that most of the JACS and JOC articles I read were unintelligible and put me to sleep. So I developed the habit of reading the experimental section first, because I could at least understand the physical manipulations even if the theory was over my head.

I developed a similar approach to C&E News. I started each issue by reading Newscripts, because I could understand it. Turns out, I wasn't alone. I'll bet the back page was the front page for many other chemists as well.

Being lazy by nature, when I found the 50th anniversary article the assignment appeared to be duck soup (Figure 1). And when I found that Ken had already written the history of Newscripts as well (Figure 2), I decided I could stand up here, read these two articles to the audience in about 25 minutes, leave five minutes for questions and get on with the business of enjoying the rest of the day.

However, Jack told me he had something a bit more original in mind, and since he's my idol I said, "OK. You're a rock star, Jack. You want a research paper, a research paper it's gonna be." And off I went to the C&EN archives.

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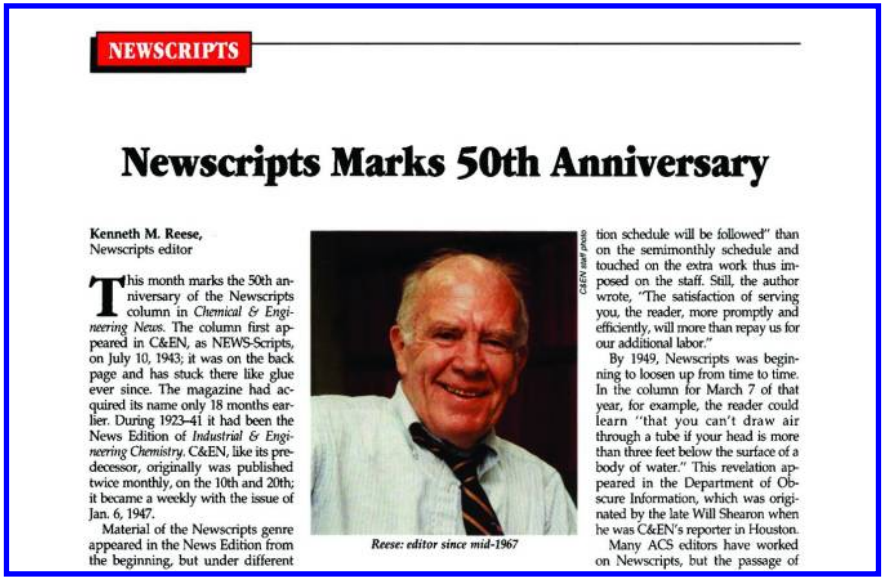


NEWSCRIPTS

Newscripts Marks 50th Anniversary

Kenneth M. Reese,
Newscripts editor

This month marks the 50th anniversary of the Newscripts column in *Chemical & Engineering News*. The column first appeared in C&EN, as NEWS-Scripts, on July 10, 1943; it was on the back page and has stuck there like glue ever since. The magazine had acquired its name only 18 months earlier. During 1923-41 it had been the News Edition of *Industrial & Engineering Chemistry*. C&EN, like its predecessor, originally was published twice monthly, on the 10th and 20th; it became a weekly with the issue of Jan. 6, 1947.

Material of the Newscripts genre appeared in the News Edition from the beginning, but under different

C&EN staff photo

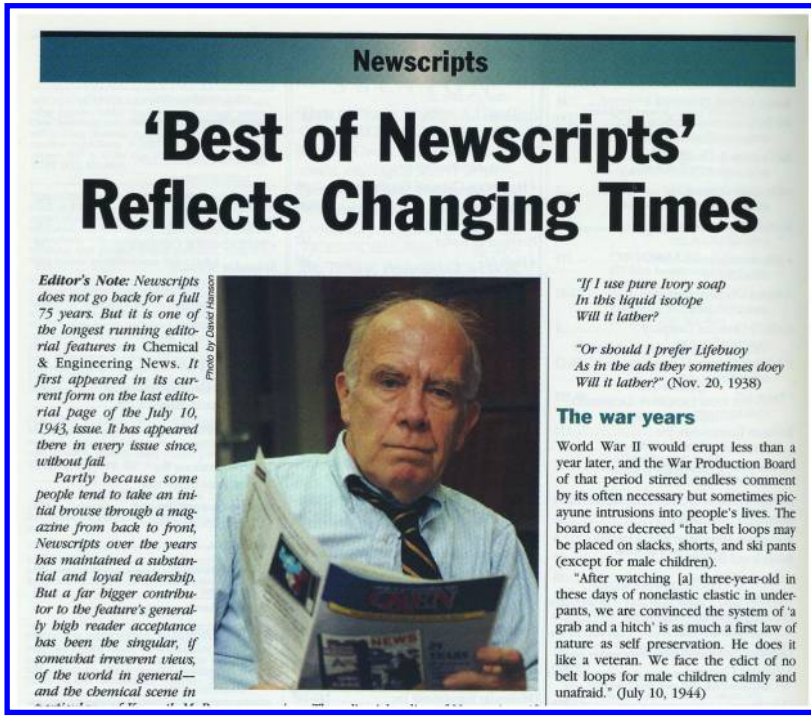
Reese: editor since mid-1967

tion schedule will be followed" than on the semimonthly schedule and touched on the extra work thus imposed on the staff. Still, the author wrote, "The satisfaction of serving you, the reader, more promptly and efficiently, will more than repay us for our additional labor."

By 1949, Newscripts was beginning to loosen up from time to time. In the column for March 7 of that year, for example, the reader could learn "that you can't draw air through a tube if your head is more than three feet below the surface of a body of water." This revelation appeared in the Department of Obscure Information, which was originated by the late Will Shearon when he was C&EN's reporter in Houston.

Many ACS editors have worked on Newscripts, but the passage of

Figure 1. Newscripts 50th Anniversary: July 10, 1993 (1).



Newscripts

'Best of Newscripts' Reflects Changing Times

Editor's Note: *Newscripts does not go back for a full 75 years. But it is one of the longest running editorial features in* Chemical & Engineering News. *It first appeared in its current form on the last editorial page of the July 10, 1943, issue. It has appeared there in every issue since, without fail.*

Partly because some people tend to take an initial brouse through a magazine from back to front, Newscripts over the years has maintained a substantial and loyal readership. But a far bigger contributor to the feature's generally high reader acceptance has been the singular, if somewhat irreverent views, of the world in general—and the chemical scene in

Photo by David Hanson

"If I use pure Ivory soap
In this liquid isotope
Will it lather?

"Or should I prefer Lifebuoy
As in the ads they sometimes doey
Will it lather?" (Nov. 20, 1938)

The war years

World War II would erupt less than a year later, and the War Production Board of that period stirred endless comment by its often necessary but sometimes picayune intrusions into people's lives. The board once decreed "that belt loops may be placed on slacks, shorts, and ski pants (except for male children).

"After watching [a] three-year-old in these days of nonelastic elastic in underpants, we are convinced the system of 'a grab and a hitch' is as much a first law of nature as self preservation. He does it like a veteran. We face the edict of no belt loops for male children calmly and unafraid." (July 10, 1944)

Figure 2. "Best of Newscripts," C&EN 75th Anniversary Issue, January 12, 1998 (2).

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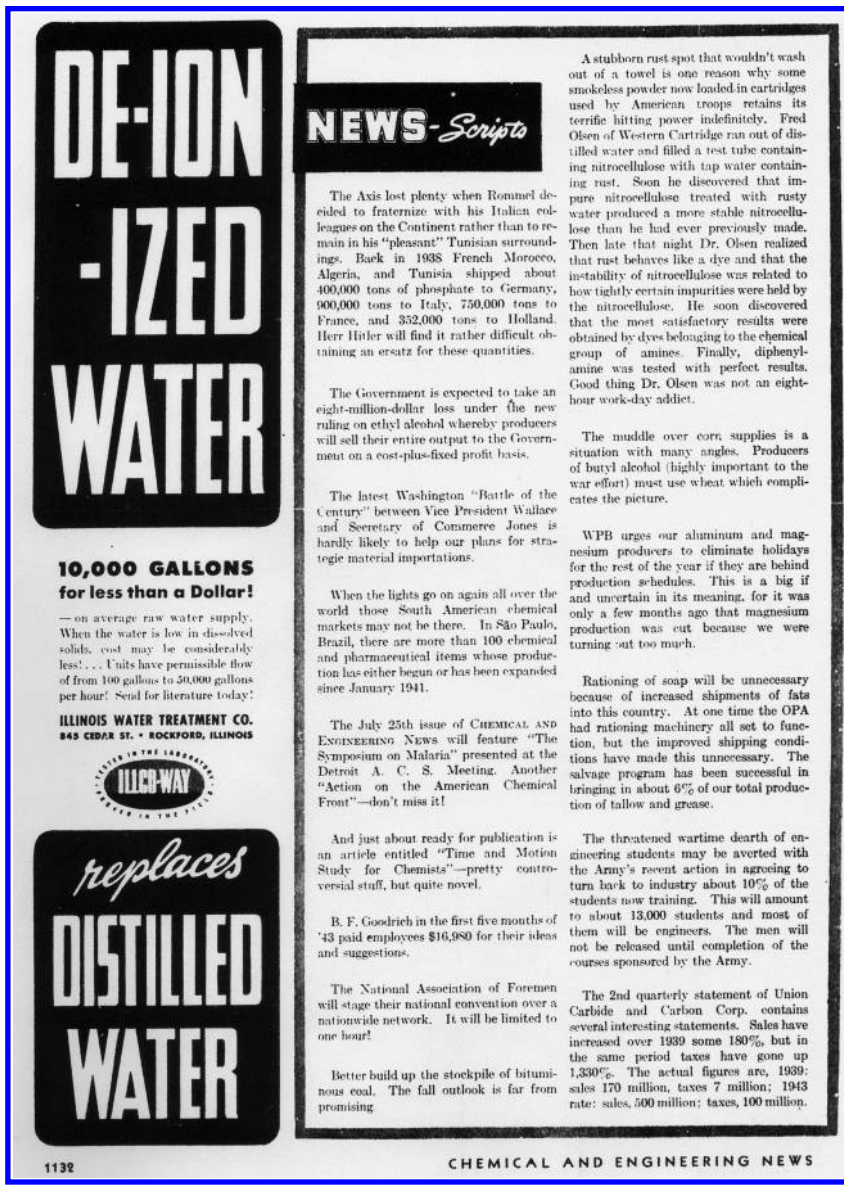
C&EN is a marvelous magazine. As with similar publications such as the Baseball Encyclopedia and Jokes for the John, you can open any issue of C&EN and find something interesting to read, especially if you pick Newscripts, or those other perennial favorites the Editors Page and its two-week later reflux, the Letters to the Editor pages.



NEWS-Scripts

The Axis lost plenty when Rommel decided to fraternize with his Italian colleagues on the Continent rather than to remain in his "pleasant" Tunisian surroundings. Back in 1938 French Morocco, Algeria, and Tunisia shipped about 400,000 tons of phosphate to Germany, 900,000 tons to Italy, 750,000 tons to France, and 352,000 tons to Holland. Herr Hitler will find it rather difficult obtaining an ersatz for these quantities.

The Government is expected to take an eight-million-dollar loss under the new ruling on ethyl alcohol whereby producers will sell their entire output to the Government on a cost-plus-fixed profit basis.

The latest Washington "Battle of the Century" between Vice President Wallace and Secretary of Commerce Jones is hardly likely to help our plans for strategic material importations.

When the lights go on again all over the world those South American chemical markets may not be there. In São Paulo, Brazil, there are more than 100 chemical and pharmaceutical items whose production has either begun or has been expanded since January 1941.

The July 25th issue of CHEMICAL AND ENGINEERING NEWS will feature "The Symposium on Malaria" presented at the Detroit A. C. S. Meeting. Another "Action on the American Chemical Front"—don't miss it!

And just about ready for publication is an article entitled "Time and Motion Study for Chemists"—pretty controversial stuff, but quite novel.

B. F. Goodrich in the first five months of '43 paid employees $16,980 for their ideas and suggestions.

The National Association of Foremen will stage their national convention over a nationwide network. It will be limited to one hour!

Better build up the stockpile of bituminous coal. The fall outlook is far from promising

A stubborn rust spot that wouldn't wash out of a towel is one reason why some smokeless powder now loaded in cartridges used by American troops retains its terrific hitting power indefinitely. Fred Olsen of Western Cartridge ran out of distilled water and filled a test tube containing nitrocellulose with tap water containing rust. Soon he discovered that impure nitrocellulose treated with rusty water produced a more stable nitrocellulose than he had ever previously made. Then late that night Dr. Olsen realized that rust behaves like a dye and that the instability of nitrocellulose was related to how tightly certain impurities were held by the nitrocellulose. He soon discovered that the most satisfactory results were obtained by dyes belonging to the chemical group of amines. Finally, diphenylamine was tested with perfect results. Good thing Dr. Olsen was not an eight-hour work-day addict.

The muddle over corn supplies is a situation with many angles. Producers of butyl alcohol (highly important to the war effort) must use wheat which complicates the picture.

WPB urges our aluminum and magnesium producers to eliminate holidays for the rest of the year if they are behind production schedules. This is a big if and uncertain in its meaning, for it was only a few months ago that magnesium production was cut because we were turning out too much.

Rationing of soap will be unnecessary because of increased shipments of fats into this country. At one time the OPA had rationing machinery all set to function, but the improved shipping conditions have made this unnecessary. The salvage program has been successful in bringing in about 6% of our total production of tallow and grease.

The threatened wartime dearth of engineering students may be averted with the Army's recent action in agreeing to turn back to industry about 10% of the students now training. This will amount to about 13,000 students and most of them will be engineers. The men will not be released until completion of the courses sponsored by the Army.

The 2nd quarterly statement of Union Carbide and Carbon Corp. contains several interesting statements. Sales have increased over 1939 some 180%, but in the same period taxes have gone up 1,330%. The actual figures are, 1939: sales 170 million, taxes 7 million; 1943 rate: sales, 500 million; taxes, 100 million.

Figure 3. First Newscripts column, July 10, 1943.

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Shown in Figure 3 is the first Newscripts column from July of 1943, although there were other columns of not-strictly-the-chemical-news that appeared almost from the beginning of C&EN's predecessor, the News Edition of I&E C.

March 29, 1929 marked the debut of "Our Poets Corner." A second column, "Emanations" appeared in September of 1930. Eventually, Emanations absorbed Our Poets Corner and continued even after the debut of Newscripts. Later, the not-strictly-the-chemical news columns were consolidated under Newscripts.

In this particular location of the magazine, Newscripts superseded a wildly interesting feature called "Miscellaneous," which was basically the 1930's-40's chemistry enterprise Craigslist. Newscripts was, at least, a literary step up.

Here's an excerpt from the first Newscripts column (*3*):

The July 25th issue of Chemical and Engineering News will feature 'The Symposium on Malaria' featured at the recent Detroit A. C. S. meeting. Another "Action on the US Chemical Front"--don't miss it. And just about ready for publication is an article entitled 'Time and Motion Study for Chemists'—pretty controversial stuff, but quite novel.

Not exactly edge of your seat exciting, but it was during the war. It got better.

Incidentally, those were the days of ads on the C&EN cover. Say what? We have ads plastered to the cover today? Good heavens.

Now, while this chapter is about Ken and Newscripts, it's always fun to look through old magazines. Consider the impact of this ad from 1943 (*4*) (Figure 4): What do I know about tetrahydrofurfuryl alcohol?

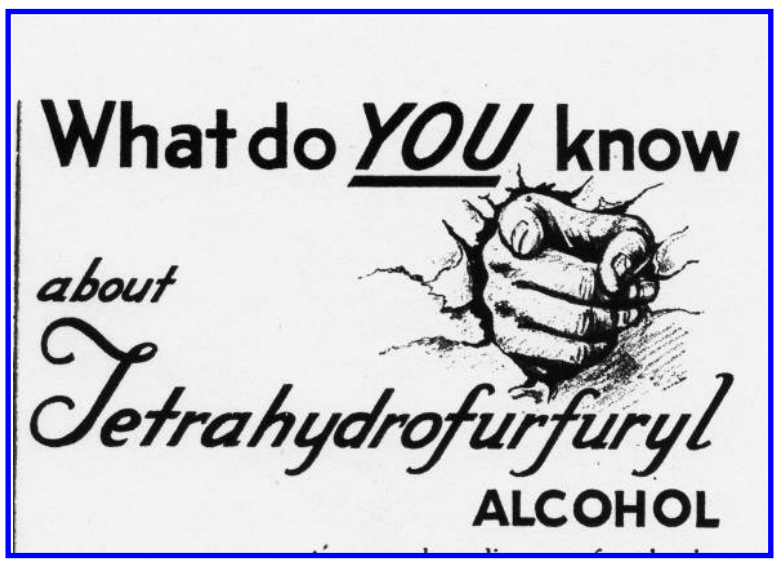
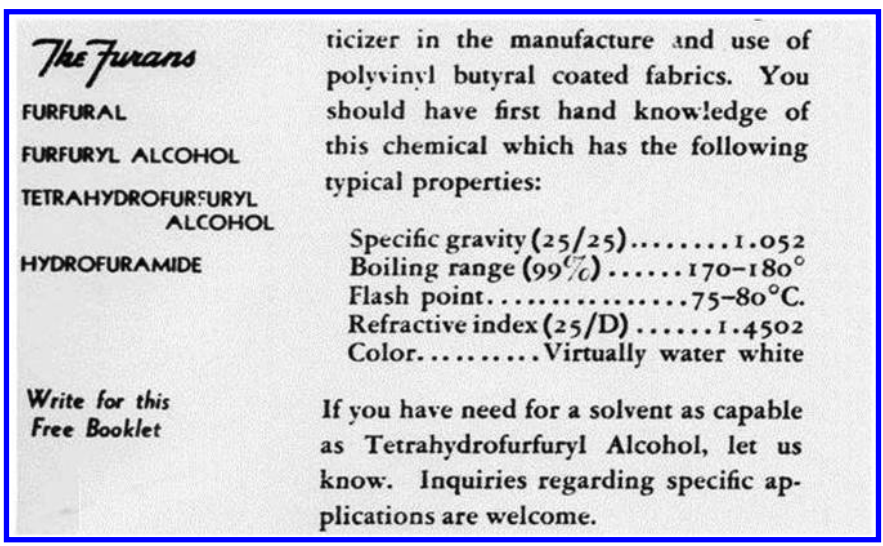


Figure 4. A provocative ad, 1943.

Not much, but it seems that it's derived from the parts of oats that aren't tasty with sugar, cinnamon and raisins (Figure 5).

Figure 5. The source of tetrahydrofurfuryl alcohol.

What about the applications (Figure 6)? Today, polyvinyl butyral is the resin between two layers of glass that makes windshields safer because when they break they tend not to shatter. If you're otherwise in the oatmeal business you must be in a great postion to make tetrahydrofural alcohol, having a corner on oat hulls.


The Furans

FURFURAL

FURFURYL ALCOHOL

TETRAHYDROFURFURYL ALCOHOL

HYDROFURAMIDE

Write for this Free Booklet

ticizer in the manufacture and use of polyvinyl butyral coated fabrics. You should have first hand knowledge of this chemical which has the following typical properties:

Specific gravity (25/25).....1.052
Boiling range (99%).....170–180°
Flash point.....75–80°C.
Refractive index (25/D).....1.4502
Color.....Virtually water white

If you have need for a solvent as capable as Tetrahydrofurfuryl Alcohol, let us know. Inquiries regarding specific applications are welcome.

Figure 6. Physical properties and derivatives of tetrahurodfurfuryl alcohol.

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Here's a blurb from May 25, 1945 (*5*).

We see by the paper that the Tokyo radio says that Japanese scientists have succeeded in increasing the alcoholic content of apple cider to the point where it is "usable as airplane fuel." We say, maybe it's just plain apple sauce.

Was this the first sighting of E85 ethanol and FlexFuel vehicles?

Any time you take on a task like this you have to have a way of filtering the roughly 2500 columns you have to choose from. I've picked a few that were timely for Ken's transitions and writing. Also, I picked some that were in the "More things change, the more they stay the same category." And because, like most people, I view the world through the lens of what's important to **me**, I picked momentous dates in my life. A crude method, but effective enough.

I was intrigued by the use in this column of an old term, "bop-head," placed in juxtaposition to another old term, "Chemist." This column ran the week I was born, January 21, 1952 (*6*).

Accolade

The Chemical Bulletin (Chicago Section, ACS) reports the following conversation between a music loving chemist and a bop-head:

CHEMIST: I see you are carrying one of Eisenschiml's books on Lincoln. Did you know Eisenschiml is a chemist, also?

BOP-HEAD: No, Man. Hey, these Lincoln cats are real gone, real gone. Eisen rides cool to the flare but then flips, dig?

A translation from Bop to English is provided "No sir. Students of Lincoln are extremely enthusiastic. The author continues an admirable personal development of the Lincoln story to the climax, at which point he appears to become speculative. Are there any questions?"

Even early on, Newscripts was prescient about the future of chemistry. Chemists in the 1960s apparently isolated and identified molecular-scale human beings known as "leprachaunes," (Figure 7) although this is probably, technically a lepro-chene-one. Newscripts was on the story (*7*).

Also recorded for the first time is the structure determination of the leprachaunes. Through spectral analysis it was found that they are composed of 'individual molecules of the dichetaune derived from leprachane, 1-cyclopropyl-2,3,4,5-tetrapropenyl-cyclopentane…' or in visual form:

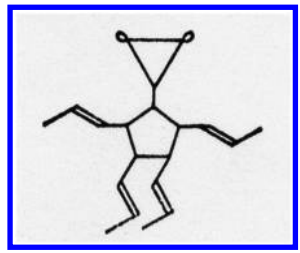

Figure 7. Leprachaune.

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It was not until the earlier part of this century that the more robust and human-like Nanokids (*8*) (Figure 8) were synthesized and isolated.

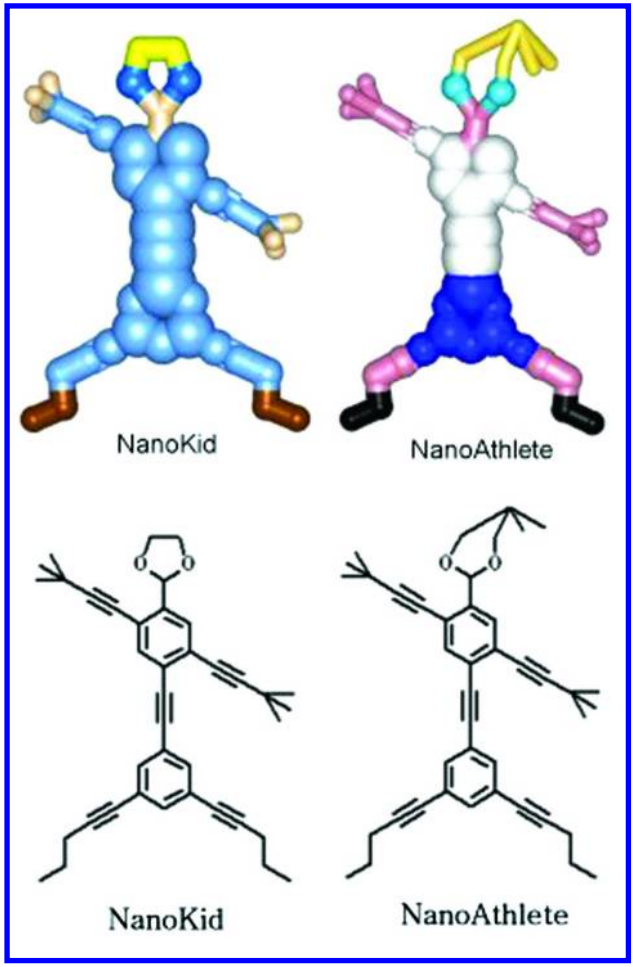

Figure 8. Nanokids © 2005 Rice University.

And one more random reference, just to humor me. This column, describes a Nobel-worthy discovery, the No-Pest strip, which, when placed in a diner removed the need for unsightly, corpse-laden flypaper (*9*).

...insecticide strip need not come in contact with the insects to do the job. Instead, No-Pest releases its deadly vapors into the air in carefully controlled minute quantities….The product…has undergone four years of testing, much of it in milk rooms at dairy farms.

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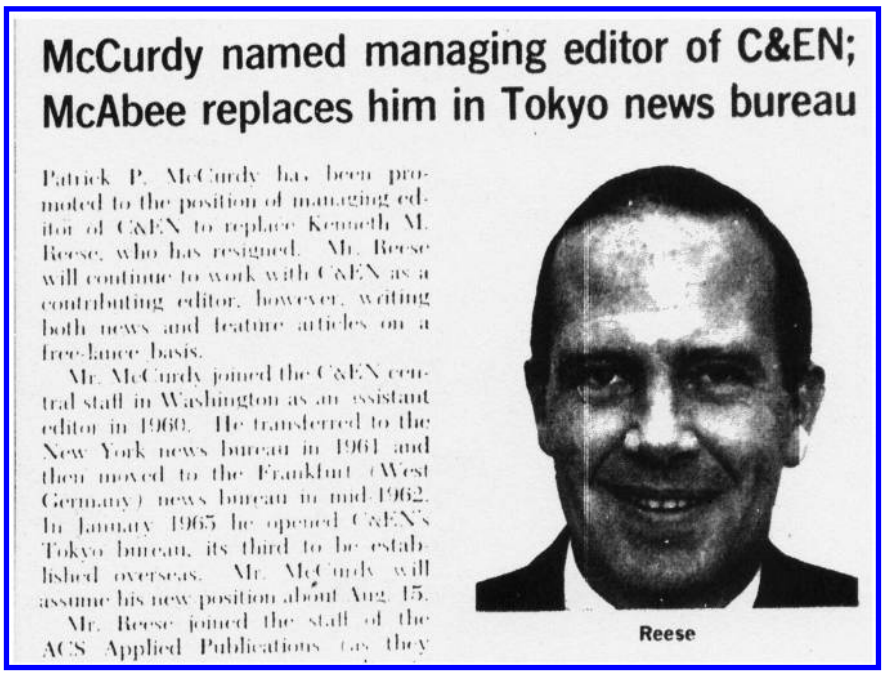
I remember them as yellow, and the vapor of 2,2-dichlorovinyl dimethyl phosphate would probably add a vaguely sweet taste to a customer's scrambled eggs. When I was a boy I wondered if the flies died in mid flight, and what their landing was like.

But I came to praise Ken Reese, not to scattershoot, and I suppose I should get around to that before I exhaust my allocated space.

Newscripts was basically a retirement job. Ken had been with ACS Publications for about 13 years, most recently as Assistant Managing Editor. This is the announcement as he stepped down, and assumed the role of Contributing Editor (*10*). (Figure 9)



McCurdy named managing editor of C&EN; McAbee replaces him in Tokyo news bureau

Patrick P. McCurdy has been promoted to the position of managing editor of C&EN to replace Kenneth M. Reese, who has resigned. Mr. Reese will continue to work with C&EN as a contributing editor, however, writing both news and feature articles on a free-lance basis.

Mr. McCurdy joined the C&EN central staff in Washington as an assistant editor in 1960. He transferred to the New York news bureau in 1961 and then moved to the Frankfurt (West Germany) news bureau in mid-1962. In January 1965 he opened C&EN's Tokyo bureau, its third to be established overseas. Mr. McCurdy will assume his new position about Aug. 15.

Mr. Reese joined the staff of the ACS Applied Publications (as they

Reese

Figure 9. Announcement of Ken Reese resignation as assistant managing editor of C&EN.

Soon after Ken took over, you could notice changes in Newscripts—changes that would become the hallmarks of the column for years to come. First, is the regal third person, as in: "Newscripts has learned…" There were the Departments: "Words Out of Context," "Flotsam and Jetsam" and "Department of Obscure Information." The next excerpt is an example of the latter.

First, we are informed that Standard Industrial Classification (SIC) Code 0913 is for "Clams, Catching of." Now, to be fair, that code has been updated in 2012 to "Shellfish" but it includes apprehending every critter that might reasonably appear in a decent cioppino. In the same column is this gem (*11*):

The Tariff Commission will hold a hearing Dec. 5 on conditions of competition between mink furskins produced in the US and mink furskins produced abroad.

Unless you're careful, it's easy to mispronounce just what part of the mink they were studying.

And this classic of Reesian dumb humor: the pun and shaggy dog story (*12*).

Snide Sioux Blast Wigwam

An artistic Plains Indian, impressed by the versatility of plastics in construction, built himself a new wigwam and gilded it lavishly with various plastic gewgaws. The amount of attention paid to the new wigwam annoyed its owner's neighbors, who begn to deride it. "Cheap Sioux veneer!" they cried to all who would listen.

To appreciate the following column, you have to be old enough, and in tune enough to remember Rowan and Martin's Laugh-In. Laugh-In was responsible for giving us catch phrases that defined an era (the late 60's) now mostly forgotten. Seminal bits of wisdom, from "Look THAT up in your Funk and Wagnalls" to "You bet your bippy." And "Sock it to Me."

Tales of Victoria R. (*13*)

George Fuermann, in his column in the Houston Post , reports an alleged conversation between Queen Victoria and Thomas A. Edison:

"Sakes alive, Tom Edison! You've come up with another invention."

"Right you are. I call this (holding a wall plug in his hand) an electrical connection."

"It may be an electrical connection to you, Tom, baby, but it's just a socket to me!"

Now, Ken's sole purpose of using Queen Victoria in that dumb joke was to set up the one he really wanted to tell:

Victoria R. may or may not have stooped to the vernacular on occasion. But it is a fact that by the time her long and famous reign had worn to a close, in 1901, she had come to command from millions of her subjects a respect bordering on veneration.

One of the Queen's subjects became so transported with admiration of his sovereign that he resolved to send her a unique token of his affection. Years of tramping to and fro on the far borders of Empire had slightly unhinged the man and he decided after deep thought…to detach one of his ears…and send it to the Queen in a small and elegant teak box, lined with velvet.

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The box duly arrived at Windsor and was presented to Victoria. She opened it, started markedly, and cried to her secretary… WOT's THIS 'ERE?

Having established a style, off he went weekly to exercise it for the next 37 years or so, give or take a few weeks. I suppose it's amazing that there is a constant supply of this kind of material, but there is. For a while, Newscripts leveraged random pictures collected at C&EN that were somehow too good to throw away but not hard enough for the news. Thus, they became the Newscripts Gallery of Science and Technology—(Figure 10-12) after applying a snappy cut line (*14–16*).

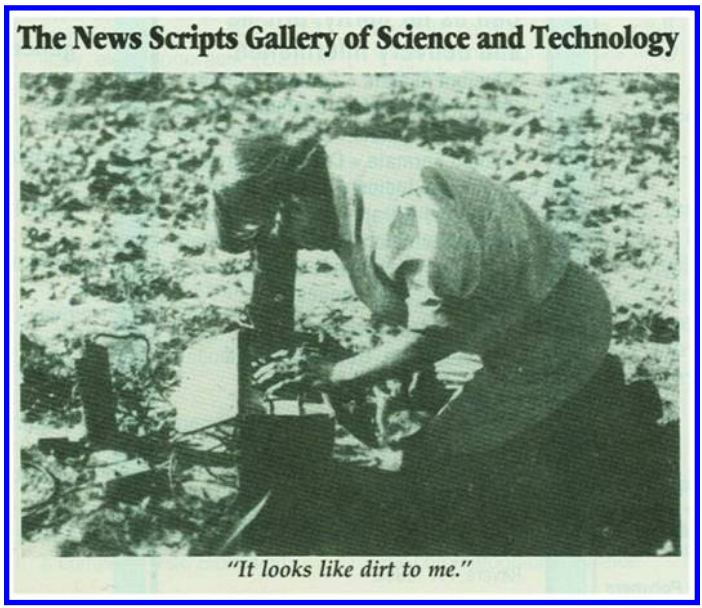

Figure 10. Newscripts Gallery of Science and Technology.

Ken wrote anonymously for two years, but the column was such that it had to be blamed on someone. This excerpt is from the issue with his first byline, Sept 29, 1969 (*15*). Viewed through my lens, I had just gone to college when this was published. I think it was Freshman Computer Date Night at DePauw. All the freshmen filled out a long questionnaire in anticipation. Now, those were the punch card days, and DePauw was a small school, and the computer had the power of a moderm digital sports watch. I think the only question that mattered was "male" or "female."

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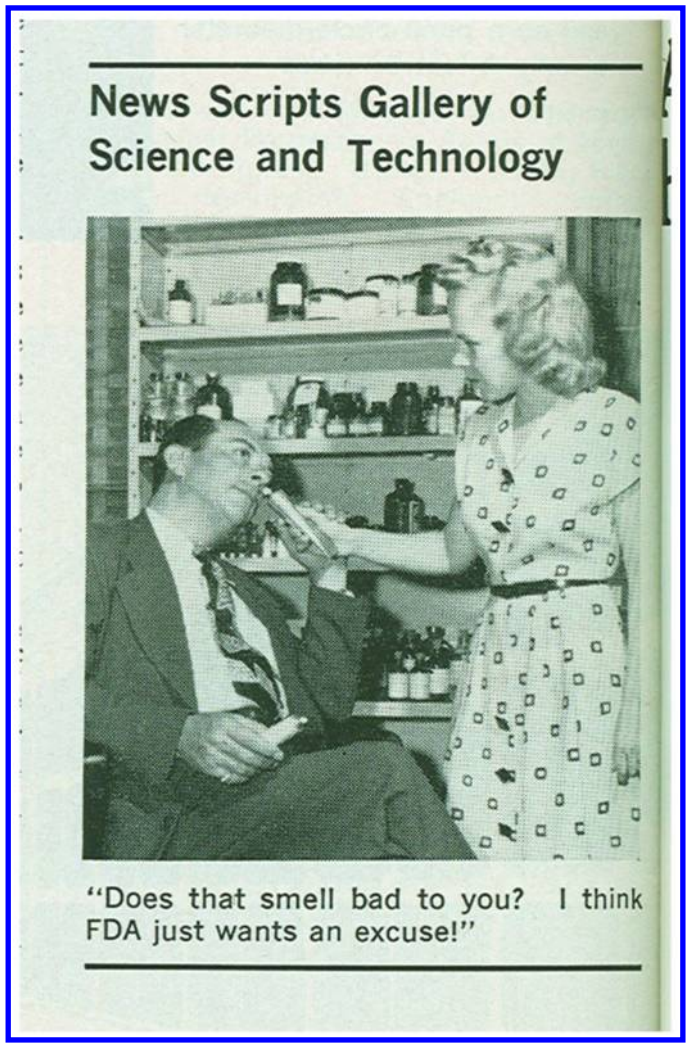

Figure 11. Newscripts Gallery of Science and Technology.

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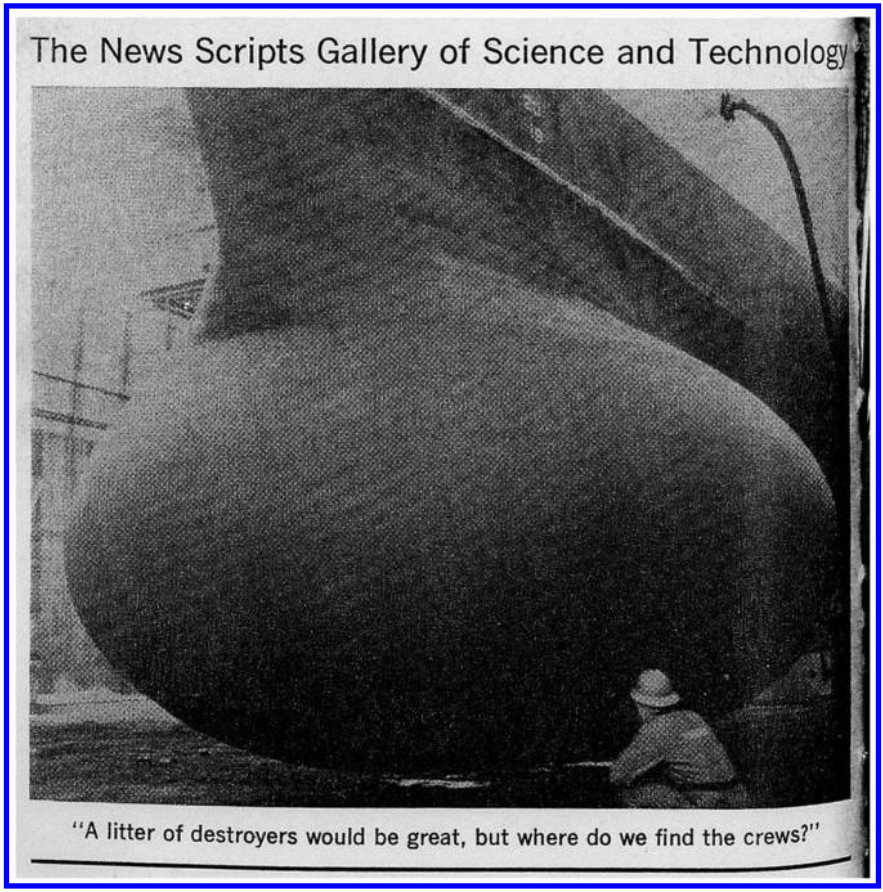

Figure 12. Newscripts Gallery of Science and Technology.

But I digress. The blurb is a response to an earlier Newscripts item alleging that the newest chemical dictionary in the reference section of the chemical library of the US Patent Office is dated 1947 (*17*). The librarian's indignant comment is printed in this column; however, Ken gets the last word, quoting her saying "an old chemical dictionary might be just as useful as a new one, especially here."

Chemical Dictionaries Infest U.S. Patent Office

Reference librarian Lois Lanham at the US Patent Office takes ladylike exception to the allegation that "The newest chemical dictionary in the reference section of the chemical library of the US Patent Office is dated 1947." (C&EN, Sept 15, page 80) "...we have been deluged," she writes, "with calls and visits from patent attorneys and searchers who hastened to point out the item..." Incited by these carpers, Mrs. Lanham offers the following information.

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The chemical areas in the Patent Office, she goes, are literally bursting with permanently assigned chemical dictionaries, 208 of them in all. These consist of:

- *20 copies of the 1966 "Condensed."*
- *40 copies of the 1961 "Condensed."*
- *13 copies of the 1962 "Bennett's Concise,"*
- *135 copies of the 1944 "Hackh's," the latest edition*

It should be noted that an old chemical dictionary might be just as useful as a new one, "especially here."

Seldom has any one journal page contained two historical classics in research (*11*). First, readers of a certain age will remember the phenomenon of polywater, described herein (*18*). As you remember, polywater was discovered after careful distillation of all the monomeric water away from high-boiling, long chains of water molecules. In the end, extracted and isolated impurities were responsible for polywater, reminding me of the time I carefully isolated a high yield of stopcock grease from a synthesis. Ken refers to a 1939 article by Sheehan (*19*) that foreshadowed the earthshaking polywater discovery thirty years later.

A Note on Anomalous Water

Sheehan noted that repeated fractional distillation under vacuum would drive the dimers and trimers from normal water, leaving only long-chain and cyclic polymers. The more highly associated fractions were quite similar to thermoplastic resins. Fibers spun from this material, Sheehan said, could be used to make a fabric he called Aquaprene. Possible uses included fireproof theatre curtains and packaged hot showers. The resinous material could also be made into a film called Hydrophane."

I have since found out that Sheehan wrote the article as a spoof to see if anyone would pick it up. Which opens another line of chemical whimsy altogether.

But that's not all, folks. On the same page was this one:

Roaches Plastered at Sea

This yarn concerns the skipper who found his boat crawling, so to speak, with cockroaches. He called in the appropriate crew members and told them he wished to see no more roaches. On his next inspection, in fact he found no roaches. Pleased, he asked the exterminators how they had done it. "American ingenuity, captain. We mixed plaster of Paris and flour and spread it around. We've been sweeping up petrified roaches all week."

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Effectively Rendering the No-Pest Strip Obsolete

A bit of my own choice of Flotsam and Jetsam from the late ’70s. First, this is the best way I’ve seen to learn English as a foreign language (*20*).

A West German toilet paper manufacturer is now printing English lessons on its latest “silky and resistant” product. There are 26 lessons in the course which is repeated eight times per roll. The firm’s slogan is “Learn English whenever you want, in a quiet corner.”

I’m intrigued by a product that is both silky and resistant.

And an article that confirms what your father told you about two kinds of drunks (*21*).

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Squeal Detection Circuit Used in Studies of Mice

A series of experiments with mice, using a squeal detection circuit has been pointed out by Peter M. Rinaldo of New York City. The apparatus was developed by Morgret. Through a set of noise-operated switches, it records mouse squeals but rejects other sounds. Morgret and Dengerink used the gear to show that the squeals of mice correlate highly with time spent fighting, and number of fights.

... Each pair of mice received four levels of treatment: no injection, saline and two levels of alcohol. Numbers of squeals were taken to correlate with the degree of aggression. Results indicate that alcohol inhibits aggression in mice, the principal effect being sedation. (Ed note: Wow!) Correspondent Rinaldo, perhaps conditioned by his environment, put it another way: “Mice, unlike some other species are less likely to fight while drunk than while sober.”

Those of you who remember polywater will remember the ’70s; an infected boil of a decade on the neck of the 20th century. The economy was bad, the music was bad, the clothing was bad, the hair was bad and not even politics was fun. The only two bright spots were that I finally finished grad school and finally got married. You’re right, there is a backstory there.

But the ’70’s also featured high inflation and for a while, price controls: the economic equivalent of holding your breath until you turn blue. Here was a Newscripts commentary (*22*):

Ask a Silly Question

A helpful reader found the following tale in the proceedings of a seminar, “Food Prices, Shortages and Economic Controls” held last August and sponsored by a group of organizations headed by the Grocery Manufacturers of America, Inc.

“...I am reminded of a letter that I sent to the Internal Revenue Service at the beginning of Phase II (price controls).”

“Dear Internal Revenue Service. I am a prostitute and I am wondering whether my prices are going to be controlled under Phase II.” Signed Mary Smith.

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The following letter was sent back: "Dear Ms. Smith: You are classified as a service enterprise and therefore your prices are controlled. You may not increase your prices during Phase II unless you have allowable cost increases which you must offset by productivity gains, and if you have any volume increases, these must also go against cost increases."

"Furthermore, you may not move off your base during the base period."

As people became familiar with Newscripts and with Ken, they started to send articles or to comment on those he published. This series is an example.

Department of Obscure Information

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- *Iceland's third largest export is bananas.*
- *The average wattage of toasters used in the home is 1146*
- *Italy produced 1471000 motor vehicles in 1976 (23)…*

Harmless enough; the banana thing is a bit surprising, but that's what Newscripts is for.

About six weeks later, this ran (*24*):

No Bananas Per Capita

It said here earlier that "Iceland's third largest export is bananas." The statement was questioned by Mary Gall, whowrote from Narberth, PA that she spent three weeks in Iceland last summer and "never saw a banana."... The Icelandic embassy was asked and said "We could grow bananas, but we don't."

The trail finally led to Jack Howard at Lawrence Berkeley Laboratory, who was apparently the source. What he actually saw in Iceland was one banana tree in a tourist greenhouse called the Garden of Eden. The place was heated geothermally, like most of Reykjavik. Anyway by the time Howard's report bounced around his circle of acquaintance to the one who bushwhacked this department, the single tree had sprouted into a major cash crop.

I had a French teacher once who liked to turn an old saw—"A word to the wise is sufficient" on its ear by saying "A word to the wise is superfluous." Ken took the latter approach, assuming you needed not one word of explanation to understand why he thought something was funny. He observed, "there are plenty of opportunities to cast aspirins upon someone else's use of the language (*25*)."

In this column he "was reminded of the roadrunner, which in the cartoons was named "Acceleratus incredibus" The actual latin name is "Geococcyx Californianus," which Ken noted had even a funnier ring to it. He did not point out directly that the latter name mixed a word that seems to refer to the earth's tailbone and another place that sounded anatomically close to it. A word to the wise…. Reminds me of the person who accused someone of "tilting at windmills like a real Don Coyote"

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Here's another place where scientific dialogue led to a stronger public appreciation of science. Most of you who took freshman biology will find this pretty obvious, that hyperventilating causes blood pH to rise (*26*).

High-Flying Ducks Can Live with Low CO_2 Level in Blood

Barbara Grubb hypothesizes that birds ability to survive altitudes of 20,000 feet or more is related to their ability to tolerate extremely low levels of CO2 in their blood….Both birds and mammals hyperventilate at high altitudes. This involuntarily fast breathing causes carbon dioxide to be expelled in unusually large amounts. Grubb speculates that the resulting constriction of blood vessels in mammals is related to the decline in blood pH caused by loss of carbon dioxide.

Her results with ducks agree with the findings of other investigators who have shown that birds can tolerate a blood pH as low as 8 without ill effects. That level is fatal in mammals.

There are, of course, a number of technical issues with this column, which readers quickly brought to Newscripts' attention (*27*). Ken's mea culpa comes in the Title "Ducks fouled up," which is what got my attention: I dare you to read the headline five times fast in polite company.

Ducks Fouled Up

Several readers have complained about a report that appeared here on the ability of ducks to survive at high altitudes….Removal of carbon dioxide from blood causes its pH to rise, not fall as stated in the original report. It was also stated that " birds can tolerate a pH as low as 8 without ill effects…." It should have been as high as 8…

Some news articles were obvious candidates. This had Newscripts written all over it (*28*).

Newtons by the Gross

Reader H.M. Davis of Chapel Hill writes that a colleague of his, John Hurt, has concluded that scientists could deal more flexibly with certain physical units if they had some additional quantitative prefixes. After dwelling on the point for an unspecified period of time, Hurt has begun to fill the gap.

If 10^3 meganewton = 1 giganewton then 10^2 newton could be 1 figanewton.

Thus 50 figanewtons = 5 giganewtons which equals 1 boxafiganewtons.

Likewise, 14.4 giganewton = 1 grossafiganewton, and one teranewton = 1 bigapilafiganewton.

On the other hand, 50 meganewtons = 5 x 10^{-1} figanewton, which equals 1 beitafiganewton

I still don't understand tattooing, and from his tone, neither did Ken, but from the perspective of the 2010s, his observation of a comeback in the practice was clearly prescient (*29*).

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When I was young, tattoos and crudely pierced ears came to town with the carnival, which was typically not held at the Galleria, if you get what I mean. What has not changed is the unbridled optimism of the young that artwork on human skin will be as unchanging as Mount Rushmore. Those of us who are older know the fluxional nature of our bodies. In fact, a badly sagged tattoo inspired Jimmy Webb to write in his song MacArthur Park: "Someone left the cake out in the rain…"

Well, it COULD have.

Discourse on Tattooing Says Comeback on the Way

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A learned discourse on tattooing has been pointed out by Alec Jordan of Guilford, NH. It appears in the August issue of Esquire under the byline of John Berendt.

Ward McAllister, the chap who compiled the list of New York City's elite 400 in 1892 had something to say about tattooing, according to Berendt. He called it "certainly the most barbarous habit of the eccentric mind of fashion ever invented. It may do for an illiterate seaman, but hardly for an aristocrat."

Still, the practice dates back to the Stone Age, Berendt notes, and plenty of aristocrats have had themselves thus adorned. The word "tattoo" comes from the Tahitian word "ta-tu" (Ed. Note— and apparently not from Ricardo Montalban's sidekick in "Fantasy Island") *brought back from the South Seas by the 18th century English navigator, James Cook. Furthermore, says Berendt, tattooing has been enjoying a renaissance since the 1960s. He cites as his source Clinton Sanders' "Customizing the Body" (Temple University Press, Philadelphia, 1989).*

Modern tattooers are respectable, according to Sanders. They decline to decorate "public skin," the parts that show, or prospects who are minors and/or unsuitably submerged. Presumably they would decline commissions unsuited for support by the National Endowment for the Arts.

All of which recalls the late Groucho Marx's rendition of "Lydia the Tattooed Lady." This Lydia was evidently a resident of the San Francisco area. In his tribute to her décor, Groucho would warble, "And on a clear day you can see Alcatraz."

Now, a bit of proper respect for the convener of the symposium, Professor Stocker, who was a dedicated writer of letters to this editor. Here's a suggestion from 1993 that made it into print (*30*).

A Way To Put Holograms on the Surface of Hard Candy

Jack Stocker of New Orleans has pointed out a report on the creation of holograms on hard candy. The process was developed by Dimenstional Foods, Boston. The report appeared in "Visions," Oregon Institute of Science and Technology, Beaverton, Winter 1993, and earlier in Discover, March 1992.

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More than one holograph can be impressed on the candy. Thus the image can be made to appear in full color and can move and change color as the candy is viewed from different angles. Eric Begleiter, the founder of Dimensional Foods, says "I look at this as a shift from a chemical basis to a physical basis for foo coloring."

Jack lamented the disrespect for chemistry; but looking back, how's the candy market workin' out for ya, Eric?

This was Jack's way of telling me it's about time to wind this up (Figure 13).

Figure 13. Jack Stocker, Timekeeper.

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Nobody should have to do this, but if you're going to do a greatest hits album, you have to be prepared for the "what's your favorite" question. So here's my answer, and it's because I'm a sucker for a dumb joke and kind of obsessive-compulsive to boot (*31*).

Hooked on Exercise

People can become negatively addicted to running, according to William P Morgan of the Sports Psychology Laboratory at Wisconsin, Madison. Exercise makes one feel good, he argues, so certain individuals can become addicted to it.

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A relevant case involved a man affected by a general malaise. He was advised by his psychiatrist to roll a hoop to and from his office which was only three miles from his home. When preparing to leave the office one evening, the man found that his hoop had been stolen. In a panic he phoned his psychiatrist who told him to calm down and buy a new hoop in the morning.

That's what I'm going to do, the man shouted, BUT HOW DO I GET HOME TONIGHT?

On September 20, 2004 Rudy Baum wrote this in his column (*32*):

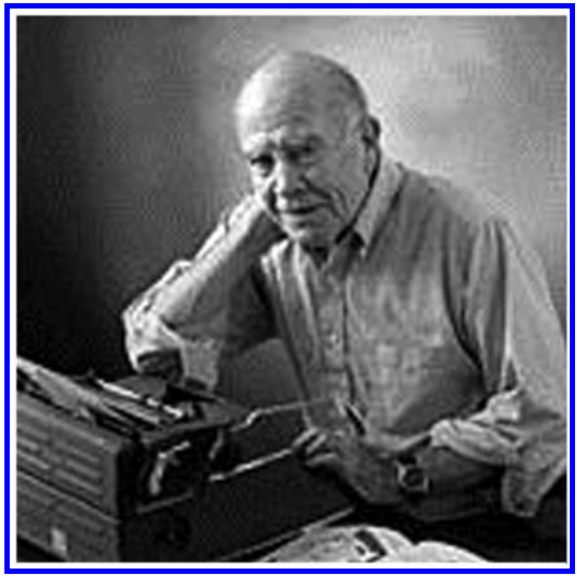
Farewell to an Old Friend

This week marks the passing of an era, Ken Reese's retirement as editor of Newscripts. Ken joined the Publications Division in 1954 and has written Newscripts for the past 36 years. He was C&EN's managing editor from 1962 to 1967. We will miss Ken's wry humor in the pages of C&EN.

And Ken wrote in his final Newscripts (*33*):

Note to readers: This Newscripts column is the last one I expect to write. It's been great fun; best wishes to all.

Simple, classy, and not to be duplicated after 37 great years.



Epilog: Jack Stocker and Ken Reese both passed away in 2009. Whimsy in Chemistry is not the same.

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Chapter 2

Intriguing Records in CAS Databases

Kathryn J. Meloche, Janice Mears, and Roger J. Schenck*

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***E-mail: rschenck@cas.org.**

Explore unexpected and lesser-known chemistry facts such as *Chemical Abstracts*™ (*CA*) world-record holders, celebrity authors, sci-fi papers and patents, and unusual substances pulled from deep within Chemical Abstracts Service (CAS) databases. Standout records also include CAS itself, and suggests the great variety of chemistry and sci-tech-related material indexed by CAS scientists. This chapter contains the works of dedicated CAS scientists and enthusiasts worldwide who share a deep understanding and appreciation for chemical information. Originally presented in 2007, the content may not reflect current record holders because publication rates keep expanding – the CAplus℠ database now contains more than 36 million records!

CAS Is More than Just Databases

What makes CAS the world's authority for chemical information? With its mission to find, collect, and organize all publicly disclosed substance information, more than 1,000 scientists worldwide create the most current, comprehensive, and highest quality chemical databases in the world. These human experts and scientists cover all areas of science and technology (beyond chemistry), are located around the globe, and speak and read in more than 50 languages.

A global network of dedicated scientists allows coverage in the CAS databases for publications in many languages worldwide. Often, less widely used languages, such as those shown in Table I, find their way into primary journals. Some languages are dead (Latin), artificial (Interlingua and Esperanto), romantic (Catalan), or extremely rare (Lingala).

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Table I. Lesser-known languages in the CAplus[SM] database (2001-present)

Language	*Number of Documents*
Esperanto	120
Uzbek	111
Interlingua	19
Latin	18
Catalan	9
Malayalam	7
Burmese	5
Samoan	4
Amharic	2
Lingala	1

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Anyone can identify a chemical substance by its unique identifier, the CAS Registry Number® (CAS RN). These numbers comprise the CAS REGISTRY[SM], the gold standard for substance information. CAS scientists add substances to REGISTRY from literature, patents, and reputable web sources dating back to the early 1800s. With more organic and inorganic substances added each year, REGISTRY now contains more than 70 million substances.

Chemistry and sci-tech publications increase yearly as reflected in CAS database growth. These publications, more than facts, show the breadth of content included in CAS databases:

- More than 70 million commercially available chemical products – the number of years dinosaurs have been extinct
- More than 61 million reactions and synthetic preparations – the number of passengers arriving and departing Hong Kong International airport annually
- More than 296,000 inventoried and regulated substances – the number of miles to travel around the circumference of the globe 11 times
- More than 957,000 searchable Markush structures – the number of identified insect species worldwide
- More than 36 million scientific literature and patent records from the early 1800s to the present – the number of minutes in an average human lifespan
- Articles from 10,000 major scientific journals – the number of known bird species

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

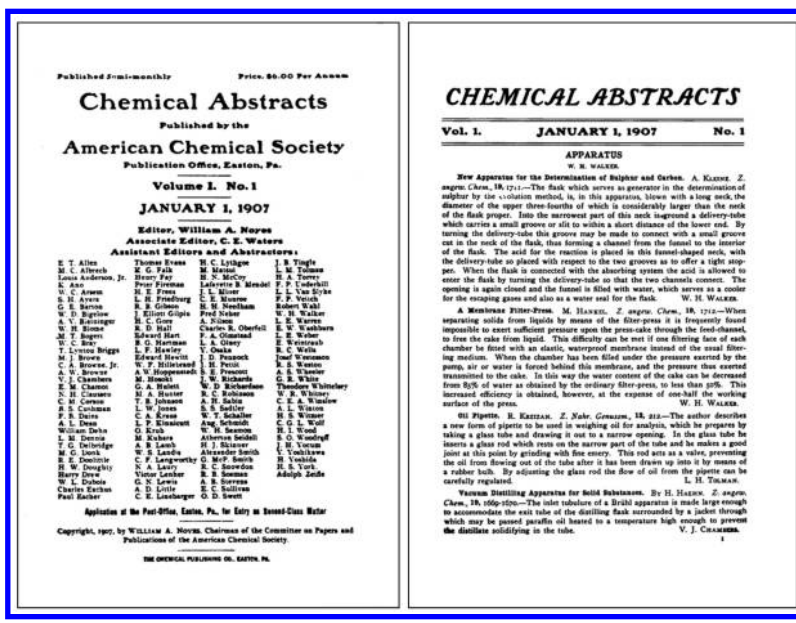
In 2007, CAS celebrated its 100th year of serving chemists and other scientists around the world. Over the decades, CAS databases have reflected the progress of science, and CAS has continuously advanced search and analysis technologies (SciFinder® and STN®), to deliver the most current, complete, secure, and interlinked digital information environment for scientific discovery. What has not changed over the course of a century is the commitment of CAS to helping scientists benefit from the published work of their colleagues worldwide. As always, CAS helps researchers build upon this knowledge by making discoveries of their own – such as the intriguing facts discovered in CAS databases.

World-Record Holders in Chemistry

In 2007, CAS first presented intriguing, unusual, and lesser-known facts from all the world's publicly disclosed chemistry and substance information. Many *CA* record-holders emerged. CAS databases acquire millions of new records yearly, and possibly, the next record holder.

The First Abstract in *CA*

The first abstract in *CA* describes an apparatus used to determine sulfur and carbon content. Figure 1 shows this abstract as it appeared in January 1907. A team of global volunteer editors added 12,000 abstracts to *CA* that year. By contrast, *CA* published one million abstracts in 2006.



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JANUARY 1, 1907

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CHEMICAL ABSTRACTS

Vol. I. JANUARY 1, 1907 No. 1

APPARATUS

W. H. WALKER.

New Apparatus for the Determination of Sulphur and Carbon. A. KLEINE. *Z. angew. Chem.*, 19, 1711.—The flask which serves as generator in the determination of sulphur by the Carius method, is, in this apparatus, blown with a long neck, the diameter of the upper three-fourths of which is considerably larger than the neck of the flask proper. Into the narrowest part of this neck is ground a delivery-tube which carries a small groove or slit to within a short distance of the lower end. By turning the delivery-tube this groove may be made to connect with a small groove cut in the neck of the flask, thus forming a channel from the funnel to the interior of the flask. The acid for the reaction is placed in this funnel-shaped neck, with the delivery-tube so placed with respect to the two grooves as to offer a tight stopper. When the flask is connected with the absorbing system the acid is allowed to enter the flask by turning the delivery-tube so that the two channels connect. The opening is again closed and the funnel is filled with water, which serves as a cooler for the escaping gases and also as a water seal for the flask. W. H. WALKER.

A Membrane Filter-Press. M. HANEK. *Z. angew. Chem.*, 19, 1712.—When separating solids from liquids by means of the filter-press it is frequently found impossible to exert sufficient pressure upon the press-cake through the feed-channel, to free the cake from liquid. This difficulty can be met if one filtering face of each chamber be fitted with an elastic, waterproof membrane instead of the usual filtering medium. When the chamber has been filled under the pressures exerted by the pump, air or water is forced behind this membrane, and the pressure thus exerted transmitted to the cake. In this way the water content of the cake can be decreased from 85% of water as obtained by the ordinary filter-press, to less than 50%. This increased efficiency is obtained, however, at the expense of one-half the working surface of the press. W. H. WALKER.

Oil Pipette. R. KREIZAR. *Z. Nahr. Genussm.*, 13, 212.—The author describes a new form of pipette to be used in weighing oil for analysis, which he prepares by taking a glass tube and drawing it out to a narrow opening. In the glass tube he inserts a glass rod which rests on the narrow part of the tube and he makes a good joint at this point by grinding with fine emery. This rod acts as a valve, preventing the oil from flowing out of the tube after it has been drawn up into it by means of a rubber bulb. By adjusting the glass rod the flow of oil from the pipette can be carefully regulated. L. H. THOMAS.

Vacuum Distilling Apparatus for Solid Substances. By H. HAENIG. *Z. angew. Chem.*, 19, 1669-1670.—The inlet tubulure of a Brühl apparatus is made large enough to accommodate the exit tube of the distilling flask surrounded by a jacket through which may be passed paraffin oil heated to a temperature high enough to prevent the distillate solidifying in the tube. V. J. CHAMBERS.

Figure 1. The first CA abstract.

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

The Shortest Abstract in *CA*

Math

The shortest abstract appears in Figure 2, and is a single four-letter word from Henry Eyring's 1935 publication (*1*). It seems the editor thought the one-word abbreviation said it all.

Figure 2. The shortest CA abstract is one word (CAN 29:16071).

The Longest Author Name in *CA*

The longest author name, Lakshminarayanpuram, is 19 characters long. Figure 3 shows his 1992 Indian patent application about manufacturing a water-soluble melamine-urea-formaldehyde resin as a cement aid (*2*).

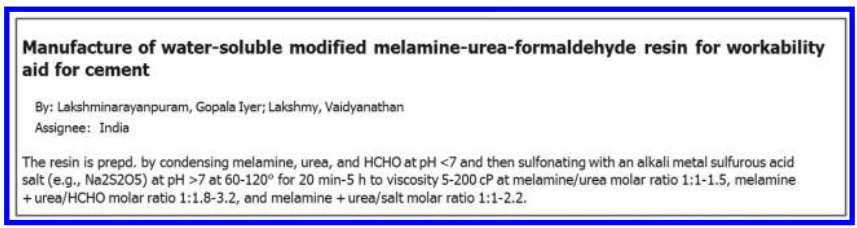

Figure 3. The longest author name in CA is 19 characters (CAN 119:204591).

The Longest Substance Name

The longest substance name contains 1,311 characters. This nucleotide sequence is 19 bases long and has more than 600 carbon and hydrogen atoms. Thankfully, the substance is identified by a concise CAS Registry Number (CAS RN: 86417-45-0). As shown in Figure 4, the substance originally appeared in a 1983 conference proceeding (*3*). The longest English word is often credited to a 1,185-letter protein sequence for Tobacco Mosaic Virus coat protein (CAS RN: 898302-48-2), first spelled-out in 1964 (*4*).

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

Figure 4. The longest substance name (CAS RN: 86417-45-0).

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

The Longest Sulfur Chain

Figure 5 identifies the longest sulfur chain, as represented in lithium sulfide (CAS RN: 66526-09-8). This 100-sulfur atom containing substance appears in a 1977 publication by Rauh, Shuker, Marston, and Brummer (*5*).

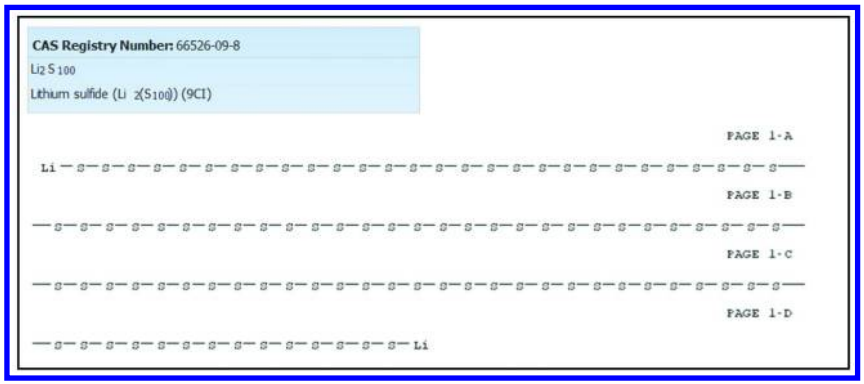

Figure 5. The longest sulfur chain has 100 atoms (CAS RN: 66526-09-8).

The Largest Single-Bond Carbon Chain

Figure 6 shows nonacontatrictane (CAS RN: 98724-81-3), the longest carbon alkane chain. The 390 carbon-atom containing substance is an ultra-long alkane used for modeling polymer crystallization, e.g., polyethylene.

Figure 6. The longest hydrocarbon alkane has 390 carbon atoms (CAS RN: 98724-81-3).

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

The Largest Carbon Ring

Figure 7 shows the largest hydrocarbon cycloalkane (CAS RN: 68040-18-6), which consists of 288 carbon atoms. A 1978 paper reports synthesis by catalytic hydrogenation of a macrocyclic polyacetalene (*6*).

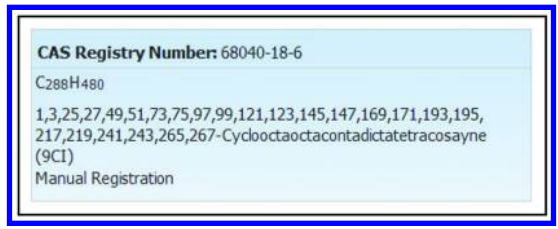

Figure 7. The largest hydrocarbon cycloalkane has 288 carbon atoms (CAS RN: 68040-18-6).

The Most Elements

A tungsten compound with 11 elements (CAS RN: 132977-13-0) sets the record for most elements. Figure 8 indicates atoms such as carbon, hydrogen, gold, boron, fluorine, manganese, nitrogen, oxygen, phosphorus, and platinum.

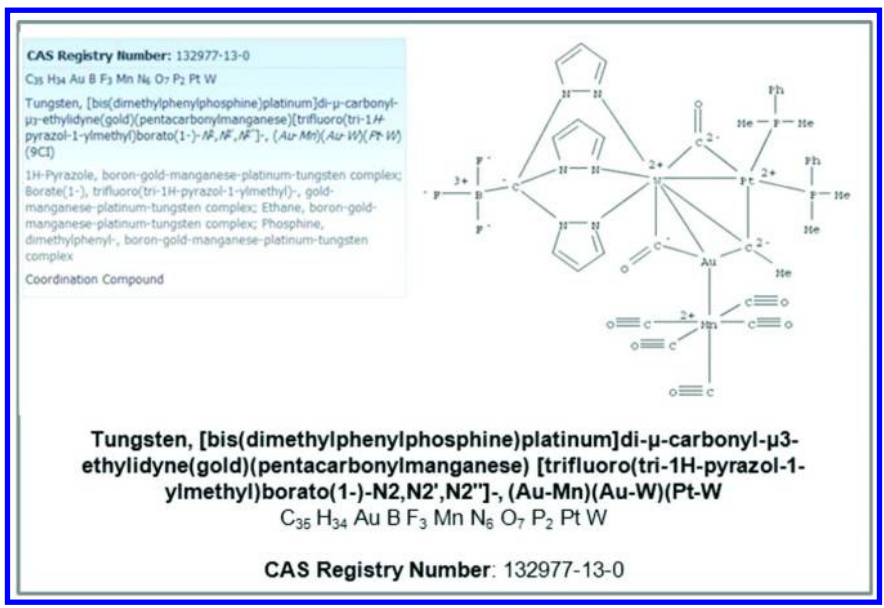

Figure 8. A tungsten compound contains the most different elements – 11 (CAS RN: 132977-13-0).

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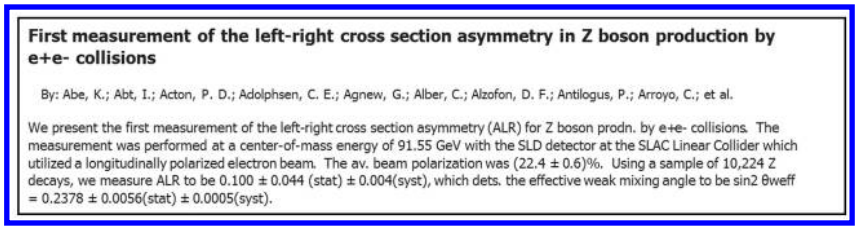
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

The Most Authors

One record in *CA* lists 406 authors for a single article. The authors' names exceeded the bibliographic section length in Figure 9. The publication describes an extensive international project for studying cosmic rays. Papers relating to nuclear physics and elementary particle physics often have tens of authors to represent machine designers, experiment planners and supervisors, operators, electronic engineers, etc., in addition to scientists. This paper was the first report of its kind and merits inclusion of all those involved.


First measurement of the left-right cross section asymmetry in Z boson production by e+e- collisions

By: Abe, K.; Abt, I.; Acton, P. D.; Adolphsen, C. E.; Agnew, G.; Alber, C.; Alzofon, D. F.; Antilogus, P.; Arroyo, C.; et al.

We present the first measurement of the left-right cross section asymmetry (ALR) for Z boson prodn. by e+e- collisions. The measurement was performed at a center-of-mass energy of 91.55 GeV with the SLD detector at the SLAC Linear Collider which utilized a longitudinally polarized electron beam. The av. beam polarization was (22.4 ± 0.6)%. Using a sample of 10,224 Z decays, we measure ALR to be 0.100 ± 0.044 (stat) ± 0.004(syst), which dets. the effective weak mixing angle to be sin2 θweff = 0.2378 ± 0.0056(stat) ± 0.0005(syst).

Figure 9. A 1993 journal article lists 406 authors (CAN 118:262131).

Celebrity in CAS Databases

Celebrity goes beyond the latest Hollywood actors and actresses. Nobel Prize winners *and* Oscar winners publish papers found in *CA*. Of course, CAS indexed the works of Albert Einstein, Marie Curie, Watson and Crick, and more. But which famous world leaders and royalty are also published authors? Have a look.

World Leader Began Career as a Scientist

M. H. Roberts, better known former Prime Minister Margaret Thatcher, practiced chemistry before starting her political career. She studied at Oxford and Somerville College, and completed a four-year dissertation in X-ray crystallography. Figure 10 shows her publication, *The saponification of α-monostearin in a monolayer* (*7*).

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

The saponification of α-monostearin in a monolayer

By: Jellinek, H. H. G.; Roberts, M. H.

At 20° and lower the following equation is obeyed: 2.303 log [(A0 - A∞)/(At - A∞)] = k(OH-)t, where A0, A∞, and At are the areas of the whole monolayer at the beginning of the reaction, at the end, and at the time t, resp. This fact indicates that the soap produced during sapon. remains in the monolayer and that the mol. areas of the soap and the monoglyceride are additive. In the range 22°-29° this equation is not obeyed.

Figure 10. Margaret Thatcher's 1951 journal article (CAN 46:16730).

Princess Studies Science and Chemistry

CA includes work completed by Her Royal Highness Princess Chulabhorn Mahidol of Thailand such as that in Figure 11. She earned a doctoral degree in 1985 in natural products, her area of expertise. Mahidol continued her involvement in scientific research by becoming the first Asian to join the Royal Society of Chemistry in England.

Diterpenoids from the roots of Croton oblongifolius

By: Youngsa-ad, Witoon; Ngamrojanavanich, Nattaya; Mahidol, Chulabhorn; Ruchirawat, Somsak; Prawat, Hunsa; Kittakoop, Prasat

Two new clerodane diterpenes, Me 15,16-epoxy-3,13(16),14-ent-clerodatrien-18,19-olide-17-carboxylate (1) and di-Me 15,16-epoxy-12-oxo-3,13(16),14-ent-clerodatriene-17,18-dicarboxylate (2), together with 7 known compds., were isolated from the roots of C. oblongifolius. The isolated compds. showed only mild cytotoxic activity against HuCCA-1, KB, HeLa, MDA-MB231, and T47D cell lines with IC50 values ranging from 10 to 50 μg/mL.

Figure 11. Princess Chulabhorn Mahidol 2007 journal article (CAN 148:280276).

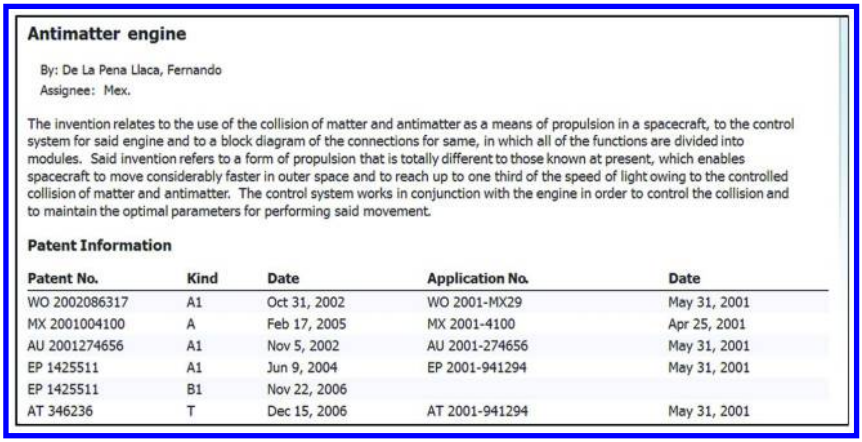
In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Fiction and the Future in CAS Databases

CAS databases specialize in chemical information. However, CAS scientists cover much broader areas of sci-tech content. This section presents creative patent and journal publications that may one day enable immortals to travel through time at warp speed.

To Infinity and Beyond

Travel has changed dramatically in the last 50 years – and the speed of travel keeps increasing as well. Soon, we may be traveling at warp speed. Figure 12 shows Fernando De La Pena Llaco's 2002 patent for a matter-antimatter propulsion engine capable of producing speeds one-third the speed of light (*8*).



Antimatter engine

By: De La Pena Llaca, Fernando
Assignee: Mex.

The invention relates to the use of the collision of matter and antimatter as a means of propulsion in a spacecraft, to the control system for said engine and to a block diagram of the connections for same, in which all of the functions are divided into modules. Said invention refers to a form of propulsion that is totally different to those known at present, which enables spacecraft to move considerably faster in outer space and to reach up to one third of the speed of light owing to the controlled collision of matter and antimatter. The control system works in conjunction with the engine in order to control the collision and to maintain the optimal parameters for performing said movement.

Patent Information

Patent No.	Kind	Date	Application No.	Date
WO 2002086317	A1	Oct 31, 2002	WO 2001-MX29	May 31, 2001
MX 2001004100	A	Feb 17, 2005	MX 2001-4100	Apr 25, 2001
AU 2001274656	A1	Nov 5, 2002	AU 2001-274656	May 31, 2001
EP 1425511	A1	Jun 9, 2004	EP 2001-941294	May 31, 2001
EP 1425511	B1	Nov 22, 2006		
AT 346236	T	Dec 15, 2006	AT 2001-941294	May 31, 2001

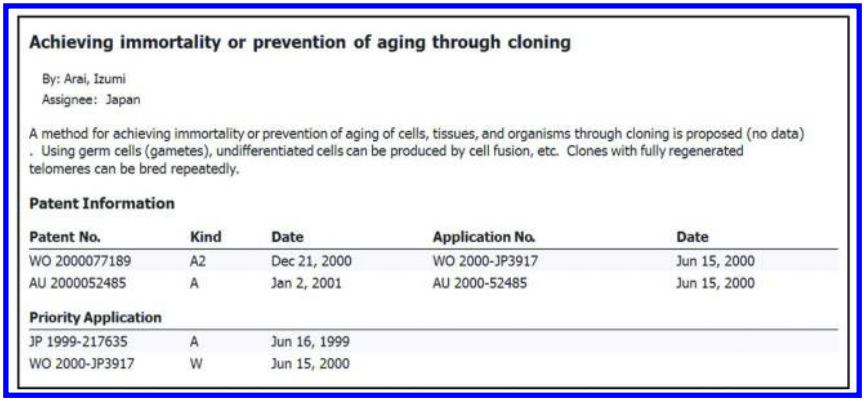
Figure 12. Patent for matter-antimatter engine capable of reaching one-third the speed of light (CAN 137:317052).

Who Wants To Live Forever?

Books, movies and music focus on immortality, or finding the Fountain of Youth. Is it possible to prevent aging through cloning? That is the idea behind Izumi Arai's 2000 patent in Figure 13, *Achieving immortality or prevention of aging through cloning* (*9*). And though the patent is brief, the anti-aging process applies to cells, tissues and organisms.

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002



Achieving immortality or prevention of aging through cloning

By: Arai, Izumi
Assignee: Japan

A method for achieving immortality or prevention of aging of cells, tissues, and organisms through cloning is proposed (no data) . Using germ cells (gametes), undifferentiated cells can be produced by cell fusion, etc. Clones with fully regenerated telomeres can be bred repeatedly.

Patent Information

Patent No.	Kind	Date	Application No.	Date
WO 2000077189	A2	Dec 21, 2000	WO 2000-JP3917	Jun 15, 2000
AU 2000052485	A	Jan 2, 2001	AU 2000-52485	Jun 15, 2000

Priority Application

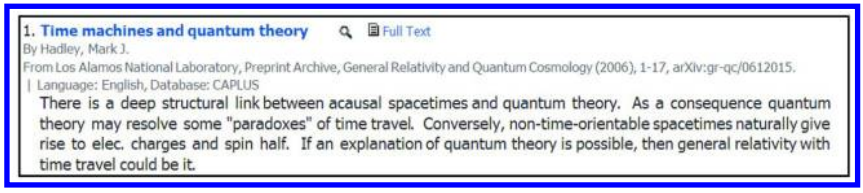
JP 1999-217635	A	Jun 16, 1999
WO 2000-JP3917	W	Jun 15, 2000

Figure 13. Patent on immortality (CAN 134:27264).

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

Time Travel Has Not Been Patented, but It Has Been Studied

Spatial relativity became vogue in 1905 – thereby popularizing time travel ideas. CAS databases include 40 articles discussing time machines, many published by Los Alamos National Laboratory, such as the one in Figure 14. And the field of science that includes time travel? File it under physics, specifically quantum physics and nuclear phenomena.



1. **Time machines and quantum theory** Full Text
By Hadley, Mark J.
From Los Alamos National Laboratory, Preprint Archive, General Relativity and Quantum Cosmology (2006), 1-17, arXiv:gr-qc/0612015.
| Language: English, Database: CAPLUS
There is a deep structural link between acausal spacetimes and quantum theory. As a consequence quantum theory may resolve some "paradoxes" of time travel. Conversely, non-time-orientable spacetimes naturally give rise to elec. charges and spin half. If an explanation of quantum theory is possible, then general relativity with time travel could be it.

Figure 14. Quantum physics explains time travel (CAN147:17889).

Name That Substance

Relax; this is not an organic chemistry class. However, could you name the more than 70 million substances in REGISTRY based on chemical structure? Some substances may be easier than expected. Morphodelotic substances are molecules for which the shape suggests the chemical name. Many substances in REGISTRY fit this description, and some substances included here are just misleading.

Organic Chemistry: The Name Game (*10*) inspired our search for morphodelotic substances. Authors Alex Nickon and Ernest Silversmith discuss the origin of organic chemistry names, noting that many names suggest their molecular shape. Of course, REGISTRY contains all these substances and more.

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

Animals, Insects, and Fish, Oh My!

Felicene (CAS RN: 59275-46-6) in Figure 15 evolved its cat-like ears from carbon bridges. This substance won its name in an adhoc competition between the authors of the 1976 publication (*11*).

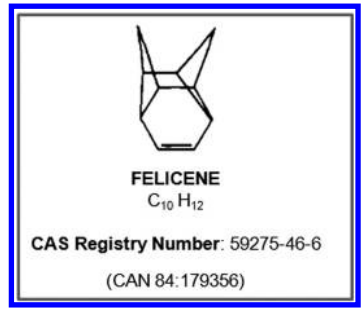


Figure 15. Felicene's carbon bridges resemble cat ears.

Moths, skippers and butterflies belong to the lepidoptera order of insects. Not surprisingly, Felix, Lapouyade, Castellan, Bouas-Laurent, Gaultier, and Hauw named their new polycyclic substance, lepidopterene (CAS RN: 55614-27-2), shown in Figure 16 (*12*).

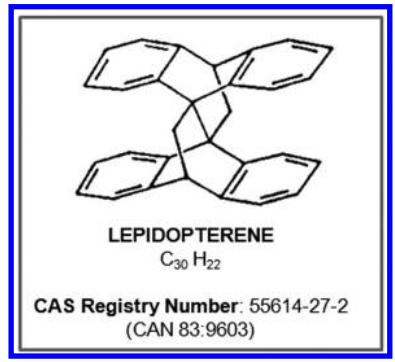


Figure 16. Lepidopterene took flight in 1975.

Eight-tentacle octopuses. What do you name the hydrocarbon with six-branches in Figure 17? Hexapus (CAS RN: 79127-45-0). This undecanoic acid derivative (ten-sided central ring) became a new complexing agent for organic molecules in 1981 (*13*). In the authors' work modeling enzyme action, they report "Hexapus (I), a mol. having 6 hydrocarbon chains projecting from a cyclotriveratrylene framework and terminating in carboxylates, has been synthesized."

In A Festival of Chemistry Entertainments; Stocker, J., et al.;
ACS Symposium Series; American Chemical Society: Washington, DC, 2013.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

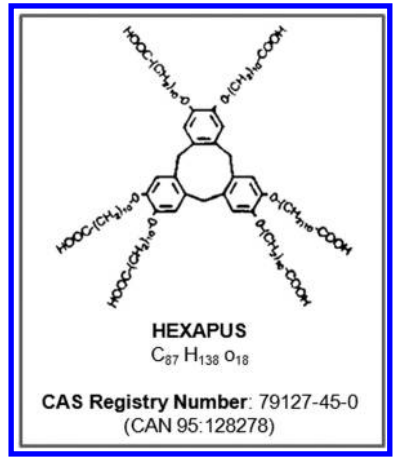


Figure 17. Hexapus the 'C' creature of chemistry.

Square Pegs and Round Holes

Inside the Box

Pictured in Figure 18, cubane (CAS RN: 277-10-1) first appeared in 1953 as an unfavorable hypothetical product of a reaction (*14*). Eaton and Cole successfully synthesized and crystalized cubane in 1964 (*15*).

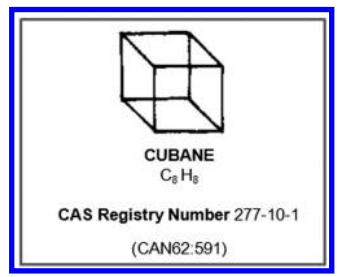


Figure 18. Cube Cubane rocked 1953.

Canadians synthesized basketane (CAS RN: 5603-27-0), the substance in Figure 19 (*16*), along with basketene in 1966 (*17*). The authors reportedly coined basketane/basketene for "simplicity." Their article presented the first cases for cleavage of four-membered or larger ring systems under mild hydrogenation conditions.

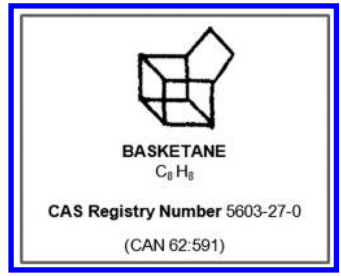


Figure 19. Basketane, a simplistic name.

Publication Date (Web): December 4, 2013 | doi: 10.1021/bk-2013-1153.ch002

Hip To Be Square

Figure 20 shows squaric acid (CAS RN: 2892-51-5), as part of Sidney Cohen's 1960 dissertation (*18*). A year earlier, Cohen and colleagues revealed characteristics of squaric acid (dioxocyclobutenediol), such as an intense purple color when in the presence of iron chloride (*19*). Perhaps a more suitable name, rectangularic acid, might better represent differences in carbon bond length.

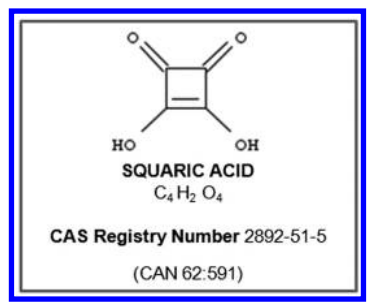


Figure 20. Squaric acid rounds out a dissertation.

Japan Flies High

The name, propellane, stems from the three rings of carbon atoms forming a propeller-type shape along a shared carbon-bond axis, shown in Figure 21. Japanese scientists described [3.3.3.] propellane in a 1977 patent assigned to the Kao Soap company (*20*).

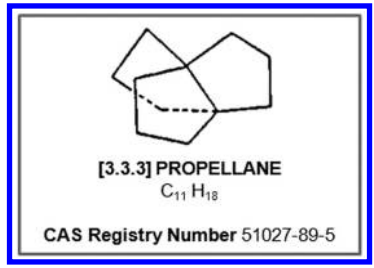


Figure 21. Three carbon rings resemble a propeller in propellane.

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Cumbersome and Unsuitable Suitors of Names

And now, the crown appears in Figure 22. Known as 18-crown-6 ether (CAS RN: 17455-13-9), the name also accounts for the substance's ability to *crown* the cations. Crown names replaced chemical names described as "too cumbersome for repeated use" according to Pedersen's 1967 article (*21*). Ether crowns follow these naming conventions:

1. Hydrocarbon ring count
2. Polyether ring atoms
3. Class name, crown
4. Number of oxygen atoms

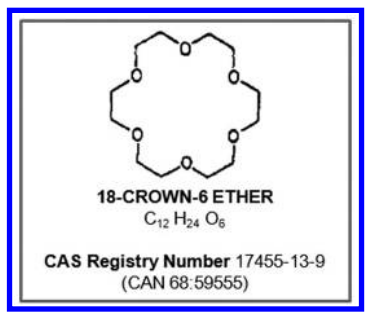

Figure 22. 18-crown-6 ether, less cumbersome name.

A 1985 *Nature* publication describes C_{60}: Buckminsterfullerene (CAS RN: 99685-96-8), as shown in Figure 23 (*22*). The authors sought mechanisms for long-chain carbon molecule formation in interstellar space and circumstellar shells. They isolated the most stable substance and consulted Buckminster Fuller's studies to find a suitable name. However, disturbed at the number of letters and syllables in the fanciful, but highly appropriate name, the authors

suggested ballene, spherene, and soccerene instead. Ultimately, they concluded the name was best left to consensus. You may have even heard of it as a Buckyball!

Figure 23. Soccerballene's name was kicked around.

National Pride Beats Science

Israeli chemist, D. Ginsberg, invented helvetane (CAS RN: 99396-93-7) and israelane (CAS RN: 99347-43-0), for an April 1st publication (*23*). These imagined nationalistic substances in Figure 24 owe their names to the cross on Switzerland's flag and the Star of David on Israel's flag. To make the CAS databases, a 1985 publication reported heat of formations using MNDO (Modified Neglect of Differential Overlap) calculations (*24*). However, CAS databases list few references because no synthesis exists for these hypothetical substances.

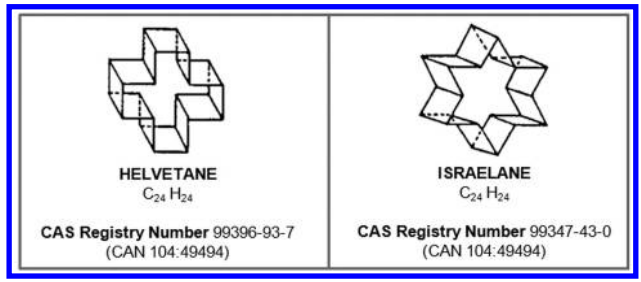

Figure 24. Helvetane and Israelane, hypothetical substances in CA.

Non-Morphodelotic Misnomers

Figure 25 shows commic acid (CAS RN: 111665-34-0), a substance better known in historical and biblical references than in comedic parodies. Instead, commic acid derives from *Commiphora pyracanthoides*, used for cleaning clothes (plant) and straightening hair (resin). However, other branched family members of genus *Commiphora* have bizarre appearances – for instance, the corkwood tree.

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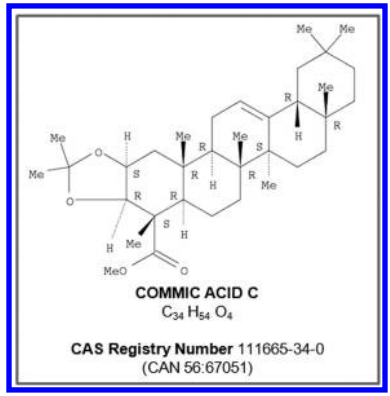

Figure 25. Commic acid C lacks comic-relief.

Likewise, moronic acid (CAS RN: 6713-27-5) in Figure 26, displays no moronic behaviors. First reported as a natural product in 1979 (*25*), moronic acid has both antimicrobial and anti-retroviral properties. Triterpenoids such as moronic acid comprise mastic, a *Pistacia lentiscus* resin used in embalming (*26*). This species of pistacia helps preserve 7th century B.C. mummies, not produce edible nuts (*27*).

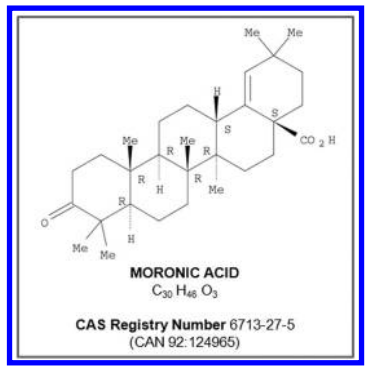

Figure 26. Antimicrobial smarts from moronic acid.

Anthropogenic Fun at CAS

CAS scientists recreated the 18 millionth registered substance (CAS RN: 207110-49-4) on the CAS lawn. Figure 27 shows the aerial image from a helicopter. This *anthropogenic* substance appears in a Merck patent for tachykinin receptor agonists used to treat inflammatory disease, pain or migraine, asthma, and emesis (*28*). Fittingly, a substance synthesized by people to treat people, was then re-formed by people.

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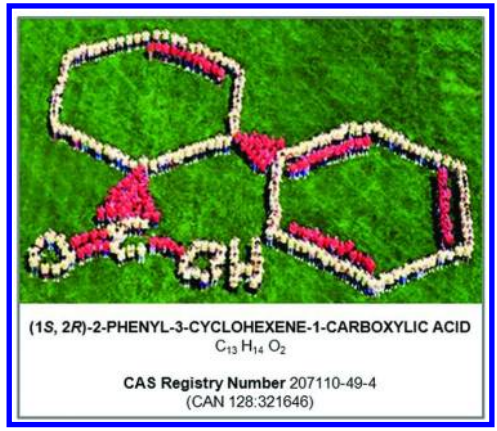

Figure 27. CAS scientists recreate 18 millionth substance.

CAS Serves Chemists

As a division of the American Chemical Society, and a service to chemists, CAS continues to report on the ever-expanding growth in chemistry and related sciences. Our scientists proudly distill the world's publicly disclosed chemistry information as they have done for more than 100 years. It has been our pleasure to share the more light-hearted content found in the CAS databases.

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Chapter 3

Curriculum Witty:

Chemistry in Verse and Song

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By way of introduction… the 2008 New Orleans Meeting Presentation was, in large part, sung, mostly with guitar accompaniment, as requested by Jack Stocker. Lyrics in the following appear in roman type, with explanatory and parenthetic material in italics.

(Adapted from the Program Abstract)

Tom Lehrer rhymed the elements with humor and felicity,
But little in his ditty indicates periodicity.
Alberto Cavaliere's book, some years before, in Italy,
Put chemistry more accurate in verse, but just as wittily.
Frank Gucker was the model of a modern doctor chemical,
And built machines about which I've waxed lyric and polemical,
The newer ones make measurements of cells stained with fluorescent dyes ...
escent dyes, escent dyes, ...Aha!
In rooms in which it's just as dark as when the lunar crescent dies.
What better place is there for songs, especially the secular,
Than New Orleans? I sang a few, atomic and molecular;
An unconventioneer was I, but nonetheless dressed snazzily,
And tried to update Lehrer's *Elements* at least as jazzily!

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I am the very model of a scientific troubador,
Although my voice suggests, to most, an urgent need to lube a door.
In Brooklyn I was born, November 8th of Nineteen Forty-One;
My major work to date's a book that tries to make cell sorting fun (*1*).

Irreverent environment, and/or defiance in my genes,
Led me to writing doggerel and songs of science in my teens,
I picked up the guitar midway through Harvard and my first degree,
A baccalaureate in 'Sixty-One in Biochemistry.

My physician father and microbiologist mother made sure that I had a real stethoscope and a real microscope by the time I was six, and introduced me to Gilbert Chemistry Sets, Gilbert and Sullivan (I share my November 8th birthday with William S. Gilbert), and Ogden Nash, not necessarily in that order. Their friends got me a copy of ***Songs by Tom Lehrer****, his first record, in 1953. Another early formative influence was* ***MAD Comics****, later* ***MAD Magazine****, to which I was first introduced in 1952 by my then 7th grade classmate Bob Silbey, [late] Class of 1942 Professor of Chemistry and former Dean of Science at MIT, and also the first author of the venerable and venerated P-Chem text I knew as Daniels and Alberty. By the mid-1950s, I was writing poems and making jokes about math (****Ode to a Googol****), biology (****Mitosis Rock****), and chemistry, and reading Lillian Lieber's popular math books, such as* ***The Education of T. C. Mits*** *(2), written in free verse.*

My M.D. came in 'Sixty-Five from New York University;
Where I applied computers to electrocardiography (*3*),
My colleagues thought we ought to write in prose, so write in prose we did,
But I wrote lyrics, music too, for both the Med School Shows we did.

I then spent two more years at N. Y. U., and trained in surgery;
If, under oath, I testify I loved the work, it's perjury,
In 'Sixty-Seven, I moved on, not to Da Nang, or Tan Son Nhut,
But down to N. I. H., where I was in the Cancer Institute.

Though very well acquainted with statistics mathematical,
I got involved with something just a little bit more "pratical";
Computerizing microscopes for looking at leukemia cells (*4*),
In hopes of finding how to turn them into more abstemious cells.

I also worked on redox states in shock and thermal injury,
Membrane and tubule proteins and numerical taxonomy,
And theory and practice as applied to chemotherapy;
Then left for Arizona, where I trained some more in surgery.

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I had attending privileges in medical oncology;
A midwife at the other end of life's what I turned out to be.
And after just a year of it, I had an offer, and the sense,
To go to work for Searle, where I evaluated instruments.

I went to Minneapolis to give a talk on redox states (*5*),
To bioengineers whose expertise ran more to logic gates,
I made the talk a Talking Blues, with great effect, once I surmised,
That if I didn't, once the lights went out, they'd be anesthetized.

Talking Redox Blues *did manage to keep the audience awake through 72 stanzas, beginning:*

If you want to study redox, let me tell you where to look;
Just thumb through your freshman chemistry book.
You'll read about reduction and oxidation,
And pretty soon you'll come to the Nernst equation.

May I have the first slide, please? There it is.
I hope it's all beginning to come back.

Suppose you're an oxidized molecule of **A**,
And **n** electrons come your way,
And you react; why, then, instead
Of **A** sub **ox** you're **A** sub **red**.

That's a redox reaction. If you want to lose weight, eat lots of electrons; it's a great reducing diet!...

and concluding:

...When they talk about Shapiro, you can say you heard'im,
And he tried to redox you **ad absurdum**!

The stunt also got me into the ***Minneapolis Star-Tribune*** *and onto the evening TV News, so I figured this wasn't too bad a way to give presentations.*

Since early in the Seventies, I've worked in flow cytometry;
I sang about it to the Histochemical Society.
The lyrics and the music, which, I hope, at least, enlightened them,
Were later published in the *J. of Histochem. and Cytochem.* (*6*).

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Fluorescent Dyes for Differential Counts by Flow Cytometry... *(6), available without charge online at http://www.jhc.org, is, as far as I know, the only peer-reviewed scientific publication to appear with the music to which it was originally sung. Flow cytometry is a process in which measurements of physical or chemical characteristics of cells, or, by extension, of other biological particles are made while the cells or particles pass, preferably in single file, through the measuring apparatus in a fluid stream. It mixes microscopy with "chemistry in small cuvettes." The first working flow cytometer was built by Frank T. Gucker et al for the U. S. Army during World War II; it was intended to detect anthrax spores in aerosols (7). The Army and other agencies are still interested in doing this. I found out in 2004 that Frank Gucker, who was thereafter Chairman of Chemistry and later Dean at Indiana University, produced the following in 1932, even before he published his flow cytometry work:*

"I am the very pattern of a modern Doctor Chemical;
I send to all the journals my remarks and views polemical.
I've studied mathematics till I think in terms vectorial
And scorn the plodding soul who seeks for molecules pictorial.

And calculus is food for babes; I love a complex var-i-able
And state a simple law in terms the layman thinks are terr-i-able.
I can talk of relativity and space-time for a month or more
And integrate elliptically to terms the (n+1)th or more-

And yet my hand and mind are seized with palsy and paralysis
When I essay that dreadful task-a chemical analysis (8)."

Credit for building the 1947 Gucker apparatus was given to Norman Nachtrieb, then a student, and later a distinguished chemist and author of two well-known textbooks, neither in verse.

Verse on microscopy (and chemistry) goes back even further. The Cambridge (England)-educated physician Henry Power published his ***Microscopical1 Obseruations*** *several years before Robert Hooke's* ***Micrographia*** *(1665) and van Leeuwenhoek's later correspondence with The Royal Society. Power, to whom Hooke referred as "the ingenious physitian" produced:*

"In Commendation of ye Microscope.

Of all th' Inuentions none there is Surpasses
the Noble Florentine's Dioptrick glasses.
For what a better, fitter, guift Could bee
in this world's Aged Luciosity.

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To Helpe our Blindnesse so as to deuize
a paire of new & Artificial1 eyes.
By whose augmenting power wee now see more
then all the world Has euer donn Before.
'Thy Atomes (Braue Democritus) are now
made to appear in bulk & figure too.
When Archimide by his Arithmatick,
numbred the sands, had hee But knowne this trick.
Wee might haue seene each corn a massy stone,"
& counted them distinctly one by one.

Although Power may have been optimistic about how soon atoms would be visualized, Tomas Hirschfeld, a leader of the Block Engineering group with which I did my early flow cytometry work, was the first to succeed in optical detection of a single, albeit very large, molecule (9). Tomas's memory is honored with an annual award given for NIR Spectroscopy at Pittcon.

I've sung at many meetings, from the platform and in cabaret;
I can't show up unless I bring an instrument that I can play,
And, after all these years, I find it eminently logical
To try to use my talents for a purpose pedagogical.

The lyric as mnemonic aid dates back before the Iliad;
You know how hard it is to clear your memory of some silly ad.
The Liebers (*2*, *10*) , Cavaliere (*11*), and Tom Lehrer, and some other wits,
Wrote verse on math and science from which students draw some benefits.

I do attend a lot of meetings; I have been called "The Great Attender," which inspired one of my ***Songs for the Jaundiced Ear*** *(12):*

The Great Attender

(Music by Buck Ram; lyrics © H. M. Shapiro, used by permission)

Oh, yes, I'm the great attender;
I go to three meetings a week.
They pay my fare when I'm session chair,
Or put up a poster, or speak.

Oh, yes, I'm the great attender.
I'm riding the circuit all year,
And now I see that, on my C. V.,
More abstracts than papers appear.

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Each slide brings a feeling of déja vu,
But I get that feeling from others' slides, too...

Oh, yes, I'm the great attender.
My lab people know I'm a jerk,
But I can get sent 'round the world to present,
With every conceivable perk,
While they're doing all of the work.

There still are students there for scientific Sirens to entrap,
Though some may say the only way to do it is with gangsta rap,
And others opt for sexy interactive multimedia;
If sex sells, will they make the CD-ROM's a little seedier?

Just as great oaks from acorns' very small binary fissions grow,
Some of the kids, and some adults, will into politicians grow;
The more they know of genomes, cells, the planet, and of space and time,
The likelier they are to help us at appropriation time.

I'd like to help make science both more fun, and less mysterious;
My twenty-five per cent proposed commitment shows I'm serious.
You haven't heard me on the air, or seen me on the tube before,
But I'm the very model of a scientific troubador.

(Yes, I did start this Curriculum Witty as part of a grant application, but I figured I would get enough grief even if I wrote in prose.)

I invited a college classmate chemist to come to my presentation, but he had a prior engagement a few blocks away; Dick Zare, of Stanford, a really great teacher, was being recognized by ACS with the 2008 George C. Pimentel Award. Back in 1996, when Dick and numerous colleagues found possible evidence of life on Mars in a metorite (13), they inspired me to write:

Extraterrestrial Extra

The anthropocentric conception we have of the Universe suffered a blow
From news that there may have been microbes on Mars some three billion or more years ago.
The chemical and geological evidence is circumstantial, but looks
Impressive enough to the scientists quoted to change what is now in the books.
Organic materials called hydrocarbons, arranged into multiple rings,
Are most often formed from precursors produced in abundance by all living things.
These P (Polycyclic), and A (Aromatic) compounds, P - A - H's, for short,

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Result when a fossil fuel's partially burned in an engine or chemist's retort,
Or when you burn candles, at one end or both, or let meat get well done on the grill
(They're carcinogenic, but *E. coli* in your rare burger's more likely to kill).
Such molecules now have turned up in a meteorite, which, at its lowly birth,
Was just one more rock on the Martian landscape, but which then made the journey to Earth
(Its origins are clear from its mineral content, which matches what Viking probes found
On Mars, when they analyzed rock from the surface or just a wee bit underground).
When, searching for signs of life, chemists examined a few chips from off that old block,
They said not "Bah! Humbug!" but, rather, "PAH's - some bugs were doing their thing in that rock".
Additional evidence strongly supporting this theory comes from the fact
That other compounds, also found in the meteor, form when bacteria act.
The magnetite, carbonate globules and iron sulfide were adjacent to PAH's
Deep inside the rock, which suggests that they came not from space, or from Earth, but from Mahs *(as the planet is known in Boston).*
The scientists' startling new findings were of such importance, they took time to brief
Not only the press, but both Clinton and Gore (with a meteorite hail to the Chief?).
The paper, from people at NASA, and Stanford, McGill and the U. of G - a,
Was published in Science, August '96; the first author was David McKay.
Alone and aloof, some may wait for more proof, or invasion by little green men,
But others of us can accept life on Mars; not today, probably, but back then.
Though not much intelligent may be broadcast by the media here, day by day,
We still scan the radio spectrum for signs of intelligent life far away;
Now, looking at what Man has done to the Earth, can the pessimists have any doubt
That Martian bacteria showed great intelligence eons ago, and died out?

Having just broached the subject of the endangered environment, which has increasing numbers of nonchemists augmenting their lists of elemental worries with concerns about carbon footprints, I should include a little ditty about global warming, which may drive polar bears into extinction before the end of the century. It is not bad enough that these magnificent animals in danger; we can anticipate an even greater catastrophe as Arctic ice melts:

The presents won't come, the reindeer won't fly,
The kids will be glum; I'm telling you why:
Santa Claus is going to drown!

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The science is done, we've checked it all twice;
Bush doesn't believe, but he's on thin ice.
Santa Claus is going to drown!

Way up there at the North Pole,
There's warming in the air.
We'd like a faith-based remedy,
But we haven't got a prayer.

Some problems are solved by going to church,
But, if we don't do more science research,
Santa Claus is going to drown!

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Tom Lehrer's *The Elements* Revisited

The very specific teaching assignment I did get from Jack Stocker for this Symposium was to update Tom Lehrer's ***The Elements.*** *The original version of this song, probably unknown to fewer chemists than there have been atoms made of some elements above 110, first appeared in* ***The Physical Revue****, presented by Lehrer and several later-to-be-distinguished henchmen to Harvard physics undergraduates during the 1951-2 academic year. The highest-numbered element added by Tom Lehrer himself is Nobelium.* ***The Elements****, which, like my* ***Curriculum Witty*** *and Gucker's* ***Modern Doctor Chemical****, is set to Sir Arthur Sullivan's melody for* ***I am the Very Model of a Modern Major General****, from* ***The Pirates of Penzance****, ends:*

"These are the only ones of which the news has come to Hah-vard,
And there may be many others but they haven't been discah-vered"

Being a slave of duty myself, I came up with the following addendum:

With years gone by, Tom Lehrer's list's in need of an extensium,
For dubnium and bohrium, seaborgium, lawrencium,
And also rutherfordium, and hassium, darmstadtium,
Meitnerium, roentgenium, and names straight out of Latium.
We're up to date at Hah-vard now; I won't sing names that start with "Un"s,
So let me know as soon as IUPAC picks better ones.

NOTE (June 2012): As science has marched on, it would be appropriate to change what comes after "Latium" to:

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"There's Copernicium now; Flerovium and Livermorium
Have lately been approved, so we're allowed to inventory 'em.
We're up to date at Hah-vard now; I won't sing names that start with "Un"s,
So let me know as soon as IUPAC picks better ones."

Now, what is the ultimate accolade for a chemist or biomedical scientist? An all-expense-paid trip to Stockholm in December, of course. Decades ago, a man named Robert Graham decided to set up a test-tube stud farm for Nobel laureates, Madame Curie and others excepted (the recipients were to be female members of Mensa). I recycled a melody I wrote for an unpublished 1979 talk on cell activation for a song about that, and was devastated when I found out that the Nobel sperm bank had closed, probably due to low interest rather than low interest mortgages. And what better title for the song than –

Crème de la Crème

(from Songs for the Jaundiced Ear (12), © H. M. Shapiro, used by permission)

When the greatest minds of our generation
Pass away, oh, Mensa women, don't you grieve.
Robert Graham's arranged for their perpetuation
In a way which you alone could not conceive.

Far beneath the rocks, off by the blue Pacific,
Is where Graham's sperm repository lies.
You're invited to drop in if you're prolific
Scientifically, and win the Nobel Prize.

Now, a man who gets to tell the King of Sweden
Of his work with genes, or molecules, or quarks,
May already have a place to put his seed in,
If you get more than the gist of my remarks.

But some laureates who've gotten off their laurels
To contribute, when Graham's given them a push,
Must prefer mind over mattress, so their moral's
That a bird in hand still beats two in the bush.

Though he mastered beta, one confessed emitter
Made some not-too-solid statements about race.
Will his future Shockley followers be fitter?
What's the gain, if the collector's biased off base?

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Science thrusts ahead in spurts of inspiration,
And our best results are frequently unplanned.
When hard problems leave us sleepy with frustration,
We may wake with a solution in our hand.

Many lauded for their seminal contributions
Are regarded, though it's generally concealed,
By the bulk of colleagues in their institutions
As among the biggest j**koffs in the field.

Was Graham crackers? Was his notion simply folly?
Or will cloning soon eliminate the need?
Once the flock has started singing "Hello, Dolly",
Will the bankers blow their wad and go to Seed?

Now it's time for me to come out of the closet,
And say, if I win the Nobel Prize, that I'm
Mighty interested in making a deposit
In the sperm bank, if I still can raise the prime.

But I should remind you girls of many facets,
Who have ova that are looking for a dad,
Of a local source of sperm as liquid assets,
Which bears interest on its own, and can be had.

You can wait and take the chance you'll get them frozen,
And you might, because I'm crazy, but not dumb,
But, if you're off to the bank, I'll say, in closin',
That you ought to know the best is yet to come.

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The songs and their versions mentioned above are available on itunes at the link below.

https://itunes.apple.com/us/album/songs-for-the-jaundiced-ear/id309478666

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Chapter 4

Always a Cross(ed) Word

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Riddles and puzzles of various sorts have been with us since the birth of recorded history. We are all familiar with the Riddle of the Sphinx; other word riddles have appeared from time to time in literature and even in grand opera – usually presented as a question whose solution is only available by making a crucial and clever connection. Presenting a number of such riddles in a compact verbally-related form with intricate, sometimes difficult clues, but an ultimately solvable outcome, might be one way to define the modern crossword puzzle.

Introduction

The birth of the familiar crossword puzzle as we know it is a well-documented and quite clear-cut event: the first such black-and-white solution grid with accompanying clues appeared in *The New York World* on December 13, 1913, brainchild of Arthur Wynne, a member of the *World*'s staff (*1*). This first venture became so popular that it developed into a regular feature of the paper – and also evolved over the decades into a highly refined specialty with definite editorial and research requirements. It also leapt across the Atlantic and took on different characteristics in other parts of the world. So today we must refer to the crossword puzzle as we know it as the "American" puzzle. As such, it must be diagonally symmetrical (a chemist would say that it must have D_{2h} symmetry), it must contain no uncrossed letters and each entry must contain a minimum of two letters (the *New York Times* requires three). Furthermore, the number of black squares is limited and there is a maximum word count in accordance with the publisher's

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editorial policy. Each puzzle usually has a unifying theme, and the clues must conform grammatically to the part of speech being defined. And in keeping with the fact that crossword puzzles are a form of entertainment, the clues are usually written not only to confuse but also to amuse.

Given these constructional strictures, it is no wonder that the world of crossword puzzle aficionados eventually self-divided into solvers and constructors, the former group constituting the vast majority of puzzlers. But the division is not hard and fast: many constructors are also solvers, and many are also editors of crossword puzzles. But whether one is a solver or a constructor, one has automatically entered a competitive world.

The lightest and easiest form of competition is with oneself. A solver can set goals. For example, some solvers give themselves a time limit; others use only pen rather than pencil; others resolve never to consult a reference work while solving; others try to solve only the "across clues" and then, when all else fails, they tackle the "down clues." Eventually, avid and addicted solvers may evolve out of the self-challenge and make the journey to Brooklyn to participate in the annual American Crossword Puzzle Tournament that has received so much publicity after the release of the film "Word Play." Emerging as the champion solver can be something akin to an apotheosis in crossworddom (*2*).

Other solvers may take "the less-traveled road" toward becoming an accomplished and published constructor. This is the path that I eventually chose, and how and why I went in this direction is detailed in the next section.

Early Background of a Constructor

Grade school was a blur and high school was a revelation. I remember very little about my days in Saint Mary's Catholic grammar school. The Sisters of Charity were firm and caring teachers. They maintained discipline, mostly by sending rambunctious hormonal boys to the principal's office, and then they were able to instruct the rest of us in the principles of mathematics and English grammar. I got away with doing a minimum of homework, but I must have absorbed something because I passed the entrance exam for the Archdiocese of Newark's high schools, and in the fall of 1947 I entered Our Lady of Good Counsel High School, a forty-five minute bus commute from my hometown of Nutley, New Jersey.

During my first week of high school, I was literally "blown away." Everyone was required to study Latin, and I had the good fortune of having Sister Mary Hermann Fengler as my teacher. I fell in love with Latin at first sight. At that time, Latin was the language of the Catholic Church, so I was familiar with it, but never in the sense of falling in love with it. Up till that time, it was a question of memorizing meaningless phrases and being able to repeat them with the rapidity of an auctioneer. But in Latin class, at long last I realized the meaning of what I was memorizing. I realized that by adding endings to words, one could do away with the need for prepositions. I found out that endings to verbs stood in the place of

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pronouns. And the endings indicated a word's function in a sentence regardless of its position. This was heady stuff for me. But as I progressed in my study of Latin, I realized something far more important: that many of the English words that I used in everyday life had their antecedents in Latin, and that these Latin words were the root words of whole families of words that I never realized existed.

For the next two years under Sister Mary Hermann's careful eye I learned most of the basics of Latin grammar, committed declensions and conjugations in all of their tenses (oh, those irregular verbs!) to memory, wrestled with the non-obvious genders of the third declension words, and in the process developed a formidable memory along with a disciplined analytical mind (all unbeknownst to me), and loving every minute of it. Translating Caesar's "Gallic Wars" and Ovid's "Metamorphoses" were a joy. It never occurred to me, nor would it have mattered if it had, that there might be no "use" to all this effort. I was having a ball!

When I began my junior year, the unthinkable happened. A new love intruded and began to take over my mind and heart. Yes, my old love still existed, and I took up Cicero's "Orations" and Vergil's "Aeneid," with great enthusiasm. But as I progressed more deeply into my chemistry course with Sister Mary Sarah Dillon, I began to realize that atomic theory and precipitation reactions were threatening to supersede the ablative absolute! I took delight in all that I was learning in this first year of chemistry – all the ingredients of the present-day curriculum were there: atomic structure, periodicity, reactions and stoichiometry, ionic and covalent bonding, acids and bases – and I lapped it all up. By mid-year, I realized that I could love both Latin and chemistry, so a peaceful co-existence developed, and I gave both subjects equal time. But the crisis came at the end of junior year when I realized that I was at a crossroads: my small high school offered fourth-year Latin at the same time as fourth-year mathematics. It was one or the other. My mother, a very practical person, counseled the math. "After all, what good is a fourth year of Latin going to do you?" What good indeed? I was too young to realize that this was not the right question – so I went along and took the fourth year of math, saying good-bye in the process to my formal instruction in Latin.

When I entered college the following fall, I found I was still on the horns of a dilemma. I fully intended to take up and to major in Latin in college. Again, practicality intervened. I was the first person in my family to "go" to college (my father was an accountant, but he had earned his degree nights while raising a family), and my mother was determined that I do something "useful" with my life. Not only that, I loved a challenge, and Latin and chemistry were the two most challenging disciplines I had studied. So when my mother observed that there did not seem to be many jobs for Latin teachers on the horizon, I decided to go the practical route myself and major in chemistry. And I never looked back.

In college I absorbed chemistry almost by inhalation. I don't remember ever putting much effort into it – it seemed to come naturally. Only by reflecting on this experience years later did I realize that it was my Latin background that made the chemistry so easy. Structural thinking along with a very large vocabulary made organic chemistry a breeze – the names of the compounds seemed like old friends as soon as their Latin (and often Greek) roots were perceived. At the same time, I began my study of German and came at the English language from another perspective. Whereas almost all English words that have to do with

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abstract concepts and rule of law are derived from Latin (via Norman French), almost all words that have to do with everyday living and the household come from the Teutonic languages. Wow! What power! So many concepts fell into place in those years, but it all had to be pointed out to me later on (*3*).

Several other discoveries claimed a great deal of my time while I was in college. One was bridge, a game for which I found I had a great affinity, perhaps because it requires a mathematical mind. The other was my discovery of the *New York Times* crossword puzzle. There was something about filling in grids with words that fascinated me. And my Latin background along with the Teutonic "connection" gave me a confidence that soon became legendary: I was the only freshman who dared to solve the Sunday puzzle in ink. I was in grave danger of becoming an addict – it was only a very caring chemistry professor who saved me from this fate.

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Becoming a Constructor

Fast forward several dozen years. In 1978 I had more than a decade of college chemistry teaching behind me. Latin lay fallow; puzzle solving was a thing of the past. While I was on sabbatical leave, my mother had a massive stroke and I found myself spending many hours at her bedside. Many of these hours were spent in prayer – for her, for the family, for me, for all terminally ill patients, for the hospital staff, for the world. After many days of unrelieved vigil, I needed a distraction. I went down to the hospital gift shop and lo! There was a crossword puzzle book.

I grabbed the first book on the shelf – one published by the Dell Publishing Company – and settled in in my mom's hospital room for the duration. Once in a while, I would solve a puzzle, and in the process made a discovery: while once upon a time puzzles held a fascination for me, this time I was bored. I began to think to myself, "I can do this. I can make one of these things up." So taking my pencil and a prepared grid from the puzzle book, I began to construct a puzzle from scratch. I soon found out that it was not as easy as it seemed and that, unlike solving puzzles by starting in the upper left-hand corner and solving systematically, one had to begin at the center of the puzzle and look for "trouble spots," i.e., those entries that had several crossings with other large entries. ("Entry" is the official word for each of the concatenation of white squares in a puzzle grid that will receive the solution when the solver enters it. "Clue" is the word for the definition that accompanies each entry.) After a while, I found that my trial effort was going to require major revisions of the grid unless I wanted to start all over again from scratch.

So, over the next few months while keeping vigil and spending time with family, I would pick up the puzzle only now and again. It was only after our family crisis was over that I began to look seriously at constructing a puzzle – this thing was NOT going to beat me! I studied the *New York Times* Sunday puzzles, observed the kinds of clever themes they included, and gradually learned to construct by the inductive method along with a good deal of instinct. The first

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thing I observed was that the themes did not happen by accident. They took a great deal of research, and if one wanted to incorporate a dozen "theme" entries in a puzzle, then one must find at least twice that many in case of fit and crossing problems. So, just like any good chemical problem, the first thing I had to do was a literature search. After that, I had to construct a grid that would accommodate my potential entries, and once the theme entries were safely embedded, then one had to construct around them. Once all that had been accomplished (no minor task!), the clue-writing had to begin.

With my first finished puzzle in hand, I wondered where to send it and thought, "Why not go to the very top?" So, I sent it off to the *New York Times*. Much to my surprise, this first attempt did not fall into a black hole. It was returned to me with a very kind hand-written note from the editor, Eugene T. Maleska, telling me all the things that were wrong with the puzzle; he also included the editorial guidelines for *Times* puzzles and encouraged me to keep on trying.

And try I did. After seven attempts, I finally succeeded in having my first puzzle accepted for publication! (My success rate for articles in technical journals was much higher.) I'd like to share with you the theme and the fun that I had in putting this puzzle together. I still chuckle at some of the theme entries and their accompanying clues.

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Table 1

Clue	*Entry*
What Mark got stuck with?	Cleopatra's Needle
Greek shipping domain?	Christina's World
Rock song for Victorians?	Brahms' Lullaby
Cabinet appliance in 1867?	Seward's Icebox
Red Sox infielder's decision?	Hobson's Choice
Where George got free drinks?	Martha's Vineyard
Wonderland tearoom?	Alice's Restaurant
Did it cost three pennies?	The Beggar's Opera
"Little Women" sequel?	The Old Wives' Tale

This first Sunday *Times* puzzle came out on September 16, 1979. It was a 21 X 21 with the title, "What's Whose?" There were nine major theme entries with some fun clues. Seven of them were placed horizontally in the grid, and two were placed vertically, necessitating crossing with two other theme entries. Here they are in Table 1 and I hope that you will get a chuckle out of some of them:

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What marks the clues is the question mark, which immediately indicates some sort of pun or license with the language. What marks the entries is that each of them has a reference that has nothing to do with the clue; some of them are literary works, one is a painting, one is an archaeological artifact, etc. Some of them are now dated: Christina Onassis is not a household word in the 21st century, and Butch Hobson is certainly not a Red Sox infielder any longer. What makes these puzzles entertaining is the unlikely combination of references and, in some cases, timeliness.

By January, 1981, I was well into the crossword game, thanks to the kind help of Dr. Maleska, and on August 8, 1982, a puzzle that I consider one of my funniest was published. Its tongue-in-cheek title was "Latin Rhythms," but not in the usual sense of this phrase. You recall that I was "into" Latin, and I thought it would be fun to Latinize some song titles to create a really puzzling puzzle. Here they are in Table 2, for better or for worse:

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Table 2

Clue	*Entry*
Hit song of 1914?	By the (pulchritudinous) sea
Hit song of 1931?	Dancing in the (tenebrosity)
"Carousel" finale?	You'll never (ambulate) alone
Foster favorite?	My Old Kentucky (habitation)
Cole Porter hit of 1936?	I've Got You (subcutaneously)
Hit tune of 1924?	I'll see you in my (phantasmas)

Substituting for the words beautiful, dark, walk, home, under my skin, and dreams in the actual song titles inserted five new Latinisms and one substitution (the first). Note also that the adverbial phrase "under my skin" had to have a similar part of speech substituted. A look at how these six entries, all 23 letters long, fit into the diagram is shown in Figure 1.

Now the challenge for you, dear reader, is to fill in the blanks. Be aware that the entire center of the puzzle and several corners are full of vertical entries that already have two fixed letters in them – these are the trouble spots that should be tackled first, as shown in Figure 2. Once that is done, you can have lots of fun filling in the rest of the entries and then the clues – let your imagination soar! Of course, every entry must be able to be documented in a reputable source all the way from the *Oxford English Dictionary* to *The Best Book of Baseball Facts and Stats* by Luke Friend, Don Zminda, and John Mehno. That is why a puzzle constructor must build a formidable reference library.

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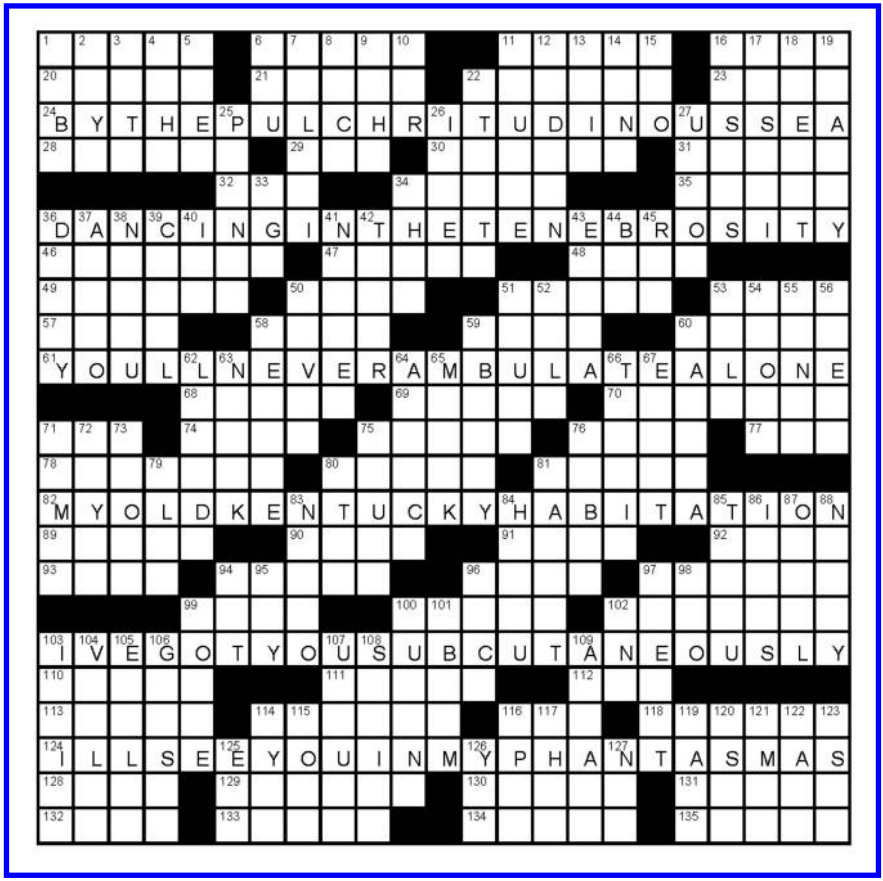

Figure 1. "Latin Rhythms" Main Entries.

"Latin Rhythms" was submitted for the second time on January 22, 1981. A paragraph from my cover letter to the Editor, Eugene Maleska, should help to see why:

"…I would like to re-submit "Latin Rhythms." I removed "Some Enchanted Crepuscule" and "Coriacious-Hearted Hannah" and substituted "My Old Kentucy Habitation (Home)" by Stephen Foster and "You'll Never Ambulate (Walk) Alone by Richard Rodgers (from "Carousel"). This, of course, necessitated an almost completely new puzzle, so I submit it for your consideration. I also tried to write clues that necessitated cross-referencing in several sources; hence, the extensive documentation in the puzzle."

I learned that "crepuscule" and "coriacious" are not exactly entertainment words.

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Since those early puzzle days, I have contributed some dozen puzzles to the Sunday *Times*, numerous others to the daily *Times*, and perhaps puzzles into the hundreds (although I never kept track) to the Simon and Schuster crossword puzzle book series and other newsstand books.

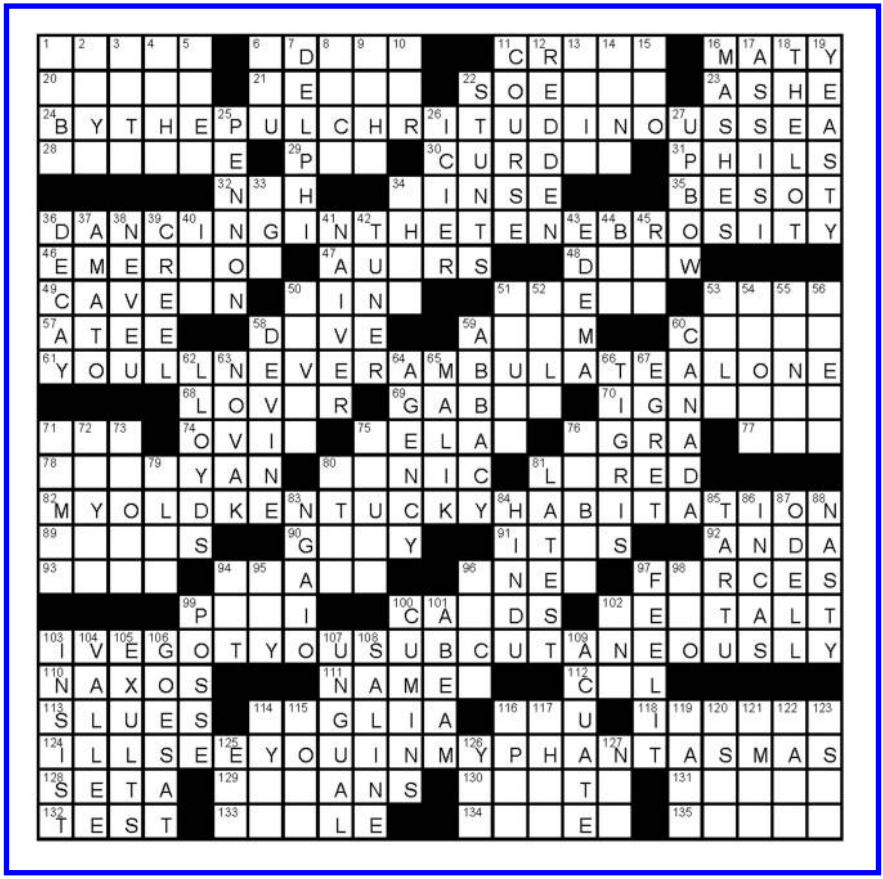

Figure 2. "Latin Rhythms" Partial Solution.

Frequently Asked Questions about Constructing Crossword Puzzles

FAQ 1. How do you think up a puzzle theme?

Answer. Themes pop up in ordinary conversation over lunch or dinner, through a TV program, through something I've read, through every conceivable avenue or medium. The trick is to recognize the theme and then run with it. For example, an acquaintance of mine once came waltzing into our dining

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room singing "I've got you subcutaneously…" When I asked her how come she changed the words, she simply thought it might be fun. I immediately picked up on her idea, and that is how "Latin Rhythms" was born. Another time, I was chatting with my friend Sister Pascal Conforti, who told me she was waiting for her Irish setter. When I asked her to explain, she said that another friend, Sister Peggy Kelleher, was due to come and give her a haircut and perm. Bingo! That remark gave rise to my puzzle, "What in the World?" (*New York Times Magazine*, July 20, 1980). "Irish setter" was clued as "Belfast beautician?" Some other geographic place names: Hamilton baby's diaper? Bermuda triangle; Schubert's schillings? Vienna bread; Louisville lid? Kentucky derby, and on and on.

FAQ 2. Once you have a theme, how do you begin to construct the grid?

Answer. The theme is only the beginning. You must then develop a word list that incorporates the theme in numerous long entries, and many of these must have the same number of letters so that puzzle symmetry can be preserved. This demands a great deal of research. Once a comfortable word list has been developed, it is trial-and-error to choose the right grid size and place the entries economically in the grid. Grid size depends on several factors. A Sunday Times puzzle can be either 21 X 21 or 23 X 23; daily puzzles are 15 X 15. Editorial guidelines limit the number of entries and black squares allowed for each size category so that the puzzle contains a fair number of long entries and does not consist of a lot of three, four, and five letter words. Once the theme entries are nicely packed in (and sometimes good ones must be discarded because of size or crossing requirements), you then look for the trouble spots and begin to fill in the rest of the grid from there, trying to avoid being "painted into a corner." When this happens, you often must dismantle the whole puzzle and start all over again. Some constructors start with a pre-made grid and modify it as they go along. I have always developed my grid after having inserted the theme words. Mechanically, I used to draw each grid by hand with ruler and pencil, fill in the black squares with India ink, and then type in the numbers with an old manual Smith Corona. Later, with new technology, I programmed an X-Y plotter to not only draw the grid, but also to fill in the numbers. Nowadays I use a commercially available computer program for this purpose, but NOT for construction. Herb Risteen, a veteran constructor with thousands of published crosswords to his credit, has observed, there is no magic construction formula (*4*).

FAQ 3. How long does it take you to construct a crossword?

Answer. Someone once asked me how long it took for me to get from my home to Laguardia Airport, and I answered "Anywhere from 20 minutes to 3 hours, depending on traffic." A similar answer applies to crosswords, "Anywhere from a few hours to months, depending on size, luck, and a host of other imponderables." I once managed to construct a 21 X 21 destined for the Sunday *Times* in under a day, including theme research. That was very unusual. Most of my crosswords take weeks and months because of tight corners, problem clues, etc. However, I usually have many crosswords in the hopper, and when one gives me trouble, I put it aside and take up another. Letting one's mind lie fallow is often a big help in getting over a trouble spot.

FAQ 4. Is crossword construction lucrative?

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Answer. Considering the fact that the *Times* paid me $15.00 for my first daily crossword and $100.00 for my first Sunday crossword, I would say that the word "lucrative" is a bit off-base. The fees paid to constructors serve one important function: they keep crossword construction in the category of hobby.

FAQ 5. Why are the fees so low?

Answer. One reason might be because of the law of supply and demand. There are lots of good constructors out there. The "in" boxes of crossword editors are full, and the time elapsed from acceptance to publication outstrips any technical journals that I know of. A second reason may be that constructors are much more interested in a by-line than in a check. What is money compared with the glory of having your name as author on the Sunday *Times* puzzle page? Many constructors would actually PAY for the privilege. Given the fact that there are about 500 active crossword constructors around the country, and that about 10% of these are considered A-1 (i.e., likely to make it to the Sunday *Times* puzzle page), then even the best constructor can hope to appear there on average only once per year.

FAQ 6. Are there any pitfalls to be avoided in constructing a crossword?

Answer. Crossword puzzles are entertainment, so constructors should think of themselves as being in the entertainment business. Crosswords should be upbeat and avoid any entries or clues that will remind people of the real world they left behind when they began to solve the puzzle. So, controversial political figures, most body parts ("heart" is OK), diseases, risqué words, etc. should be avoided unless they can be defined as something else. For example, if the entry "cancer" appears in a crossword, it is acceptable to define it as part of a Henry Miller novel title, but certainly not as a life-threatening disease (*5*)! Keeping to the entertainment theme, boredom is also to be avoided. Too many old, tired three- and four-letter words that solvers are not likely to encounter except in crosswords are not a good idea. Nor are too many abbreviations, foreign words, or other sometimes frustrating entries – they should be limited to one per crossword, or eliminated entirely.

FAQ 7. Once you have completed your grid, how do you go about writing your clues?

Answer. There is a real art to clue-writing. Puns and humorous clues are often entertaining, but should not be overdone. Clues that refer to more than one discipline can often be challenging because they require the solver to draw upon more than one font of knowledge. And sometimes misleading clues can be a learning experience and at the same time, very frustrating. I have defined the word "ale" as "stout" on more than one occasion, prompting solvers to place the word "fat" in the grid, only to find out to their sorrow that they were misled. I often try for a clue that will spice up an otherwise dull entry. Some examples are: Juan de Fuca, e.g. = strait; how sashimi is eaten = raw; ma that says "maa" = ewe; Guernsey or Jersey = elm (NOT cow); soprano Mills = Erie. In every instance, the clue must grammatically match the part of speech of the entry. Clues also may be easy or difficult. Which is more difficult as a clue: "Where the Gurgan flows" or "Tehran is its capital"? Sticking to standard dictionary definitions can bring on boredom, ennui, tedium, monotony, irksomeness, weariness – need I say more? Finally, each clue and entry must have a reference source unless it is immediately obvious.

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The Transition to Scientific Crossword Puzzles

It was only late into my puzzle career that I realized that crossword puzzles and other types of puzzles could be used as educational tools. My tardiness in this respect was more than likely due to the fact that I deliberately chose a hobby that would not intersect with my work obligations; I saw work and hobby as two separate and distinct worlds. However, several members of the Education Divison at the American Chemical Society encouraged me to construct and submit puzzles on chemical themes for ACS publications such as "SciQuest" and "CHEMTECH." In pondering this challenge, I realized that constructing puzzles of a chemical nature would be very difficult since all of the major and many of the minor clues would have to relate to a specific area of chemistry in order to have the intended pedagogical or entertainment value. I realized that perhaps I would not be able to adhere to the *New York Times* guidelines, and perhaps not be able to construct standard puzzles at all.

The simplest type of puzzle that would allow each entry (and therefore, each clue) to be part of the chosen theme is the criss-cross type where each of the entries would cross only with one or several other entries, and where each letter in the puzzle would not be keyed, that is, would not cross with other words. I say "simplest" with respect to the constructor; these puzzles are difficult to solve because they have fewer clues, and consequently, more guesswork. An example of such a puzzle is shown in Figure 3. The theme is Inorganic Chemistry, and each of the entries and clues corresponds to this subdiscipline of chemistry in some way, although I'll admit that some of them are a "stretch." It is evident that this type of puzzle can easily be constructed by an instructor to cover a particular area of the curriculum, and it lends itself also to further research on the part of the student: if some entries or clues are not immediately understood, or have not been "covered" in class, they could be the subject of an essay, paper, or assigned project. Such entries could be deliberately inserted by the teacher in order to broaden and enrich what has been discussed in class, but in a non-threatening, inviting, and entertaining way. Even the clues can be written to entertain and instruct.

Each of the entries in this type of puzzle contains in its clue the number of letters in each word of the entry. For example, 1-Across has nine letters in the entry and consists of only one word, so the clue is followed by the number 9 in parentheses. 7-Across, on the other hand, consists of fifteen letters, but it also consists of an eight-letter word and a seven-letter word, so the clue contains the hint (*7*, *8*). There are also references to other entries within the puzzle, which is standard practice in all puzzles, but renders this type of puzzle even more difficult because of the dearth of information. So you can appreciate that solving this puzzle will be quite a challenge! Go ahead and try it – the solution to this and to any of the following puzzles can be found at the end of the paper.

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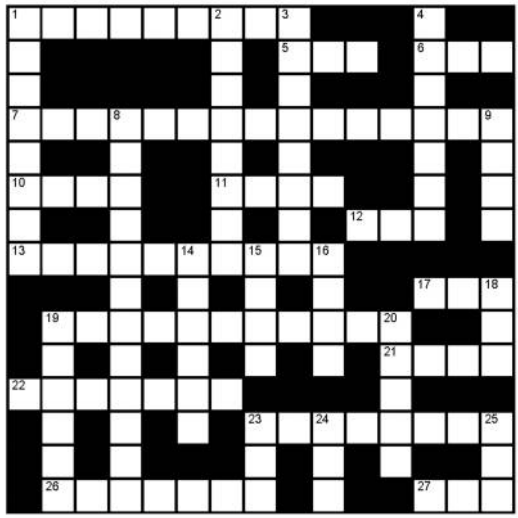

Across

1 Like a mercaptan (9)
5 Unit of resistance (3)
6 Type of dye (3)
7 It uses the air of refinement (8,7)
10 CaO (4)
11 $AlK(SO_4)_2 \cdot 12H_2O$, e.g. (4)
12 Source of Fe, Sn, etc. (3)
13 Old name for Celsius scale (10)
17 Tritolyl phosphate tradename (3)
19 Kind of acid (11)
21 $Mg_3Si_4O_{10}(OH)_2$ (4)
22 Element 20 (7)
23 This is really noble (two words) (5,3)
26 Possible constituent of 23-Across (7)
27 __ of yarrow, natural source of cineol (3)

Down

1 __ acid, alternative name for phenol (8)
2 Nitrogen has one (4,4)
3 Ethane or calcium carbonate, e.g. (8)
4 22-Across has one of two (7)
8 Chemist's valuable tool (12)
9 The Leblanc Process produces this (4)
14 $CaSO_4 \cdot 2H_2O$ (6)
15 Unit of 3-Down (4)
16 Keto's partner (4)
18 Polymer useful to plumbers (3)
19 A constant, companion to chemists (6)
20 __ function; __ of aggregation (5)
23 Word with trap or exchange (3)
24 It is measured in volts (3)
25 Colloidal solution (3)

Figure 3. "Inorganic Chemistry".

Figure 4 illustrates a regular 15 X 15 American-type puzzle themed to Nobel laureates. Notice that this puzzle contains no long entries, i.e., no entries longer than five letters. The difficulty with this type of puzzle is that not all of the entries or clues relate either to the theme or to chemistry – it would be impossible to accomplish this given the requirements of the grid. However, it is important to look at each of the entries and then try, by hook or by crook, to turn some of

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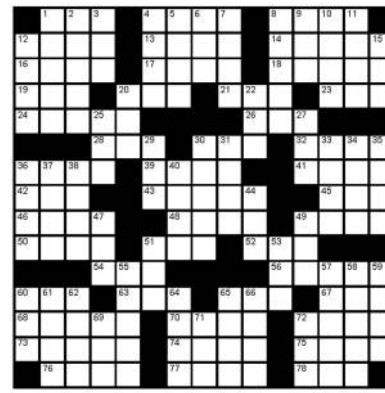
them into chemical, or at least, scientific entries by creative clue-writing. Another way of presenting the puzzle is given in Figure 5. This works more like a jigsaw puzzle and is quite difficult – however, no clues are available. The instructor could challenge the students to identify "scientific" entries and to supply a possible clue. Students working in teams could be challenged to come up with as many scientific clues as possible and then be vetted by classmates.



Across

1. Once around the track
4. Blows away
8. Miss Hogg and others
12. Boxer Tony
13. It's a long story
14. Gunpowder ingredient
16. Fluspirilene tradename
17. Second most abundant element in earth's crust
18. 1974 NOBEL CHEMIST
19. It comes before the FIR
20. Forest runner
21. Blow it
23. Wild West
24. Gem carved in relief
26. Dinghy propeller
28. Essential amino acid (Abbr.)
30. 1986 NOBEL CHEMIST
32. Boat in "Jaws"
36. Astringent containing element 13
39. Way, way off
41. Textile worker
42. Carbonium, e.g.
43. ___ American sumach, source of gallic acid esters
45. Take effect
46. Florida's Miami-___ County
48. Eyeball
49. Containing combustion residue
50. Tautomer
51. Bachelor's last words
52. Strong joe
54. TV monitor?
56. Crack an equation
60. Flow's partner
63. "Star-Spangled Banner" preposition
65. Big heart?
67. Priestley plaything
68. Characteristic of solutions
70. Bum kin
72. Bug-eyed
73. 1985 NOBEL CHEMIST
74. Hebrew for "delight"
75. Relatives of sols
76. Hideous
77. Uses an abacus
78. Lobster ___ Diavolo

Down

1. Female demon
2. Auto option
3. Energy
4. 30-Across' continent of origin
5. Weft's partner
6. I, to Claudius
7. All there
8. Prefix with red
9. 0.001 inch
10. Bohr's study
11. Antitoxins
12. Brass component
15. Kvass ingredient
20. Oil source
22. Beluga yield
25. "Slippery" tree
27. Bacillus shape
29. Honshu honorific
30. Slow
31. 2007 NOBEL CHEMIST
33. Types of woven rugs
34. 1989 NOBEL CHEMIST
35. Bohemian
36. Capitol Hill worker
37. Student aid
38. Menu option
40. Alimentary element
44. Bottom line
47. Grimm character
49. Big deal
51. Winter coat
53. Function
55. 1990 NOBEL CHEMIST
57. Potent potable
58. Quartet member
59. CGS system units
60. __thyl __etyl __etone
61. Blue, to 31-Down
62. 1980 NOBEL CHEMIST
64. Cassowary's cousin
65. Lying, maybe
66. Hoodwinks
69. 100%
71. 1969 NOBEL CHEMIST HASSEL
72. Compound with a formula weight of 126.87

Figure 4. Nobel Chemists.

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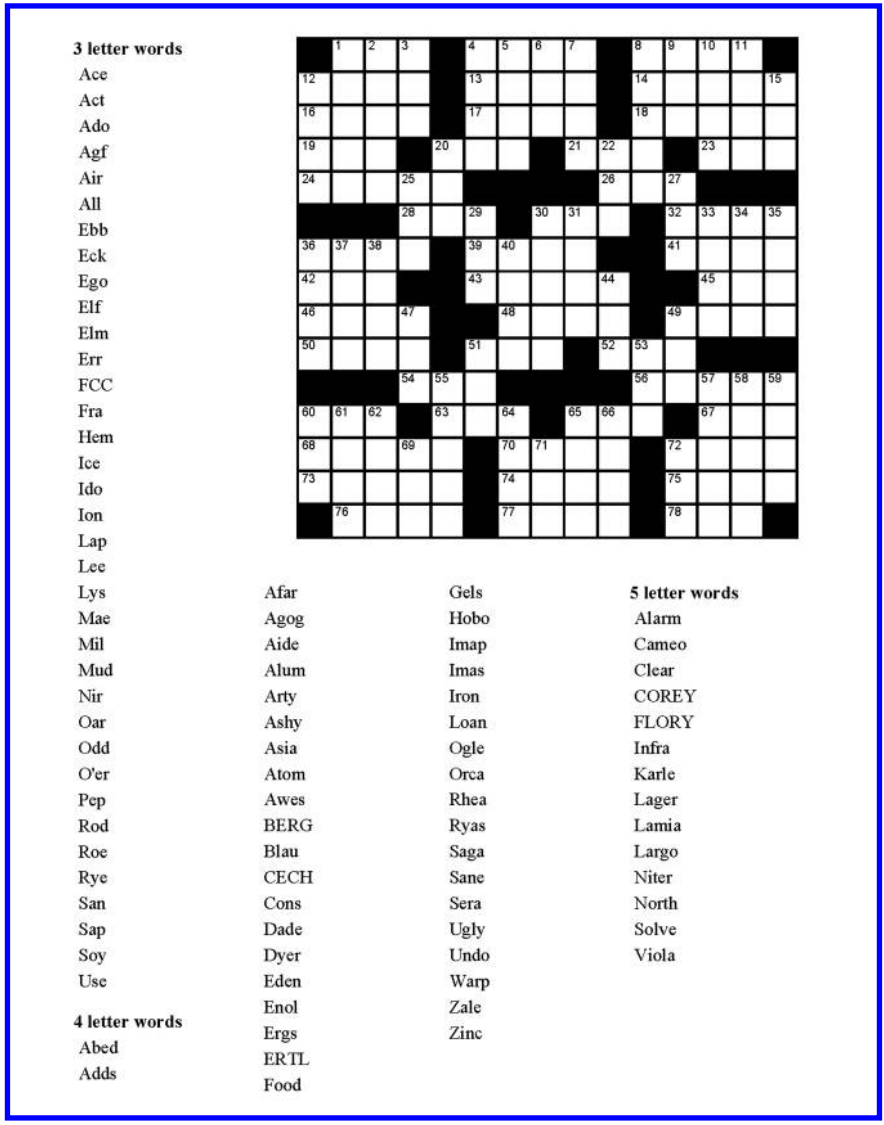

3 letter words

Ace
Act
Ado
Agf
Air
All
Ebb
Eck
Ego
Elf
Elm
Err
FCC
Fra
Hem
Ice
Ido
Ion
Lap
Lee
Lys
Mae
Mil
Mud
Nir
Oar
Odd
O'er
Pep
Rod
Roe
Rye
San
Sap
Soy
Use

4 letter words

Abed
Adds
Afar
Agog
Aide
Alum
Arty
Ashy
Asia
Atom
Awes
BERG
Blau
CECH
Cons
Dade
Dyer
Eden
Enol
Ergs
ERTL
Food
Gels
Hobo
Imap
Imas
Iron
Loan
Ogle
Orca
Rhea
Ryas
Saga
Sane
Sera
Ugly
Undo
Warp
Zale
Zinc

5 letter words

Alarm
Cameo
Clear
COREY
FLORY
Infra
Karle
Lager
Lamia
Largo
Niter
North
Solve
Viola

Figure 5. Nobel Chemists "Fill-In" Type Puzzle.

Figure 6, "Lab Humor" (*6*) and Figure 7, "Polymers," are examples of more sophisticated puzzles with specific themes and long entries – these are a challenge to practicing chemists as well as students.

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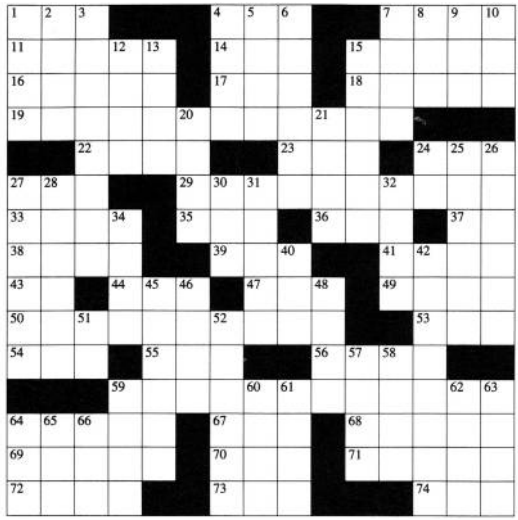
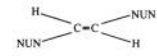
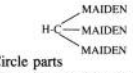
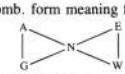
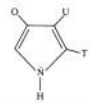
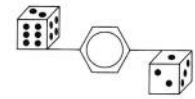


BY MARY VIRGINIA ORNA

Across

1 __ utyl __ enzyl ____hthalate
4 With 69-Across, $2.303 \int \frac{d(\text{cabin})}{\text{cabin}}$
7 Prefix indicating presence of sulfur
11 Pearl Buck heroine, and others; elements 8, 57, 7, & 16
14 Gas mixture containing 78% nitrogen by volume
15 Closes up a time capsule
16 Invisible emanations or vapors
17 Series of lubricant additives (trademark)
18 See 42-Down
19 
22 Permitted amount, as for radiation exposure
23 Wine (comb. form)
24 Monochloroacetic acid (abbrev.)
27 Troy, NY campus
29 
33 Circle parts
35 Kind of verb (abbrev.)
36 _____ Activated Carbon, Trademark of Calgon Corp.
37 Word which can go before take, set, and shot
38 Eating regimen
39 Barium's oxation number
41 Church part
43 "_____ Getting Sentimental Over You," Dorsey theme song
44 __nterrupted __ontinuous __aves
47 Chemist Remsen, discoverer of saccharin
49 Comb. form meaning four
50 
53 Kind of whiskey
54 FDR's successor
55 Luteotropic hormone (abbrev.)
56 Cousin of a Saab or BMW
59 
64 Davidic song-prayer
67 Word with soda or ammoniac meaning "salt"
68 Series of dyestuffs used for coloring fats and oils
69 See 4-Across
70 Toluene diisocyanate (abbrev.)
71 Kind of acid which forms zwitterions
72 _____ oil, alias furfural
73 __tandard __ydrogen __lectrode
74 Unit of heat energy (abbrev.)

Down

1 A major conformation of cyclohexane
2 Smear; render indistinct
3 
4 Fa, sol, ____, do; elements no. 57 & 22
5 Safflower and castor, e.g.
6 Shredded, as cheese or vegetables
7 Beverages containing caffeine
8 Bibl. prophetic book; elements no. 105 & 5
9 Not well; sick
10 Sugar suffix
12 Prefix between micro and pico
13 Court or congressional sitting (abbrev.)
15 Adjective for HCl or NaOH
20 Prefix for conductor or permeable
21 Oelfins
24 Result of LCAO; element no. 42
25 Snappish; blunt; curt
26 Unit of electric current
27 Common salad ingredient
28 Prinks; preens
30 Nickname for Nobel physicist Compton
31 Troll in "Broom Hilda"
32 One way to describe benzene or cyclopentane
34 Common laboratory manual direction
40 Limonite or siderite, e.g.
42 With 18-Across,


45 Chromatographer's necessity
46 S.I. unit of power
48 Gone; distant
51 Neuter pronoun
52 Specters; phantasms
57 _____ Major, constellation of the Northern Hemisphere
58 Large shipping container
59 Manufacturer of "HTH," a high test $Ca(ClO)_2$ product
60 Reduced form of nicotinamide adenine dinucleotide, for short
61 Ballerina's step
62 Actress Turner, composed of elements 57 & 11
63 Keto-_____ tautomerism
64 Polychlorinated biphenyl, for short
65 Type of ion-exchange resin used in water treating (trademark); elements no. 16 & 18
66 Coarse woolen fabric

Figure 6. Lab Humor.

Note 31-Down in Figure 6. The answer is Irwin, but a scientific clue could have been 2004 chemistry Nobel laureate Rose – the only problem is that Irwin Rose received the Nobel prize long after this puzzle was published!

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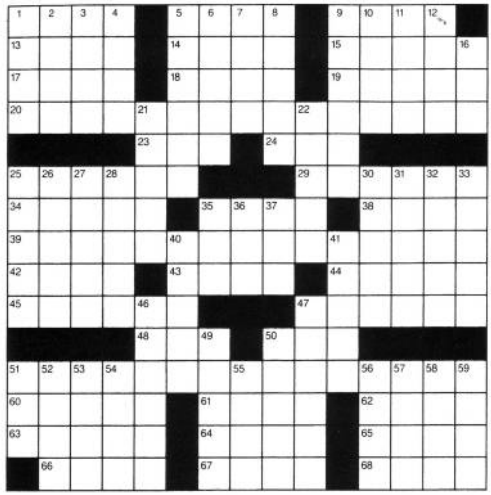
Crossword puzzle

by Mary Virginia Orna, O.S.U.

Polymers



Across

1 Polymeric unit in cell nuclei
5 Source of the hallucinogenic alkaloid bufotenine
9 Geological time periods
13 Ellipsoid
14 Therefore, to Tacitus
15 Wanderer
17 Level to the ground
18 Dessert, in Durango
19 Kinshasa is its capital
20 Major raw material for manufacturing epoxy resins
23 Long time
24 __andom __ccess __emory
25 _____ Way, famed Roman road
29 Old name for C_6H_6
34 Uncommon negative contraction
35 Soft cheese
38 Wine (comb. form)
39 Polychloroprene or polyacrylonitrile, e.g. (two words)
42 Symbols for elements 13 and 68
43 _____ oil additive, as butene polymers, etc.
44 Played the film again
45 Hydroxysuccinate
47 Widen, such as a blood vessel
48 Product of I and R
50 Your (Ger.)
51 Polyethylene or polystyrene, e.g.
60 Physical property
61 Kind of cable, for short
62 Kind of pigment
63 Thorn (Lat.)
64 Part of Hamlet or Macbeth
65 Subj. of the Periodic Table
66 Gen. follower (in the Bible)
67 Claim on property
68 *m* in $F = ma$

Down

1 Clotted blood
2 Vaporize (abbrev.)
3 Speer's party
4 Subj. akin to magnetism
5 Fluorocarbon polymer (trade name)
6 Copolymer containing at least 85% acrylonitrile (trademark)
7 Natural polysaccharide
8 Lewis base
9 Type of polypeptide
10 Word with map or runner
11 Moslem bigwig
12 Garb for Indira
16 Lair
21 Open tract of wasteland
22 1918 Nobel chemist
25 Indian state; symbols for three elements
26 Animal kingdom divisions
27 Wall surface, sometimes
28 Certain polymers undergo _____ molecular reactions
30 Prize won by polymer chemist Flory
31 African animal
32 _____ a time; singly (two words)
33 Actor Greene
35 Accepted std. for comparison of heating values of fuels
36 Costa
37 Allotropic, crystalline form of H_2O
40 Natural resin
41 One of the archangels
46 Atom or radical with a valence of four
47 Toxic, chlorinated hydrocarbon much in the news
49 _____ length, lens property
50 Large outpouring
51 D.C.-based org. for chemists
52 Add a trace impurity to an ultra-pure substance
53 Half of MCXVIII
54 Prefix for sphere or mer
55 Walnuts, in Napoli
56 Original substance from which atoms are believed to have been derived
57 Beginning of chite or thion; actress Powers
58 Makes do (with "out")
59 Periodic eyeball movements during sleep

Solution can be found at www.iscpubs.com/crossword

Figure 7. Polymers.

Another interesting twist on puzzle construction is the provision of hard clues and easy clues. This, of course, requires more space and is often not an option that is used. One of my favorite puzzles along these lines is shown in Figures 8a and 8b, "The Last Word," (*8*) as requested by the late editor of CHEMTECH, Ben Luberoff.

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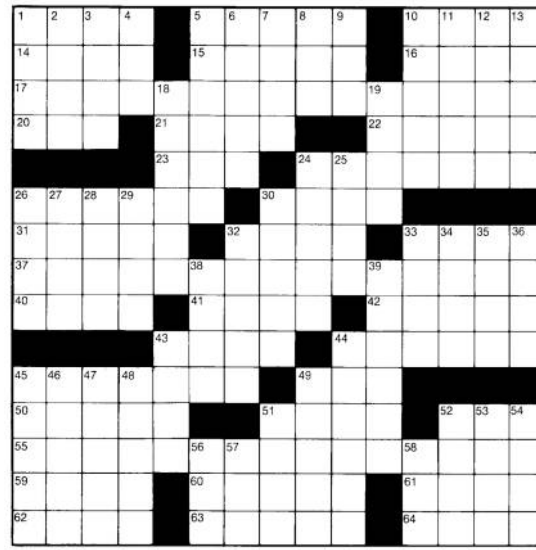
Crossword puzzle

Here's a puzzle for pros and duffers. If the first set of clues is too hard, turn to the inside back cover. Answers will appear next month.



Across

1. 27.343 grains, Avoirdupois
5. Relative of Pascal
10. Stet's opposite
14. Fe_2O_3, often
15. A.L. Rookie of the Year (1964)
16. Exploding star transformed into a river by reverse process?
17. Process mentioned in Chen's article
20. Type of coal
21. _____azole = glyoxalin
22. Musical direction
23. Actor Chaney
24. Substrate for ethanol fermentation
26. Product obtained by cracking naphtha at high temperatures
30. "If in that room a friend await, Felicity or _____" —Dickinson
31. Kind of show
32. Describing a cryostat
33. Ending for con or canon
37. Mixture mentioned by Chen
40. _____ Mech., grad. course
41. Paraffins, for short
42. Hengist's brother
43. MacGraw, and others
44. Clothed; arrayed
45. Hydrocarbon fuel components
49. Creosote's precursor
50. Aphelion possessor
51. Kind of solid state detector
52. Cpd with a FW of 41.07
55. Shape-selective substance
59. Theowman
60. Prefix for an extinct Mesozoic life form
61. _____ boy!
62. Autoclave, e.g., (abbrev.)
63. Adjective for *Homo sapiens*
64. Substance initially converted to an ethylene-rich hydrocarbon product (Chen)

Down

1. Word with dew or tear
2. Trouton's _____
3. Where the Irrawaddy flows
4. Process developed by Mobil (Chen)
5. Word with weal or wealth
6. Triglyceride used in textile lubricants
7. Kite, e.g.,
8. Prefix for parous or positor
9. Sunnite of the Caucasus
10. Item in a scientist's record
11. _____xif or _____mrof
12. Sacks
13. Capital of County Clare
18. More pinguid
19. Isotone, at times
24. Varieties of friable earthy clay
25. Prefix with form or phor
26. Spheres, to Shelley
27. Milk, in Montpellier
28. Soprano Berger
29. Geste
30. Catnaps
32. Dog, to Diocletian
33. Yield from taconite or siderite
34. With 64 Across, feedstock listed in Table 3 (Chen)
35. Nave ending
36. Material electrolytically refined by the Betts process
38. Gibbs's institution
39. Refractory compound used as a nuclear fuel
43. Prefix for matter or thesis
44. Synonym for amu
45. Percolates slowly
46. Ectoloph, e.g.,
47. Chuck's relative
48. Shakespearean sprite becomes ill?
49. Cidaris, e.g.,
51. Hard water reaction product with soap
52. Collection of bits
53. Commune near Padua
54. Rigel, e.g.,
56. Thyrotropin (abbrev.)
57. H_2O, to Mirabeau
58. Research ctr. site

Sister Mary Virginia Orna, O.S.U., is a chemistry professor at the College of New Rochelle (New Rochelle, N.Y. 10801; 914-632-5300) and holds a Ph.D. in analytical chemistry from Fordham University. She is a feature editor of the *Journal of Chemical Education* and is on the editorial board of *Art Materials Technology*. Under the auspices of NYU's Institute of Fine Arts she is pursuing research on medieval blue pigments and pigment analysis of medieval manuscripts. She constructs crosswords as a hobby and has compiled them for the *New York Times*, *SciQuest*, and *American Laboratory*.

Figure 8a. "The Last Word" – Difficult Clues.

An examination of the clues in this puzzles reveals that many of them refer to an article by Chen which appeared in this particular issue of CHEMTECH. Having read the article is not much of a help in solving the puzzle, but by solving the puzzle, one may be prompted to read the accompanying article – at least, that is what I think the editor had in mind. However, the interesting thing about this puzzle is how the clues are written. Let's look at some examples.

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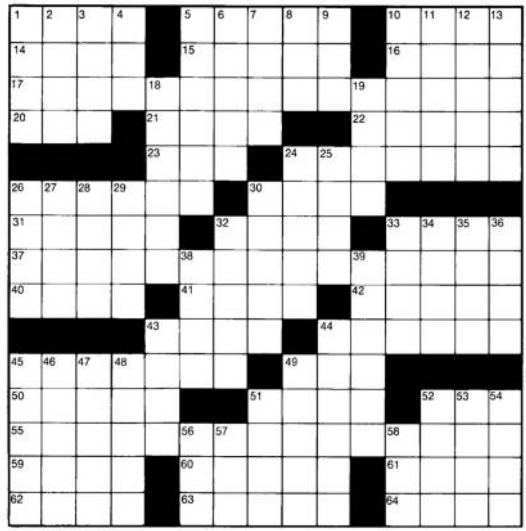

LAST WORD

(continued from OBC)

Easy clues

Across

1. Apothecaries' unit
5. Computer language
10. Editor's "remove"
14. Corrode iron
15. Oil source, in Italy
16. Stratford's river
17. Polymerization process yielding short chains (Chen's article)
20. Mendel's experimental vegetable
21. ==NH (Comb. form)
22. _____-frutti
23. _____ Nol
24. 34 Down, for one (according to Chen)
26. Type of unsaturated hydrocarbon that can sometimes undergo 17 Across
30. Destiny; fate
31. "Barbaree" without Bab
32. Common winter ailment
33. Spec. ht. of H_2O between 14.5 and 15.5 °C
37. 95% methanol–5% water, e.g.,
40. R.B.I., e.g.,
41. Saturated hydrocarbons, for short
42. Jute who invaded England (5th century); Israeli dances in anagram
43. Muhammad and Baba
44. Put on; assumed
45. Isomers of C_6H_{18}
49. Black, viscous liquid
50. Planetary path
51. Symbols for elements 14 and 3
52. Beryllium sulfide (formula)
55. Substance effective in converting ethanol to gasoline (à la Chen)
59. Symbols for elements 99 and 10
60. Lizard (prefix)
61. Symbols for elements 85 and 73
62. Suffix with old or fun
63. "To err is _____"
64. Type of stripping column (to Chen)

Down

1. Globule formed because of surface tension
2. Govern; control
3. Mongolia's continent
4. _____ethanol _____o _____asoline catalyst
5. _____ ion effect
6. Glyceryl trioleate
7. Wren or robin, e.g.,
8. Egg (comb. form)
9. _____y Susan
10. Item of fact
11. Smash Broadway musical without a dog
12. Plunders
13. Dressed to the _____ (anagram)
18. Slicker; greasier
19. Unit proposed by 44 Down
24. Tree trunks
25. Element 53 (comb. form)
26. Eyes (poetic)
27. Café au _____
28. Symbols for elements 68 and 11
29. Accomplishment
30. Nods off
32. _____ Major, Sirius's constellation
33. Only metal that can be tempered
34. Material ground and cooked prior to fermentation
35. Church part
36. Metal used in radiation shielding
38. New Haven campus
39. ThO_2
43. Against; con
44. Name associated with atomic theory
45. Seeps
46. Standing wave feature
47. Kind of steak
48. One who is ill
49. Head ornament; the Pope's triple crown
51. Bathtub ring residue; offscouring
52. Group of adjacent binary digits
53. Villa d'_____, Tivoli attraction
54. Movie hero or heroine
56. _____hyroid _____timulating _____ormone
57. _____ de cologne
58. Chemist's bailiwick (abbrev.)

Figure 8b. "The Last Word" – Easy Clues.

The entry for 33-Down is IRON. A very easy clue would be "Element number 26," but presuming that most solvers are chemists, a better and more challenging clue would be "Only metal that can be tempered." To my way of thinking, a more difficult clue would be "Yield from taconite or siderite." What makes a clue more difficult is the degree of information that the solver must have. I assume that most people know that iron has to be tempered; do most know that it is the only metal that can be so treated? For the more difficult clue, the solver must know that iron

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is the principal metal in each of these two ores. However, it is always up to the judgment of the constructor or the editor as to what constitutes a more difficult clue. Another example is the entry for 36-Down, LEAD. Think of a really easy clue. Perhaps "Pipe material" would be one, although so many pipes are now made of PVC that this may be a difficult clue for younger people. The easy clue that I chose is "Metal used in radiation shielding," which is easy for a chemist, but maybe not for someone else. The more difficult clue, "Material electrolytically refined by the Betts process" may send even chemists scurrying to their *Handbook of Chemistry and Physics*. Pedagogically, this type of clue-writing could serve to enhance student knowledge by sending them scurrying to any number of sources.

In addition to the standard type of "American" puzzle that we have been discussing so far, and which is the most common in most peoples' puzzle lexicon, we have the word-search type puzzle. These are very simple, don't require much thinking, but some spatial cognition in order to see a word that has been reversed, or occurs in the puzzle on the diagonal. One way of making this type of puzzle a learning experience in chemistry is to include a set of extended clues. The following set of clues and the puzzle in Figure 9 could be used in a unit on chemical equilibrium, for example.

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L	E	C	H	A	T	E	L	I	E	R	D	A	K	L	V	T
K	B	H	J	F	E	O	K	E	A	M	M	O	N	I	A	N
W	D	Y	A	S	F	O	D	Q	E	B	A	X	E	S	F	R
E	Q	C	O	B	A	L	T	U	W	Z	J	Y	Z	X	E	R
X	J	I	J	F	N	Y	C	I	L	D	P	D	E	B	Y	W
O	X	R	R	B	M	I	J	L	F	B	B	A	A	D	E	G
T	P	N	I	P	T	P	E	I	F	N	K	H	P	M	D	F
H	A	K	T	A	H	F	Z	B	N	O	A	Q	J	T	N	Y
E	N	Y	T	N	A	S	T	R	E	S	S	D	A	A	T	N
R	B	S	C	Y	T	I	L	I	B	I	S	R	E	V	E	R
M	J	W	J	E	V	L	E	U	A	L	U	Y	G	Y	P	U
I	L	X	R	L	H	G	T	M	I	X	E	Z	M	Y	N	A
C	K	V	E	I	E	O	E	R	U	S	S	E	R	P	X	B

Figure 9. Word Search Puzzle on Chemical Equilibrium.

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Clues for Figure 9

- Change in the reaction conditions of an established equilibrium
- State of a chemical system such that the rates of formation of products and reactants are equal
- Substance formed in the nitrogen plus hydrogen gaseous equilibrium
- German chemist who synthesized the previous item from nitrogen and hydrogen
- Seeming characteristic of a system in chemical equilibrium
- Factor that can cause a shift in a gaseous system at chemical equilibrium
- Type of reaction in which heat is absorbed by products to form reactants
- Metal in compex found in some commercial weather indicators responsible for pink-to-blue color change as temperature changes
- Balanced see-saw represents this type of equilibrium
- French chemist for which a famous principle of equilibrium is named

Conclusion

We have seen that puzzles can be used not only for entertainment, but also can have pedagogical value. We have seen that some puzzles are fairly easy to construct, but others require a great deal of skill and research. Some can be regarded as "professional," and others can ignore editorial guidelines if used for specific occasions or purposes. There are many forms of puzzles, and some have not been discussed in this paper, such as acrostic puzzles, cryptic puzzles, or puzzles with clues embedded in the squares. Puzzles can be constructed by hand and from scratch, which was the only way to do it when I first began this very enriching hobby.

With the advent of the internet came numerous possibilities for downloading free or inexpensive software that will fill some puzzlers' needs. Although there are dozens of such websites, here are a few that I found useful.

http://www.armoredpenguin.com/crossword

They request a contribution if you use it more than once.

http://www.crossword-compiler.com

$59.00 for the compiler; $189.00 for the professional bundle that includes word lists, foreign dictionaries, etc. I have found this compiler very useful for constructing diagrams and writing clues. It has limitations when one wishes to construct a more sophisticated puzzle.

http://hotpot.uvic.ca

Hot Potatoes is the creation of half-baked academics from the University of Victoria. The license is free if you use the materials for non-profit and you are faculty at a public educational institution. Otherwise the fee is $50.00.

http://puzzlemaker.discoveryeducation.com

The cost for this compiler is $50.00 to $600.00 depending on how much support you want. It is designed mainly for K-12 use.

Happy puzzling, happy solving, and may the Thesaurus be with you!

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Solutions

Figure 10. Solution to Figure 3.

Figure 11. Solution to Figures 4 and 5.

Figure 12. Solution to Figure 6.

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Figure 13. Solution to Figure 7.

Figure 14. Solution to Figures 8a and 8b.

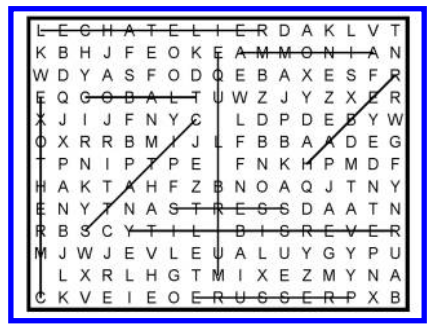

Figure 15. Solution to Figure 9.

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Chapter 5

From the Pens of Thirsty Chemists and the Occasional Cat: Chemists' Humor in Publications

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The chemical literature is surprisingly full of pranks played by authors and even editors of journals. Sometimes these jokes have taken on a life of their own and have become part of the folklore of the discipline.

Nomenclature Gone Wild

Naming chemical compounds has been standardized for a long time, but the description of structural features has sometimes led to fanciful designations. We all know about axial and equatorial positions on rings, sandwich compounds, and buckyballs. The following illustration may come from a scientist who had just had his fill of special classifications involving cyclic compounds and embarked on a rather fantastic voyage of nomenclature.

Chemistry in Industry, a publication of the society of chemical industry in London, in March, 1955 (*1*), featured in its letters to the editor a communication from Alonzo S. Smith of Trinity College, Dublin on the stereochemistry of octahydrohexairon, a so-called molecular raft. Dr. Smith begins his letter with a description of the stereochemical features of cyclic compounds that were common then: axial and equatorial positions in the chair form of cyclohexane, molecular sandwich compounds like ferrocene, and bowsprit (*bs*) and flagpole (*fp*) bonds at the bow and stern of the boat form of cyclohexane. Indeed he comments that Beckett and Mulley in this same journal suggested a 'barge' shape for slightly flattened boat-shaped molecules in which the *bs* bonds become *lin* (linear) and the *fp* bonds become *perp* (perpendicular).

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Continuing with this nautical motif, Smith then reports the results of X-ray diffraction studies on octahydrohexairon, Fe_6H_8, which necessitate the introduction of the "raft" (or *r* form) of a molecule. In the *r* form of Fe_6H_8 (Figure 1a), the iron atoms are in a six-membered ring; six hydrogen atoms are joined to the raft by *s* (stanchion) bonds, and two hydrogen atoms are held below the raft by *k* (keelson) bonds.

In case one begins to smell something fishy at this point, a quick glance at the references tells all. The first four are impeccable and include two papers in *Nature*, one from *Reviews of Pure and Applied Chemistry*, and one from an earlier issue of *Chemistry and Industry* in 1955. However, when the subject turns to Fe_6H_8, things become more curious: continuing the nautical strain, the compound in question was reported by von Grizzling and Applefritter in *Proc. Bilge Acad. Sci.* (*2*) (1899), and other contributors include Inimini and Minimo in *J. Hotsitotsi Polytech. Inst.* (*3*) (1935) and Washpot and Kettleblack in *Reports, N. Y. Assoc. of Alienists* (*4*) (1913).

As the report continues, Smith isuggests more additions to the nomenclature. Upon inversion, the molecule assumes a new conformation (Figure 1b), which he calls *h* (hat) and he notes that upon inversion all *k* positions become *c* (crown) and all *s* positions become *t* (tassel).

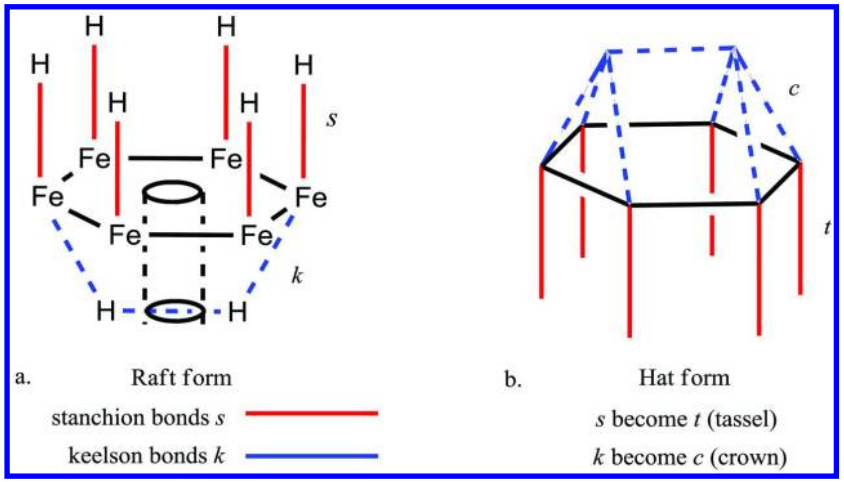

Figure 1. Nomenclature associated with Fe_6H_8 shows (a) the raft form and (b) the hat form. (adapted from Ref. (1))

Smith then delves into the physical properties of F_6H_8 and its derivatives. Octahydrohexairon has an abnormally high density, because the center of the molecule is a hole, which of course causes it to sink in water. In contrast, the derivative $F_6H_8S_2$ (Figures 2a and 2b) has very low density because the two sulfur atoms fill the hole (so the raft does not then sink) or bond sideways as 'buoyant balloons.'

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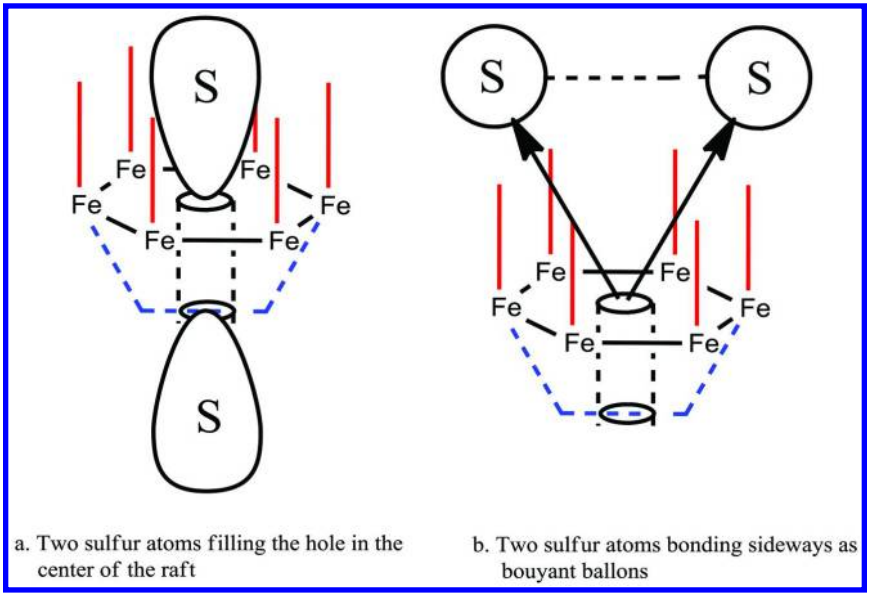

Figure 2. Alternative binding modes of sulfur to account for low density of $Fe_6H_8S_2$; hydrogen atoms have been eliminated from the structures for clarity. (Adapted from Ref. (1))

To complete the list of properties, the author reports the compound had no physiological properties, so it was tested for its psychological effects in Wistar strain white rats. Tests of the *mrf* (moral resistance factor; this is cited as the publication in the *N. Y. Assoc. of Alienists*) were carried out by giving rats fed a standard diet free choice of roughage consisting of chopped-up portions of (a) Beilstein's *Handbuch der Organischen Chemie*; (b) the *British Medical Journal*; (c) *Parisian Peepshow*; and (d) *Supersensational Horror Comics*. Smith reports that the rats showed a distinct preference for (c) and (d), hence giving a mrf value of the compound of -5.8. After feeding on these publications, the rats were noted to have gone to sleep "with a salacious leer."

Now in all fairness, this is a letter to the editor and not a refereed publication, and *Chemistry and Industry* frequently featured letters that deviated from strict chemistry. In the next several issues, for example, part of an exchange appears between two readers pleading for accuracy in publications under the banner of '*Quis custodiet ipsos custodies*? ('*Who watches the watchers*?') (*5*) about the use of the verb 'to scotch.' One letter-writer cites Shakespeare as his source, but the second reader reminds him in the next exchange that words have more than one meaning, and the discussion continues through several issues (*6*). But Smith's letter is in a category of its own, because of subsequent events. *Chemisches Zentralblatt* (the first and the oldest abstracting agency and journal for chemistry)

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did not get the joke; they abstracted it. In the Sept. 26, 1956 issue (*7*) under the heading "Research in Structure," the publication gives a detailed abstract of the new structural form and commented on 'die sogenannten Flossform…' or the so-called raft-form, of this new compound.

Now that this joke has a certain stature by virtue of its having been abstracted in the legitimate literature, we should perhaps look at where it actually came from. A Hungarian publication on humor in chemistry (*8*) provided the answer. The author uncovered that Alonzo S. Smith was a pseudonym for the chemist John T. Edward, then working in Dublin. The author then observes that Smith's initials form a word that is a "mild expression which may mean donkey."

Edward was actually a Canadian inorganic chemist who worked in London during World War II and was at the University in Dublin for two years during the time he published this letter. One senses that he must have simply been expressing both his frustration and amusement at the trends in nomenclature during this period and created the letter from Smith as a spoof of his fellow inorganicers and their lack of systematic nomenclature.

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Liter or Litre?

Compounds are not the only names of consequence in science. Many devices are named for their inventors or popularizers: think of Erlenmeyer flasks and Büchner funnels. Certain units of measurement also bear the names of scientists, and therein lies the next tale.

In the April, 1978 issue of *Chem 13 News*, a chemistry newsletter for high school teachers published in Canada, Ken A. Woolner from the Department of Physics at the University of Waterloo published a spoof (*9*). He admitted directly in the text that this story was not real. However, the issue he cited was: the liter was a problem. It was symbolized lower-case "l" because IUPAC stipulated that the only units that were capitalized were those named after a human being. Woolner's point was that it would be much better to abbreviate it upper-case "L" because it would then be easier to read; the "L" would be less likely to be confused with the number one. In effect, he was mounting a campaign to capitalize "Liter" for very sound reasons.

To make this possible in light of IUPAC's tradition, he created the character Claude Emile Jean-Baptiste Litre (1716-1778) and provided us with his biography in this newsletter. According to Woolner, Litre was born in Margaux, in the heartland of the Medoc, the French wine region. The Litre family – Jean-Baptiste's father, grandfather, and great grandfather before him – were very famous in France for providing bottles for the wine industry. The wine growers loved the 'Litre' bottle because it was a nice size for a convivial amount of wine. Another feature that the vintners appreciated was that the Litres were such good craftsmen with glass that all the bottles were of uniform size, so when one bought a Liter bottle, one knew one was getting a constant quantity of wine.

As Liter grew up, he became a friend of Celsius, who convinced Litre of the importance of precise measurement. Litre became intrigued by the idea of the careful quantification of liquids and crafted a series of graduated glass cylinders

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so that one could measure not only Litre quantities but amounts less than 1 Litre as well. He became so enamored of these cylinders and their graduations that, when he married the daughter of a wine merchant named Barrel, they named their first daughter Millicent as a nod to one of the graduations on his cylinders, the Milli-litre.

Litre ultimately received a gold medal from the Royal Society for the aid he provided people who needed to measure quantities of liquids. In thanks to the Society for the honor, Litre donated a set of his graduated cylinders to the organization. Unfortunately, the cylinders did not survive into modern times because Sir Humphrey Davy used them in an experiment to make NCl_3 and broke every one.

Thus ended the story of Litre. But things also then get a bit out of hand.

In September, 1979, the spoof by Wollner was reprinted in an IUPAC publication, the *International Newsletter on Chemical Education* (*10*). Because space is always at a premium in any publication, the newsletter deleted some of the material, and the admission that the story was a complete fabrication was left out. As a consequence, when another summary of the story was printed in 1980 in a different IUPAC publication, Chemistry International, the story was treated as real (*11*). They took Woolner's spoof seriously, and the biography of Litre was published by IUPAC as a legitimate story.

At this point, other friends of Woolner, knowing the story was bogus, began to fabricate other insights into Litre's life. Identifying a 15-year period from 1736 to 1751 that was "shrouded in mystery," Paul Martin of Merrick, NY, wrote that he was in possession of a letter that he was willing to offer to the public domain to clear up the story of this 15-year gap in Litre's life story. Merrick's announcement of finding this letter was published in *Chemical and Engineering News* (*12*). The story continued to grow because people who were in on the joke published additions to the tale, and these additions to the spoof were taken seriously.

In another issue of *Chem 13 News* (*13*), ten years after the original article, Woolner again came clean. He told the whole story, described it as a spoof, and implored people to pay no attention to this other than as an item of good fun. There was no Claude Emile Jean-Baptiste Litre – it was a joke.

As luck would have it, Woolner's confession was published along with another entry from Jerry Toogood, a colleague of Woolner in the Chemistry Department at Waterloo, who claimed to have found Litre's grave. Litre's tombstone was inscribed:

REQUIESCAT IN PACE

The man who lies here, deceased,
Was trained as a Catholic priest.
With help from St. Peter
He invented the litre,
That infamous Claude Jean- Baptiste.

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Toogood claimed to have found the tombstone in Waterloo Cemetery. He further claimed that Litre was buried there because of a cholera epidemic that produced more victims than French cemeteries could handle. Bodies, Litre's among them, were sent overseas for proper burial. The engraving was also noted to provide evidence that Litre studied theology during the 15-year gap in his biography.

In 1989, the *Winnipeg Free Press* published an article, "Phony Litre evaporates," in which the entire story was yet again described as the joke that it was (*14*). Woolner stated unequivocally that Litre was born over a bottle of scotch when he and a friend were trapped in an Ottawa hotel during a blizzard. Over the years others added to it – all in good fun – but the story was just that: a story. Fiction.

Like all good stories, however, this one had taken on a life of its own that even its creator could not control. In 1995, *The Globe and Mail* (*15*) ran an article on the metric system, in which they pointed out that many units are named for famous scientists, but "one is named for a wine merchant – Claude Emile Jean-Baptiste Litre." The source for this statement was given as *Collier's Encyclopedia*. Indeed, the attribution showed up in two different editions of *Collier's Encyclopedia* (*16*, *17*):

> "The liter, a metric unit of volume or capacity, is named for a founding father of the metric system, Claude Emile Jean-Baptiste Litre, whose family sold wine in the first litre (liter) bottles to bear the name."

As a final nod, for now, a letter to the editor in *Chemical & Engineering News* in 1995 (*18*) noted the 1980 appearance of Litre in the magazine by stating:

> "Litre is the only correct spelling because it is named after the father of volume, Claude Litre. Such was his passion for the accurate measurement of volume that he named his daughter Millicent (C&EN, Jan. 14, 1980, p. 64)."

Perhaps this is an instance of the adage (*19*), "when the legend becomes fact, print the legend."

Consultations and Collaborations with Animals

Scientists very often collaborate with others to strengthen their work and expand the scope of their studies. Acknowledged collaborators have not always been human.

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How To Guess NMR Parameters

The decades of the 1960s and 70s were characterized by the entry of computers into our laboratories. The use of computers had had a major influence on our ability to collect and analyze spectral data, and in 1977 Anstey and Harris published a paper in Chemistry in Britain (*20*) that reviewed the available programs and techniques for analyzing NMR spectra. A block diagram in the paper summarized the steps of computer-aided analysis, and an early step in the suggested procedure prescribed that one used as input into the program values of chemical shifts and coupling constants that were 'guessed.' A star directed the reader to the following recommendation about how to guess: "using inspection of the spectrum, consideration of subspectra, symmetry, transitions with explicit frequency expressions, comparison with analogous cases, examining the entrails of newly slain pigeons, etc."

Anstey and Harris don't stop with just that comment: their list of recommendations bears a reference to an early computer program by Aksel Bothner-By called LAOCOON II. LACOON was the earliest iterative program, written in Fortran, for the simulation of spectra. It indeed included consideration of many of the items listed in the comment. Whether the modern spectroscopists actually used information gleaned from pigeon entrails is doubtful, but the ancient Greeks, who gave us the story of Laocoon (*21*), certainly did practice divination by reading all sorts of entrails.

The reference to animals in NMR didn't stop here. LAOCOON gave rise to a program for calculating spectra on a PC called RACCOON, or Really Awesome Computer Calculation of Observed NMR Spectra. Finally, LAOCOON and RACCOON were the progenitors of program from Bruker Instruments called PANIC, or Parameter Adjustment in NMR by Iterative Calculation. Those pigeon entrails certainly gave rise to a lot of code.

A Cat Amidst the Pigeons

Consultation sometimes leads to co-authorships, and that scenario is perhaps best typified by the publishing career of F. D. C. Willard. Felix Domesticus Chester Willard was a Siamese cat. His given name was Willard, and the inclusion of Chester in his complete name is a nod to his parentage. Willard lived with J. H. Hetherington, a PhD physicist at Michigan State University in East Lansing. Because there was only one male Siamese cat in the town where they lived, a cat called Chester, Hetherington knew that his young cat Willard was a descendant of Chester and named him accordingly.

Hetherington worked in the field of low-temperature physics, and in 1975 submitted a paper on the topic of multiple site exchange in bcc solid helium to *Physical Review Letters* (*22*). Hetherington was originally the sole author. During the review process it was pointed out to Hetherington that he used 'we' throughout the document in describing his results, and the journal would not allow the plural

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construction to be used in a paper with only one author. Hetherington balked at retyping the entire paper; this was 1975 and word processors were not yet at hand to make editing painless. His solution was to extend second authorship to Willard. The paper was accepted and published, 'we' intact.

Later when Hetherington sent copies of his paper to colleagues, he signed them 'compliments of the authors – J. H. Hetherington' and then followed his name by a print made with Willard's inked paw. This paper became actually quite well known in scientific circles and was referenced as "landmark paper number 15 in low temperature physics" on the website of the Hahn-Meitner Institute in Berlin (*23*). Considering that Willard did not have an advanced degree and indeed may never have completed any schooling at all, having joint authorship of a landmark paper in physics was truly an amazing feat.

Willard did not rest on these laurels. Although he never accepted any of the speaking engagements he was offered as an up-and-coming researcher, a 1980 issue of the French publication *La Recherche*, similar to our *Scientific American*, contains an article on which Willard is the sole author (*24*). In the five years since the appearance of his initial publication, Willard clearly did more work on low temperature helium and also learned exquisite French. A footnote to the article allows that it was written in collaboration with physicists at the CEA-Ormes (the French Commissariat for Atomic Chemistry, similar to atomic energy commission in the US) and at Michigan State University. In the best academic tradition, Willard sites his previous paper in this review article, so he was clearly very astute about building his own resume.

These papers are the sum of Willard's published work, but they were sufficient to secure him a place in a book by Sam Stall, "100 Cats Who Changed Civilization," in which he is listed as the only feline with two publications in low temperature physics (*25*).

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Thirsty Chemists

From issues of nomenclature and coauthorship, we now move to the Emperor of all spoofs in the chemical literature: *Berichte der durstigen chemichen Gesellschaft*. Most older chemists know the journal affectionately just called 'Berichte.' *Berichte der deutschen chemischen Gesellschaft* has been a highly regarded journal for the publication of original research in chemistry since its founding in 1868, through its transitions into *Chemische Berichte* in 1947, to *Chemische Berichte/Recueil* in 1997, and up to its merger with other European journals in 1998 to form *European Journal of Inorganic Chemistry* and *European Journal of Organic Chemistry*. The Berichte name is gone but not forgotten, and the journal takes the prize for most extensive spoof ever perpetrated on the chemical community.

In September 1886 *Berichte* published an issue under the name *Berichte der durstigen chemischen Gesellschaft* – Reports of the Thirsty Chemical Society (*26*). The name itself was certainly a tip-off that the contents might not be the usual

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serious research reports, and the date was also an indication that something special was afoot: *Berichte* never published an issue in September. The masthead also announced that this was an 'unerhorter Jahrgang,' ('unheard of' or, perhaps even more to the point, 'outrageous volume'). Despite all these clear indications of the joke, the title page was in format and design so much like a normal issue of *Berichte* that many librarians reportedly bound it with the rest of the issues of that year, thereby treating it like a regular entry into the literature.

The material inside the issue also followed the standard format of an issue of *Berichte* in that era. The issue always contained an announcement of the meeting and listed the chairman. For the meeting on 20.September 1886 the Chairman was one 'Hr. Aujust Kuleké, President,' who can be none other than August Kekulé. Kekulé was indeed President of the Society in that year. Other members in attendance were Dr. Omnibus, Prof. Tieftrunk (deeply drunk), and one N. N. aus M. The President explained that "Herr N. N., my most extraordinary colleague in chemistry, is here *incognito* but wishes those in attendance to rise from their seats to acknowledge him." Of course, they do. Then Herr Omnibus thanks all in attendance "for the honor which he was earlier able to accept, as he was prepared to declare under oath that he reads every issue of *Berichte* completely." Upon hearing this, the assembled again rose as one in acknowledgement.

Throughout the entirety of this issue there is a level of self-effacing humor that even today is quite refreshing. What follows are some selected items that are illustrative and representative but by no means exhaustive of the breadth of topics covered. This issue is clearly the product of a mature society of scientists having great fun laughing at themselves. Many of the entries contain delightful double entendres and word-plays that are impossible to eonvey in English.

Sixteen articles appear by authors such as "Tea and Totaler" who write "*On the Meaning of Alcohol Elimination*" (*27*), but the word Entziehung in this context is a double entendre, meaning elimination but also withdrawal. The double meaning is clear through the article, and it ends with the following observation in which the authors liken the behavior of young chemists to that of molecules, and get in a parting shot at Kekulé at the same time:

> "We know many young German chemists, about whom we are convinced that, as a consequence of their withdrawal from alcohol, have experienced a powerful increase in their energy and their ability to act, and that these same chemists then bestow upon their formerly open but unstable characrters a closedness and completeness, similar to those qualities of aromatic molecules that we have learned to marvel at since the advent of Kekulé's theories."

One article in the volume has actually received rather wide attention in the history of science (*28–30*). Number 1138 by F. W. Findig ('findig' means clever or inventive) is entitled "*On the structure of benzene*" (*31*). Mr. Findig suggests that sciences other than chemistry may be helpful in explaining the constitution of

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benzene, which has been the "preoccupation of the most brilliant living chemists." He suggests that the chemists' point of view, however, has been too shortsighted and insufficient. The sciences are destined to help each other, and zoology offers us a way to understand the behavior of carbon atoms. He then offers to try to make clear to the reader using principles of zoology what the relationship is between the atoms in a molecule of benzene, although he expresses his doubt "that the reader is capable of understanding it."

He states that the carbon atom has four affinities. The German word for affinity is Affinität and the word for monkey is Affe; this is an example of the wordplay found throughout the publication that is lost in translation. Mr. Findig instructs: If you look at members of the quadrumanus family, for example, the Rhesus monkey, they have four hands. Consider a group of six such monkeys, and let them build a ring in which they alternatively grip with one hand or two. One gets in this way "a perfect analog of the Kekulé-isch hexagon."

Findig continues: the monkeys have a fifth grasping tool, namely a tail. Looking at the structure with this in mind, there is a second way that the six monkeys can bind to each other. In this case every carbon atom has a tail which does not count among the normal affinities but is certainly predisposed for gripping. He calls this "caudal residual affinity," and further allows that this is actually an "exquisite illustration of tautomerism" (*Tautomerie* in German), a hypothesis that is "one of the greatest creations of the critical research mind." This concept, the author allows, is crucial to theories of benzene structure and is a brilliant achievement. He then includes a footnote, stating that 'Tautomerie' is the correct way to refer to this concept. He chides his colleagues, who clearly have poked fun at this idea, by stating that "calling this 'Traute Marie' ('trusted' or 'dear Marie') belongs in the realm of mean-spirited contrivances. This is my dearest hypothesis, and people who give it that pet name are simply being malicious."

Remember that Kekulé himself was President of the Society in 1886 and was clearly a target of this entire spoof. Apparently 'Tautomerie' was in jest referred to as 'Traute Marie,' and the authors are unabashedly poking fun back at those who referred to Kekulé's pet theory in this fashion, and also chiding Kekulé for some petulance: "People who give it that name are just being malicious." The authors may also be making a broader joke about the fondness scientists have of their own theories.

Other articles clearly indicate a healthy amusement about the vigor with which people defend their data and shows the Chemical Society making fun of itself and the practices of its members. An article by F. Schnappius ('snapper,' in the sense of a dog snapping at someone) entitled '*In Defense*' (*32*) begins with Snapper complaining about a colleague / research competitor named Bissig ('biter,' in the sense of a dog being a biter) who constantly claims that Snapper has the wrong melting point for a new compound. Snapper reports 67.28° C, while Biter insists Snapper is totally wrong, because the melting point is definitely 67.31° C!!!! (The four exclamation points are Snappers.) Snapper writes that this sort of thing has just got to stop because he has the melting point correct and he cannot let Biter's challenges go unanswered any longer. After all, Snapper

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has repeated his measurements using a great number of carefully calibrated thermometers and can only confirm his earlier statement.

The year 1886 is in the heartland of science defining properties to more and more places beyond the decimal point. The architects of this spoof are poking fun at themselves for the vigor in which such numbers are pursued. You can almost hear Snapper laughing about the tempest in the literature regarding a 0.03° discrepancy in reported melting points.

After the reports come a series of communications. Under the heading of Analytical Chemistry is one from L. Truecolor with the title "*On some new indicators*" (*33*). Mr. Truecolor says that, "because we really do not have enough indicators, I am happy to report three new indicators. Their color changes and my suggested names for them are: 1) white to blue, called the Bavarian, 2) green to yellow, the Saxon, and 3) black to white, the Prussian. The discoverer claims that "each one is more sensitive than the other." The colors involved are the colors of the flags of each of those German states.

Another feature in a typical issue of *Berichte* that is duplicated in the spoof is the section on current patents. One patent reported is from an A. Butterworth from Chicago, IL, on '*The Collection of Fat from Pigs*,' dated 12. August, 1886 (*34*). In the patent, Butterworth claims that he can take living pigs, heat them to 50° C, pull them through a wringer, and thereby express the fat they contain. He admits the pigs become very thin in the process, but by simply feeding them, he restores their plumpness, at which point he can heat them up and repeat the process.

The next patent in the listing is from James W. Porkins, also from Chicago, filing his patent 5 days later: 17. August 1886 (*34*). Porkins, whose patent bears exactly the same title as Butterworth's, claims that he puts living pigs in a specially constructed vat so that just their heads stick out the top of the vessel. He then extracts the pigs using any one of a number of fluids – benzene, petroleum ether, carbon disulfide, naphtha. One continually refreshes the extracting fluid until a sample of the liquid no longer leaves a fatty residue on a piece of paper. He notes that after their removal from the vat, the pigs are very hungry but can be made extraction-ready again by feeding them lots of carbohydrates, especially sugar.

At the end of an issue of *Berichte* there is always a section called Announcements that contains corrections or comments about any of the items published. This issue is no different, and in the Announcements section is an item from A. Butterworth. To wit: "the undersigned finds it necessary to declare that he alone is the discoverer in America of a means to extract oil and fat from living pigs. Anyone else who suggests he can do that is plagiarizing his work (*35*)."

Two announcements later, James Porkins replies under the heading "*Chemistry gets you to your goal quicker than mechanics*." He continues to explain that extracting living pigs with solvents is his method, not subjecting them to torture reminiscent of the middle ages by this rolling nonsense. "Humaneness is the best economy! Details of my patented method will always be available for purchase (*35*)."

The final section in this lengthy spoof is a suprising supplement consisting of poetry written by the contributors to the issue. One on thiophene (*36*) is particularly touching. (Note: the poem rhymes in the original German; the translation gives the sense of the poem but does not rhyme.)

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There once was a student in Jena (*37*)
Who complained about his coming exams.
His entire life long
He had never heard of thiophene.

And when his professor asked him,
"What do you know about thiophene?"
The student knew nothing, but answered
"As a substance it is very beautiful."

The sage laid his hand upon the student's head
With this blessing:
"May God keep you naïve
Still longer," he said, very moved.

"He who is not harmed by sulfurous compounds,
He who can stand their smell,
He must be," said the sage professor, "thank God –
Born to be a chemist."

One of the final poems (*38*) is suited for all time:

Solo Song

I had an idea.
I tell you, there was none better.
Then Berichte arrived.
It was the same old story:
I had been scooped.

To this day it is still not known with certainty who was responsible for this spoof. Several people (*39*, *40*) have speculated that the probable authors are two dye chemists, Emil O. Jacobsen and Otto N. Witt. Their initials appear as signatures on the poems at the end of the issue. Both were highly published in the chemical literature of the time: Witt as a theoretician as well as a chemical technologist; and Jacobsen as an industrial chemist who improved several production processes for Shering and was best known for his technical writing. Both were also acknowledged as novelists, and indeed both were known for writing humorous books.

Only a few excerpts of selected sections have been shown here to give you the flavor of the issue, which is about 60 pages long. As Alan Rocke opines (*28*), it is an early version of a combination of the *Journal of Irreproducible Results* and the *Harvard Lampoon*. One can also toss in a dash of The Ignoble Prizes, and perhaps even The Daily Show and the Colbert Report, for the satirical flavor and the cabaret

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atmosphere. In addition to the parts mentioned herein, the issue includes the minutes of the most recent executive committee meeting of the group, some of which is rendered in verse, and even some humorous corrections of typographical errors.

If the true measure of a mature discipline is the ability to laugh at itself, then chemistry has enjoyed a long maturity. The pursuit of the next decimal point, the improved theory, and the better yield have been with us since the beginning days of our modern science, but so too has the ability to see the potential for humor in the practice of rigorous discipline. Examples of wit still pop up in the most unexpected places. May we be alert and enjoy them when they come our way.

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Chapter 6

ACS History in Personal Debates, Both "political" and "Political"

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Politics is really a part of the human enterprise and science and scientists are involved in it whether they want to be or not. You can either be a part of it or you can simply stand by and watch it go by, which is probably not a very good thing to do either. The American Chemical Society and its members have played a lot of various political roles over time. I'll talk a bit in this chapter about internal "politics" and external "Politics."

In this talk on politics in the American Chemical Society the Lower case 'p' designates politics within the ACS and big 'P' political issues that the society took on between itself and the outside world. The end result is not a particularly funny piece but a rather thoughtful one on what we have done in the past and what we may be able to do in the future.

Before I start I have to say one thing with repsect to the politics played out between individuals. In New Orleans, probably 35 years ago, I was on the Medicinal Chemistry Review Committee for the NIH. So were Harry Gray and a couple of other people. We met in New Orleans and we decided that we would have a bioinorganic symposium to go with it. It was in the very early days of bioinorganic chemistry, so there were a few luminaries in the area. There was a gentleman from Harvard who was one of the early biochemists who was involved in this group, and of course Harry Gray was involved in it, and Al Cotton was involved in it. I called up Al Cotton and asked him if he would participate. He

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wanted to know who else was participating, and I told him. He then said no, he wouldn't come, because he refused to come to the same podium as at least two of these people, one of them being Harry Gray and the other the gentleman from Harvard. I thought I have to manage somehow to make this work, because these were really the people who had to be at this symposium if you were going to have the right people there.

I said, "You know what Al, you will have an opportunity – if you take this in a small group meeting in a symposium like this –to make your case. You can then criticize it with everybody there." He said that maybe that would be worthwhile and he agreed to come

I then talked to Harry and of course Harry didn't care. Those of you who know Harry Gray understand that he thought it would be fun! I'm sure he thought in the plane all the way from California to New Orleans just how he could bait Al into doing whatever it was he was thinking about doing.

Now the poor gentleman from Harvard was one of these very staid people – thank God all of these people except for Harry are dead now, so I can talk about them a little bit – but this guy was one of these very proper kinds of people with his lab coat on and in charge of everything. First of all, he was a biochemist and he thought the inorganic chemists who were meddling around in this area were totally without merit.

We ended up with these three, and I had to arrange for some cars to pick them up because it would have been a disaster if you had picked up two of them at the same time. We got them here and got them all in the same room. It was not too uncivil; they had their arguments and whatever, but we took them out to dinner that night and they all got drunk and the next day they were much more cordial. Frequently behind "political" and "Political" enterprises is a lot of personal interaction that drives the whole lot.

What I want to talk about herein are the political issues in the ACS and also the issues between the ACS and the rest of the world. We sometimes take this 'holier-than-thou' attitude that we're not involved in politics, that we are scientists and therefore politics is not our game. I would remind you that politics has been part of chemistry for a very long time.

This first story is a very good example of politics and chemistry. Probably the most brilliant chemist certainly of that century and certainly the father of all of our quantitative beings in chemistry was Antoine Lavoisier. If you'll remember, Lavoisier had a very bad political position at the time because he was an officer of the French government and was one of Louis XVI's ministers. He managed munitions and other things as well. One of the famous paintings you may know of Lavoisier and his wife was done by an artist whose commission was actually to capture the equipment which Lavoisier had designed. The painter happened to be a fellow who was part of the Free Party and was very much in favor of the revolution, and of course Lavoisier was on the other side. Politics at this level can sometimes be rather rough, and poor Lavoisier's head ended up in a basket from the guillotine. The point is that politics and who you are politically has had an impact on science for a very long time. Let's take a look at a few examples that have been going on in the ACS and and in the wider world.

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Timing Is Everything

The first one I want to mention is the famous case of Nobel laureate Irene Joliet Curie. Timing is everything. This story takes place right in the middle of the McCarthy era.

All of you know that Irene Joliet Curie was the eldest daughter of Pierre and Marie Curie. She had won a Nobel Prize with her husband in 1935 for artificial radioactivity. Irene Curie was denied membership in the French Academy just like her mother because she was a woman. Regarding Marie, after Pierre Curie died, Marie Curie was involved – now no one knows for sure – but the scandal was that she was involved with Paul Langvein, who was the famous physicist and mathematician at the Sorbonne. It created an enormous issue. In fact Marie was denied membership in the French Academy a second time, and the people involved wouldn't even put her name in for consideration. The second time they used the scandal as the reason, although she had just won a second Nobel Prize on her own. One of the most famous footnotes of this is that Irene's granddaughter Helene ended up marrying the grandson of Paul Langvein, both of whom are respected scientists in their own right. She is a Professor at the Sorbonne and he works down at CERN as a physicist. These dynasties go on.

In terms of Irene's political activities: both she and her husband were very much opposed to the Fascist movement. Remember this started in the 1930s when the Fascist movement in Germany was having a major impact in France and a lot of the French were not that unsympathetic. She and her husband were very much opposed to Fascism and joined the Socialist Party in 1934. To show the respect she had within France: she was appointed Under Secretary of State for Scientific Research by the French government in 1936, so she did a lot of things other than just science. She was the Commissioner for the Atomic Energy Commission in 1946 after the war and was named the Director of the Radium Institute in Paris. She also was a major advocate for women's issues and women's education.

What caused the problem within the ACS was that Irene and her husband were also very active in the peace movement and other Leftist political issues. Her timing was poor, and the ACS got itself in a bind because when she applied for membership in the ACS in 1953 it was right in the middle of the McCarthy era. The membership was denied by the ACS Committee on Admissions, and the denial was confirmed by the Board of Directors. The major letter-writing campaign that ensued is one of the classic pieces in ACS literature. A whole group of Nobel laureates wrote a very impassioned letter about how poorly the ACS had handled this and questiond how they could possibly turn down a scientist of this magnitude. This letter-writing campaign also included some extraordinary chemists who actually wrote back and forth. With the help of a person in the ACS Secretary's Office we were able to find a lot of the original letters. They make a great piece of history and are definitely worth reading. This is a topic that someone should explore and talk about, and the reason is that it is as relevant today as it was in 1953, because some of the same issues are there.

This whole issue left a lot of members very very unhappy, and some resigned from the Society. It really created major adverse publicity for the Society at that

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time. The Board never backed down; they backed the Admissions Committee all the way. Some of their comments were extraordinary:

"On the other hand, race, creed, color, nationality, and political beliefs have never been considered in connection with an application for membership. Active participation in the Communist program cannot be construed as simply a political belief. A Communist scholar is a contradiction in terms. He is irresponsible for he has given up all pretense of objectivity of intellectual inquiry."

In other words, their definition was if you were a Communist, you could not possible be a good scientist because your entire intellectual base would be bent on following the communist Party rules. By the way, Irene was never member of the Communist Party. Her husband was, but she was not. There would be no way that people could get away with that comment today; hopefully that is true. I'm not sure, but I hope. .

The flavor of the responses in support of Irene Curie being a member of the society came from David Todd, who at that time was a very important scientist and advisor to Presidents. Lewis Levine was another. One that is really interesting is Michael Heidelberger from Columbia who had a long correspondence back and forth with Alden Emery, who was at that time the Executive Director of the ACS. A Dr. Pipenheimer, who was a friend of his, also did a significant review of the issue. He took the time to read all the documents – the ones the membership committee hadwritten, the ones the Board had put out – and then wrote back a letter using some arguments that really made an awful lot of sense. There was lots of other letter writing from ordinary ACS members.

For example, in support of the ACS position:

"It should be obvious to anyone of any intelligence at present that a Communist outside of Soviet Russia is either a traitor or a potential traitor to any country he happens to be in."

I wondered what the French thought about that, with respect to Joliet-Curie in particular, since she had held a fairly high position in the government in France and was still the Director of the Curie Institute at the time.

"Since Madame Joliet-Curie, by joining the communist Party (*note: which she had not done!*) has admitted her lack of faith in God I heartily commend the Admissions Committee on its decision."

In light of some of these letters that came back … can you imagine the ACS going through the entire membership rolls and trying to decide who was an atheist and who wasn't? They didn't do that, but the end result was that the support we see from these people is really worth reading, because it does say a lot about the human condition at certain times and how people can end up with extraordinary views simply because the McCarthy issues were on the daily news everyday – television, newspapers, whatever – and these people truly had become believers in the kind of stuff McCarthy was peddling. The point is we've got to be careful about how we go about tackling some of these tough problems. They are not simple. What would have happened if they had let her in? My guess is that if had they had accepted her applicaqtion for membership without any notoriety, nothing would have happened, but by making it such a case, they just fired up everybody – those that were for and those that were against.

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Timing Is Still Everything

Next is the case of Linus Pauling, for which also the timing was not the best. Those of you who knew Linus Pauling know he was one of the most exciting people you would have ever met, whether you liked him or you didn't, or if you thought some of this theories were crazy. He was a man who was a big piece of the human race and an enormously lot of fun. He loved to poke fun at the establishment. I truly do believe that he really did get a lot of satisfaction out of doing that. As you remember, he was a chemist extraordinaire – won the Nobel Prize in Chemistry in 1954 -- but his political positions did not satisfy everybody. In fact, a whole lot of people didn't like them, including the ACS.

He worked on the war effort in World War II; he was awarded the Presidential Medal of Merit in 1948, he was a major piece of a lot of the work that went on during that time. From the late 40s he was a member of Einstein's Emergency Committee of Atomic Scientists and a peace supporter. And that's where he really was: he was a big part of the issue of trying to control nuclear power and trying to see what could be done about peace. He was very idealistic in a way, when you think about it. He was also accused of being pro-Soviet or a Communist. Because of that his passport was withheld.

He was invited by the Royal Society to give the keynote lecture for a big meeting of the Royal Society in London and the State Department would not let him go. They pulled his passport. It turns out that there is again a bit of irony about that because that was the meeting at which Rosalind Franklin's x-ray photographs of DNA were shown. Pauling had worked out the helical arrangement for one strand but he hadn't gotten the rest of the structure correct. But he would have been the one person in the audience who would have immediately figured out what Franklin's photographs meant, rather than having it go the way that it went with Watson and Crick. It was really a rather interesting interlude because, in a way, it changed the history of the science of DNA, by the fact that he was not there. But he was not there because he was considered to be a communist sympathizer and our State Department wouldn't let him travel outside the country.

The next issue to come up with Pauling was that he was awarded the Nobel Prize in 1954, and the question arose again: should the State Department let him go? They had long discussions in the State Department and in the government about whether he should go – would it look worse for the United States if they let him go, or would it look worse for them if they made him stay home because of his communist sympathies. They finally decided that it would really look bad if the US did not allow one of its most prominent scientists to go pick up his Nobel Prize. They gave him back his passport and he made it to the Nobel ceremony and he made his speeches as usual, just as Pauling would always do.

Next the Government signed the test ban treaty in about 1962 and because all of his work he had done on those issues – to add injury to the rest -- he won the Nobel Peace Prize. But the other fall-out was interesting, too. Pauling got so upset with people that he resigned from the American Chemical Society in 1963, and he also resigned from Cal Tech because he had colleagues at Cal Tech who were not happy with his political positions and made things uncomfortable for him. When they figured out that the State Department was going to let him have his passport,

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they decided that maybe this was going to have an impact on Cal Tech. It really was not a very pleasant situation, so he resigned from Cal Tech as well.

Of course after that he finally got himself back into the pack. The McCarthy era had passed and a lot of these actions were forgiven. In 1975 Pauling was given the national Medal of Science by the President, and in fact the American Chemical Society in 1984 gave him the Priestly Medal, which is the highest honor the Society can give. He was quite elderly by the time it came through, but the Society finally did award it to him after a lot of internal discussion about whether they should or shouldn't.

Changes in the ACS

The third case took place in the early 1970's and the issue within the ACS arose because of the recession and all the problems chemists were having. Chemists were driving taxi cabs and all kinds of stories were coming out about difficulties in employment. A major member response resulted in petition candidates for ACS President, and this truly changed the nature of the ACS, because it changed the officers, who in the past had been chemists of some renown who spent not a whole lot of time on governance because for them it was just a scientific organization. These events changed the landscape within the Society's governance because of the petition candidates and the other things that came along with that; the ACS became a much more membership-oriented group.

This is all tied to the story of the 100th Anniversary celebration in 1976 of the founding of the ACS, but to get there we need to remember the political climate in the 1960s and serious concerns about chemical related employment. It was a real tragedy at that time. To give you some of the data that really drove this period in the Society and in the nation at large: in the ACS Clearing House in 1967, the ratio of applicants to employers was about 0.64, which means that you had about 2 employers there for every applicant who needed a job. Within 2 year's time, that ratio had flipped. In 1969, it was 1.7, which means there was essentially one employer for every 2 people who needed a job. Things moved that quickly in that downturn.

This whole business resulted in a demand for ACS response and the rise of professionalism within the Society because people began to argue that the Society really ought to spend some of its time on the needs of its members in addition to just the science. During this time and in response to these concerns, the Society worked on its first '*Guidelines for Employers*.'

Politically within the Society, there were 5 petition candidates for President-Elect between 1970 and 1974. There were only 3 names in that, because 2 of them ran twice. Alan Nixon won in 1971 – the first of the petition candidates to win, and in 1972 Bernard Freeman was the second. This had a major effect on the ACS as a Society.

Membership fell. This was an era when ACS membership went down, not up; advertising income fell; dues increased; and the ACS began to focus on public affairs, because all of a sudden it was obvious that we were involved with trying to have some impact on public affairs, the same as everyone else.

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The previous few years of hard times really had pitted the Society internally between those who really wanted to push professionalism and those who didn't. It was a time of pretty much turmoil in the Society in many many ways. There was lots of little 'p' politicking taking place. People started writing up petitions and you got out there and campaigned. This was considered to be something absolutely unseemly at the beginning of this era. You didn't *do* that sort of thing. It wasn't done. But that all changed.

The nice thing about it was that the recession began to turn around in 1975 and we also had a turn-around in members and financing which made things look a little better. This made the need for a positive face at the National Meetings because of all of the things that the ACS governance wanted. The big thing we did not want was a public fight on the occasion of the 100th anniversary of the Society, and many of us felt strongly about the sort of person we wanted as that most public face of the organization in our hundredth anniversary year.

Within the ACS we have a presidential succession, in which a person serves one year as President-Elect, and then a second year as President. We needed to elect in 1975 the person who would serve in 1976, and this was the climate in which that election took place. It was really an extremely interesting time.

I was on the Board at that time and we were extraordinarily concerned. We wanted the 100th year celebration to be something that everybody would be proud of. We'd have all kinds of great things happen, and we'd end up with a very good face outward to the public of what the American Chemical Society was all about. To be honest, some of us really did not want some of the petition candidates who were running at that time to be President in 1976. We had the feeling that this would not be a good thing for the public face of a scientific society. You cannot imagine the kinds of politics that went on behind the scenes, but they were most interesting and I have to admit that I was a part of them.

In thinking about the Presidency, we first of all talked to Glenn Seaborg, who had the chemistry background, the stature within the United States, a name that was recognized, and he had indeed been involved with some political issues as you may know. We asked him if he would stand for election. He somewhat reluctantly agreed. We explained that it would be so nice for him to be President during the 100th year celebration. The question was: how do we convince the Nominations Committee that this should be not only the nomination but perhaps the only nomination, so that we did not have the votes split up three ways and end up with whomever we might get. We managed essentially to do that. The end result was that Seaborg did indeed win that election. Those of you who sometimes wonder how things happen, that one happened by a whole lot of background, behind-the-scenes, smoky room kind of activity to get his name on the ballot and to get him elected in 1976.

The Society had really changed during this period because even Glenn's response to some of these other issues was perhaps not quite what many people had expected. The celebration came about; it was in the city of New York because that's where the Society started. It turned ou to be an absolutely fabulous event, but the story is how it all came about.

First, as I have indicated, there were a lot of back-room discussions to make the election happen. Those of you who knew Glenn Seaborg would have to

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adknowledge that he was probably the perfect candidate. He had all the scientific credentials, he had the stature that was required, he had worked in the government, he had been a part of the Atomic Energy Commission. He was a Nobel laureate, which didn't hurt, and this meant that he in many ways was the ideal choice to be President during the 100th-year celebration.

Glenn Seaborg was also a very savvy guy, amongst all his other attributes. He wrote in the anniversary issue of C&ENews in the forward:

> "Surely the Society's greatest achievement today has been its stimulation of chemical progress by disseminating knowledge through its publications and meetings. But a review of Society concerns in the past few years yields impressive evidence of new directions in policies and programs, more attention to the professional rights and needs of the individual members…"

and he goes on to develop a case that attention to members' concerns was necessary and that the ACS needed to divide its time and energy and resources between the two objectives. These should not be 'either/or' but these should be both of the objectives of the Society. That provided a really nice and, if you will, a sort of tamping down of some of the rhetoric and so forth that was going on at the time. Not only did he have all the attributes to be President, he also had really good, sound common sense about what needed to be said, and he didn't mind saying it, which was a big help.

There was just one glitch. That glitch was between Linus Pauling and Glenn Seaborg. I don't know that they hated each other, but it was close. They just really had major disagreements about positions. The interesting thing to me is that both of them by that time had become very much advocates of the peace position. Seaborg himself had worked on some of these issues as had Pauling, but they still just had a prickly, a *very* prickly, relationship. There's no question about that. The disagreement was all really over nuclear policy. They just didn't agree on the details because Glenn had been the Director of the AEC, the Atomic Energy Commission, and Pauling had worked very hard to not have them decide the end result.

It was really kind of a touchy situation, but Pauling had to be a part of the Society's celebration. He had been President of the ACS before all of these changes arose, so the need for Pauling to participate in the meeting's ceremonies was simply obvious. We had to figure out some way to get that done without having chaos. We arranged a big convocation, and people from all over the country and the world had been invited; there was a big academic procession. Everybody had on their academic robes and regalia – it was really quite wonderful. Pauling had at some point in his career been given an honorary degree from a Spanish institution, and it had one of the most outlandish academic regalia that I have ever seen. Pauling decided to wear that regalia. It was a big robe with red all over it, and it had a huge, flat hat with a long a feather out of the top. I'll never forget this as long as I live – Pauling came prancing down the parade with all of these academics, and he was literally having a ball. It was just the essence of somebody enjoying himself immensely.

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The convocation was going to be on some of the major issues because it was a big event that was going to get national publicity. We planned discussions on nuclear power and those sorts of things. Both Pauling and Seaborg sat on the stage at the same time; they didn't throw spitballs at each other, and both of them made their pitch.

Of course Glenn Seaborg's was very properly couched and very thoughtfully composed out and wouldn't have offended anybody. He figured out how to make his remarks work that way. Pauling didn't do that. He just made his points and sat down. But it worked out fine.

The end result was one of the best things the Society has ever done. The meeting was a great success and for all practical purposes it restored the stability and progress to the Society which had been pretty badly stymied by all of this internal politics and everybody saying you're wrong and I'm right and whatever. It left a great image with the public. Edward Kennedy was the keynote speaker and he could be very eloquent when he works at it and he was that day. The whole thing was a great event. We got extraordinarily good public relations out of it and a very good vision of what the Society was on the part of the American public. It was really a very interesting event.

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Continuing Examples

Going forward the next thing that comes to mind was the US cold war defense of chemists worldwide. During the cold war, the United States ran a large percentage of the international conferences in the United States. The reason for that was that the IUPAC that sponsored many of those – one of the requirements was that you had to let any bona fide chemist or any bona fide scientist come to the meeting. You had the right not to let them stay beyond the meeting, but they had to be allowed to come to the meeting and participate. That was the rule.

At that time we were one of the few – certainly Russia would not do it under those circumstance; East Germany had a problem: the whole eastern bloc had a problem. Western Europe and the United States held most of the international meetings at that time. It was before the rise of real scientific advantage in China and those places so there wasn't very much competition from those areas.

The push then for international members within the Society was a very long way from the Joliet-Curie case, because people were interested in making the Society more international in character. In fact, the ACS was in talks to develop international local sections in a few countries. Thus there was major interest in hosting international conferences in the United States.

This world changed dramatically after 9/11 when restrictions on foreign scientists entering the country became so onerous that it was very difficult for an American host to guarantee entry to all scientists who wished to attend a meeting or even to be sure invited guests would be cleared in time to participate. These conditions have changed the "playing field" for American participation in international meetings, and the last few years have seen the IUPAC sponsored conferences moved to many new locations around the world with very few being held in the United States. In my opinion this has limited US chemists from fully

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participating in the global chemical community. Since the US today does only about 30% of the world's research, these conditions are not conducive to our taking advantage of the world's knowledge.

Thus in conclusion one must come to understand that political issues, both "p" and "P", will be with us in all of our efforts. Thus the ACS and its members must deal with these issues as they arise and be prepared to defend the position that science should be above politics but scientists must live and work progressively in a political climate.

Note: After the conclusion of this talk, Jack Stocker asked if he could add a supplement as follows. " In the early 50's, the existence of a major scientific meeting on the west coast dealing with free radicals – the local committee on un-American activities was so upset by these free radicals running around unattended that they actually sent representatives to look at the meeting and see who these free radicals were. It was a measure of the times and an illustration again of the interface between chemistry and government".

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Chapter 7

Absurd Items That Survived Katrina: A Small Cornucopia of Miscellaneous Whimsy

Jack Stocker, as told to all of us*

***Please direct any comments on this chapter to nf00@lehigh.edu.**

Jack was many different people, and his circles of friends rarely overlapped in the style of classic Venn diagrams. However, we all knew him as a collector. This chapter is a compilation of Jack's collection of chemage, his sons' name for one of his hobbies -- chemistry plus garbage. He lost much of his memorabilia in Katrina, but fortunately for all of us, the memory lives on in this edited transcription of his presentation at the 2008 National Meeting of the American Chemical Society in New Orleans. Take it away, Jack.

Wordplay with Nonmenclature

When we first learn chemistry, we have fun with structures and with nomenclature. A large part of the game is to combine chemical symbols in a way that expresses other ideas. When I first learned about 'orthodocs' (Figure 1a), it was probably 75 years ago. Later when 7-UP became known as the 'un-cola,' someone noticed that by replacing one of the MDs with 7-UP, one then had the structure 'unorthodocs' (Figure 1b). I just learned the next one a few years ago: again, we have an ortho- relationship between the two 'mu-delta' groups on the aromatic ring. That, of course, is 'Greek orthodocs' (Figure 1c). That leaves us with only 'paradocs' (Figure 1d) to complete the set.

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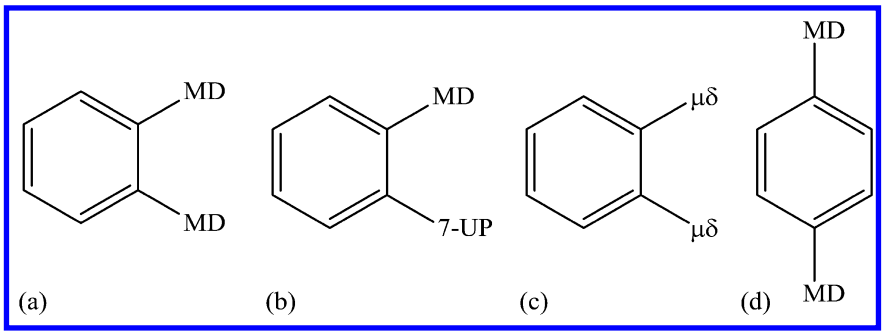

Figure 1

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The next one illustrates another way to have fun with chemical symbols. Two sodium chlorides in water, supported by a raft of carbon (Figure 2), is simply "saline, saline…over the seven Cs."

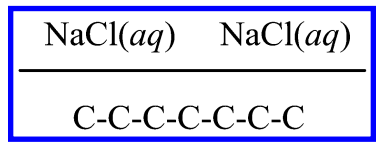

Figure 2

Continuing with a nautical motif: the integral of d(cabin) divided by cabin will be recognized by all calculus students as 'log cabin' (Figure 3). One time a young man in the audience said that the name was really incomplete. The value of the integral is 'log cabin + C,' and when you have that – a log cabin and the C – it must be a houseboat.

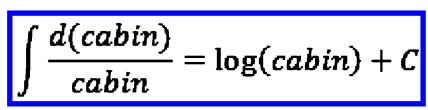

Figure 3

The next example shows a benzene ring with nitroso groups in every position (Figure 4a). A chemist would call this hexanitrosobenzene, but it is also considered the perfect contraceptive, because it says "no" in all the possible positions. Of course its counterpart also exists: a six-fold anion with six potassium counterions, hexapotassium benzenehexoxide, which is the perfect aphrodisiac, saying "OK" in all possible positions (Figure 4b).

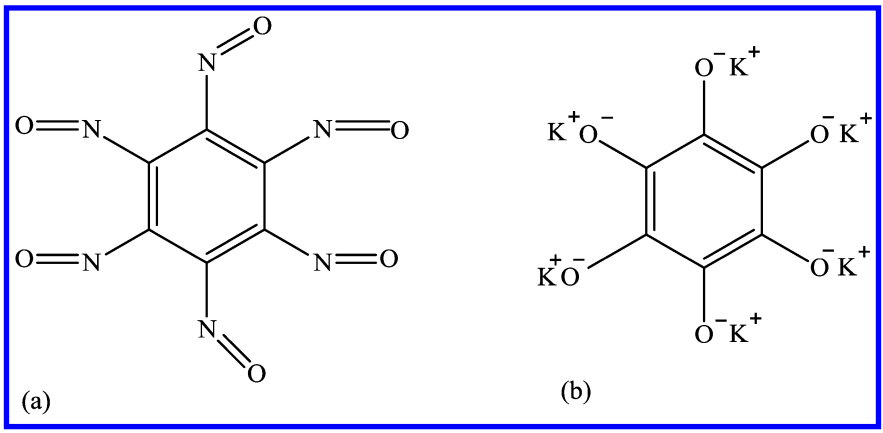

Figure 4

Names of famous people show up in chemical structures and formulas, too. Figure 5(a) is a structure for one of the greatest golfers in the history of the game, Arno(ld) Polymer (Arnold Palmer). The next formula is the Ugandan President known in the 1970s for his brutal regime, E-D Amine (Idi Amin: Figure 5b). Any bicyclic compound that shares a single atom with both rings is called a spiro compound, so Figure 5(c) is Spiro Agnew, Vice President of the United States from 1969 – 1973. Agnew resigned the office after being investigated for charges of extortion and bribery. As an aside, Agnew studied chemistry for 3 years as an undergraduate at Johns Hopkins.

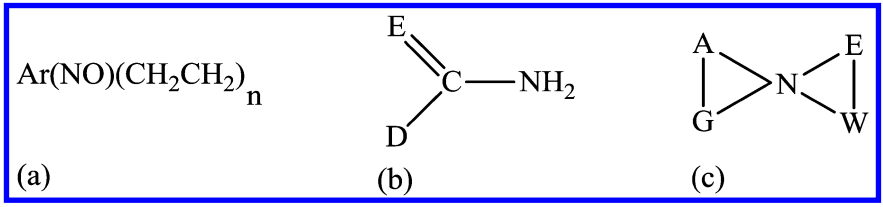

Figure 5

When a molecule has a carbon-carbon double bond, groups may be arranged cis, with two groups of interest on the same side of the double bond, or trans, with the groups on opposite sides. The structure with 'Nun' on opposite sides of the double bond (Figure 6a) is therefore 'trans-sisters' (transistors). Continuing along these lines, we can generate 'cis-Co-kid" (Cisco Kid, the fictional Western character created by O. Henry and further popularized in an early TV show and later a song by the American band, War: Figure 6b), trans-N-dental (transcendental: Figure 6c), cis-boom-bah (Figure 6d), and with MA and PA on opposite sides, trans-parency (transparency: Figure 6e).

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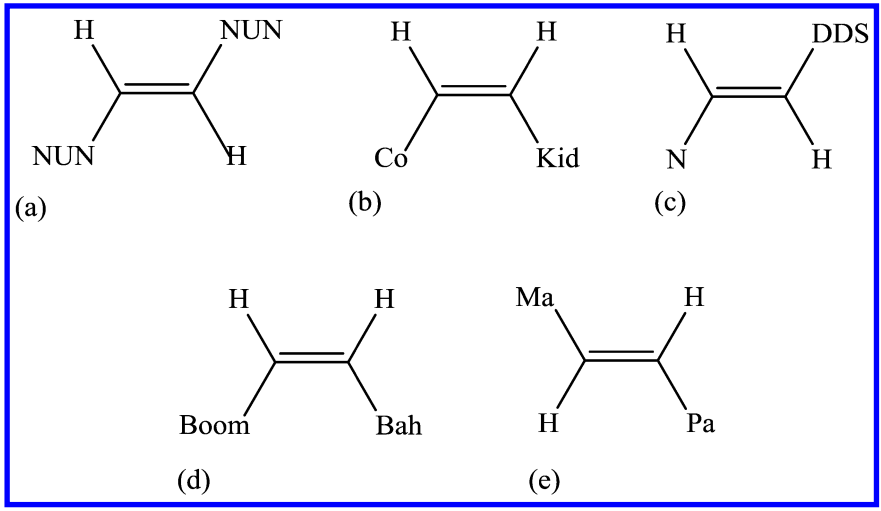

Figure 6

The name of a five-membered ring containing one nitrogen and two unsaturations is pyrolle, so Figure 7(a) becomes 'out on parole.' The four membered cyclobutane ring with a periodic groups attached to each of the carbons is a 'periodic table' (Figure 7b).

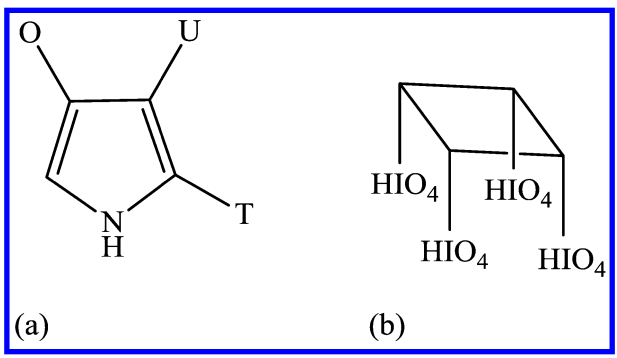

Figure 7

In the case of chemical reactions, the one in Figure 8 does not balance at all in the usual sense. However, what should you get when you react quick lime (CaO) with silver (Ag) … perhaps quick silver (Hg)?

$$CaO + Ag \rightarrow Ca(OH)_2 + Hg$$

Figure 8

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A journey into the actual world of nomenclature gives us this story in which an author (*1*) found the name of his compound forbidding, so a colleague suggested referring to tetracyclo[4.3.0.$0^{2,4}$,$0^{2,7}$]-non-8-ene (Figure 9a) as deltacyclene. The author related in a talk given at a national meeting of the ACS that even that name seemed too cumbersome at times and told his audience that his group had decided to call the compound George. He then proceeded to describe dissolving George, brominating George, distilling George, and the final step of a sequence in which George was successfully dimerized (Figure 9b) to make … can you guess? … biGeorge.

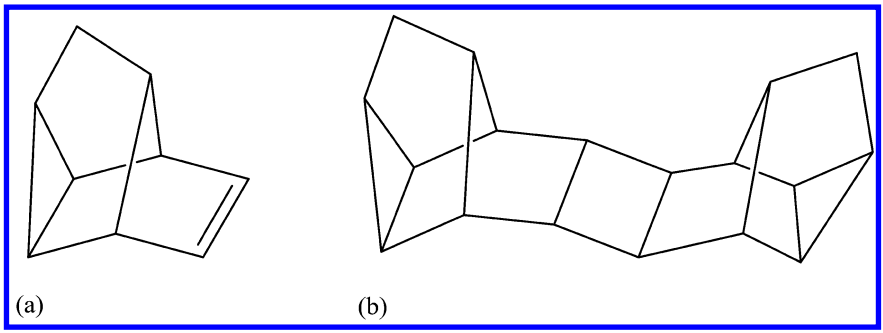

Figure 9

A group (*2*) at Bristol Laboratories in Syracuse working on antitumor agents also became weary of calling their anthrocyclines CYX761 or some other equally nondescript names. Because of the colorful nature of the anthrocyclines, they named the compounds after characters in operas. They called the antibiotic complex bohemic acid (after the Puccini opera *La Boheme*) and the individual mycins derived from it Rudolphomycin, Mimimycin, Collinemycin, and Alciondormycin, after the characters in the opera: Rudolpho, Mimi, Colline, and Alcindor. Prior to the paper in which these compounds were announced, they had made structural assignments to musettamycin and marcellomycin, for two other characters in *La Boheme*: Musetta and Marcello. It is rumored that one of the coauthors on the paper had also named his children after characters in operas.

Big, Small, Long, and Short

We all struggle to understand very large and very small numbers, and these examples provide some humorous insights into scale.

1 ppm = 1 jigger of vermouth in a tankcar full of gin

1 ppb = one step on a walk to the moon

1 gram of curare could kill from 100 to 300 metric tons of mice

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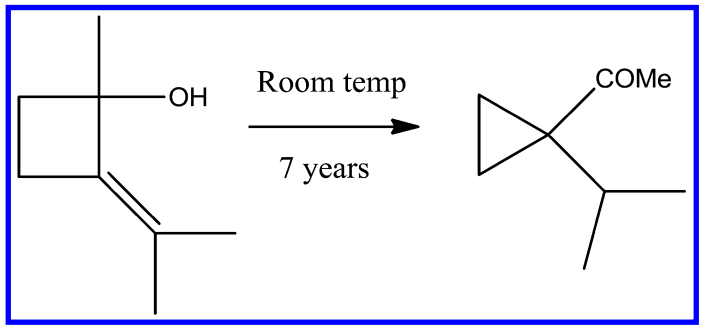
This gives one pause to think about what 300 metric tons of mice might look like.

If you counted on million molecules per second, it would take approximately 10 billion years to count the molecules in one ounce of ethanol.

Speaking of time, I wondered once what the longest reaction time reported in the literature was. A chemical communication (*3*) contained the following equation:



Notice how long it took the reaction to take place: 7 years. We can only hope the graduation of the student wasn't dependent on this compound. There's actually a story of a reaction left in a British laboratory when the chemist went off to fight in World War I that was not opened until 28 years later. There were indeed some crystals in the flask, but we don't know if it took the entire 28 years for them to form, so the 7 years reported in the communication currently stands as the officially reported record.

Typical textbooks now have new editions appearing every 3 or 4 years. In contrast the prize for longest time between editions of a text may go to Louis Hammett. The first edition of Physical Organic Chemistry appeared in 1940 (*4*), and the second edition, in 1970 (*5*).

The briefest abstract of a fundamental article is attributed to a paper from Henry Eyring that appeared in *Journal of Chemical Physics* in 1935 (*6*). The article is entitled "Activated Complex in Chemical Reactions," and the abstract is one word: Math (C.A. 29 2057[4]). There is reportedly one abstract that is actually shorter than that. The title of the paper asks a question, and the abstract is simply one word: No.

I occasionally posed questions to colleagues at Chemical Abstracts Service to enhance my collection. After asking W. V. "Val" Metabomski "what's the largest Arabic numeral locant that Chem Abstracts has published?" I received the following reference (Figure 10): CA 103:177926c (1985) to a 383-bromo compound. For fans of nomenclature, the formal index name of this compound may also be some kind of record, although I don't know in exactly what category: 1,3-Dioxolane, 2-(383-bromo-11, 23, 35, 47, 59, 71, 83, 95, 107, 119, 131, 143, 155, 167, 179, 191, 2043, 215, 227, 239, 251, 263, 275, 287, 299, 311, 323, 335, 347, 359, 371-trioctacontatrioctagentriacontaebyl-, (all Z)-.

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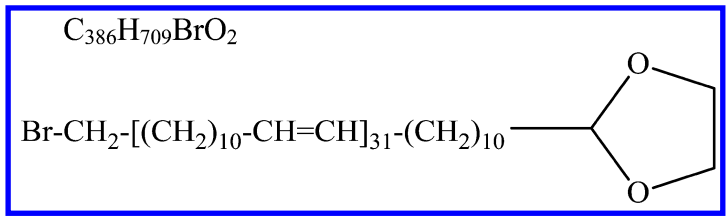

Figure 10

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Possibly the longest series of papers is attributed to Tetsuji Kametani on studies of heterocyclic compounds. In 1972 paper 460 in the series appeared (*7*); in 1977, paper 715 (*8*). Kametani was publishing a paper a week, and that was just in this series; he has many other articles to his credit. Paper 1000 appeared in 1983 (*9*); he had kept pace at about one paper per week in that time. This incredible productivity is explained by the fact that over this period he was the head of the Pharmaceutical Institute at Tohoku University and later the Institute of Medicinal Chemistry at Hoshi University in Japan. Every paper coming from the institutes bore his name. (Dr. Kametani indeed went beyond 1000, but Jack said he lost interest in the whole thing after Dr. Kametani hit 1000 and stopped following the series. Paper 1201 appeared in 1990 (*10*), and that seems to be the final one in this series.)

Assorted Authors, Acknowledgements, and Whimsical Asides

There are series and then there are series. A paper appeared in *Die Angewandte Makromolekular Chemie* (*11*) by authors Patel, Patel, Patel, and Patel. In the acknowledgements the lead author mentions the scientist who did most of the spectroscopic work: a scientist named Patel. Patel is a name in India much like Smith or Jones here, but this still qualifies as an interesting entry. It is also amusing to note that the work was done at Sardar Patel University.

I had been told that Raold Hoffmann had published a paper with four authors whose names illustrated the four different possible spellings of Hoffmann: single or double ‘f’ and single or double ‘n.’ I sent Hoffmann a note asking if that were so, and received the rapid reply that no, so far they had only gotten two, but Hoffmann did have another one working in the lab and they were trying to find the fourth to make the author list happen.

An article in *The Journal of the American Oil Chemists’ Society* (*12*) featured the lead author named Singleton, but the other authors were Gray, Brown, and White. That may not be very colorful, but it is still rather nice. An article in the Journal of Organic Chemistry on preparation of *m*-polyphenols was written by Norman B. Sunshine and G. Forrest Woods. I’m happy to have any article written by Sunshine and Woods in my collection.

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A book by A. I. Scott of the University of British Columbia Vancouver (*13*) bears a dedication: "To W. Conover and L. Armstrong." The L. Armstrong in question was indeed Louis Armstrong. Scott himself was a trumpet player, and Armstrong was one of his idols.

It is usual practice to indicate the organizations that have provided funding in support of authors. In an early paper from Harry Gray's lab (*14*), three of the four authors have very prestigious acknowledgements: two are a National Science Foundation Predoctoral Fellows, and Harry himself was an Alfred B. Sloan Research Fellow. The fourth author had no such prestigious award, but Harry listed him as a N. I. C. E. fellow so he wouldn't feel left out.

Politics of a different sort may require other forms of standard reference and acknowledgement. *Scientia Sinica* features this introduction to a paper in 1966 (*15*):

> "The first successful total synthesis of a protein was accomplished in 1965 in the People's Republic of China. Holding aloft the great red banner of Chairman Mao Tsetung's thinking and manifesting the superiority of the socialist system, we have achieved under the correct leadership of our party, the total synthesis of bovine insulin."

Figure 11(a) shows a diagram published in a paper in 1955 by Nobel-Prize winner Melvin Calvin (*16*) and a colleague showing the apparatus used in the experiment. It seems rather cluttered, so readers may just skip right over it, but if you look carefully at the out-take from this illustration (Figure 11b), you will see a small stick-figure sitting on one of the tubes; it is fishing in the next vessel and appears to have hooked a something. Calvin apparently had a reputation for doing this sort of thing. It is rumored that the editor of *JACS* at the time was very upset; this, after all, was so terribly undignified. It is, however, a nice piece of intended whimsy.

An article in *Bulletin de la Societe Chimique de France* (*17*) contains a description of a result that was so unexpected that the author likened it to an artist throwing a ball of paint at a canvas and ending up with a copy of a known work of art. He then illustrates that idea with a cartoon from *The New Yorker* (Figure 12).

The *Journal of Organic Chemistry* (*18*) contained a report on the chemistry of diamminomaloylnitrile, the acronym for which is DAMN. Scattered throughout the entire paper in large letters is the mild expletive DAMN, so one reads:

> "Kinetic data for the oligomerization if HCN to DAMN are available and many details if the photoisomerization of DAMN … are established, but no similar information exists for non-photolytic conversions of DAMN …"

I quite liked that.

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Along the same lines, we have an article in *Chemical Physics Letters* (*19*) on 'fast, accurate kinetic energy,' or FAKE, molecular orbital calculations. The calculations aren't phony; they are just done by the FAKE method, which is described as "a logical descendant of various extended Huckel procedures. FAKE calculations are based on and effective one-electron Hamiltonian…"

In a similar vein, we have the story of Dr. Alex Pines who was thwarted by an editor who thought he had tricked him with a pornographic acronym for an NMR pulse sequence. Pines reduced the paper to a communication (*20*) that does not use an acronym for Proton-Enhanced Nuclear Induction Spectroscopy.

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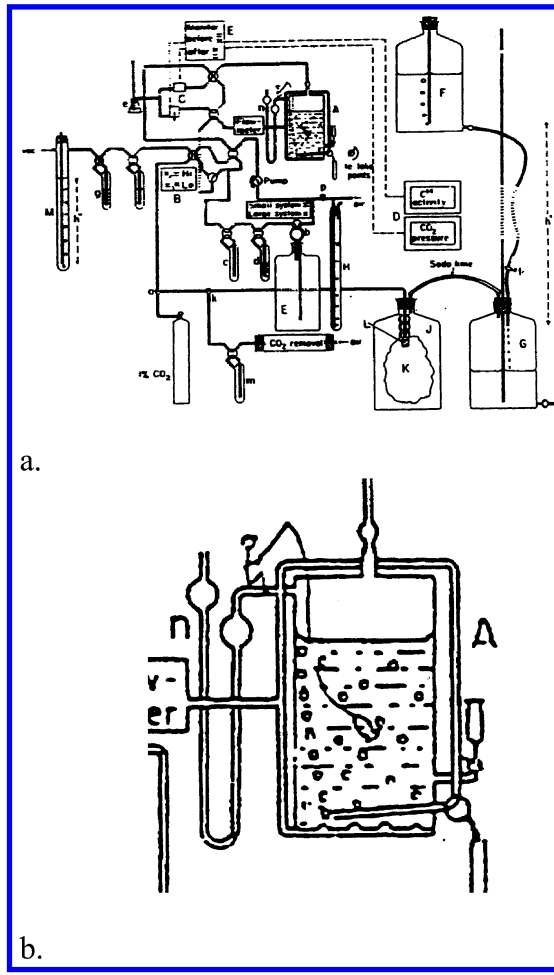

Figure 11

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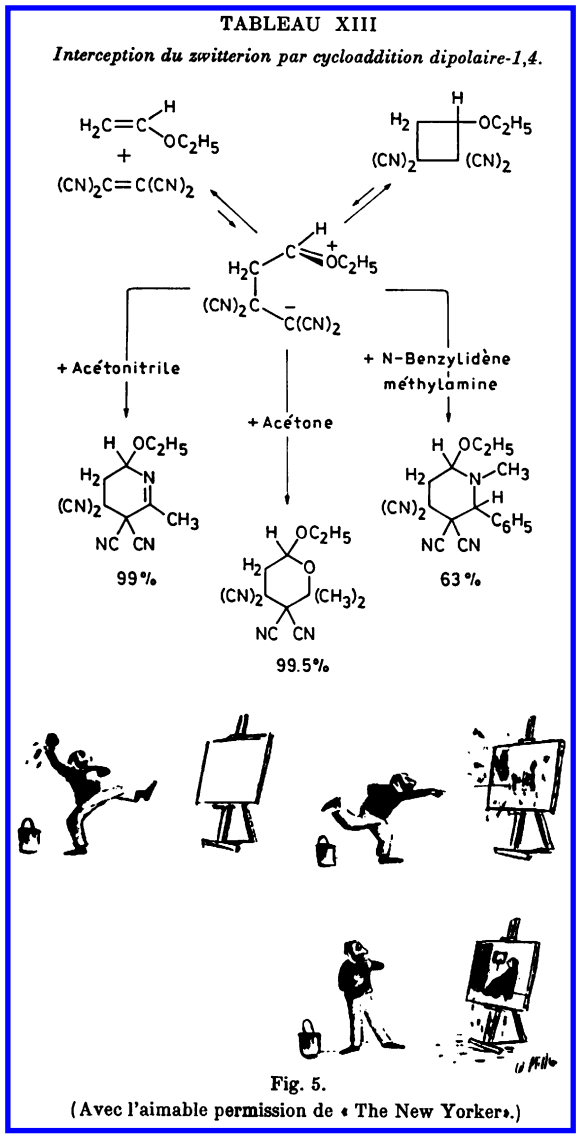

Figure 12

Chemical and Engineering News has also had its share of entries into the world of acronyms and jokes. A 1980 issue (*21*) featured a news item about a group called Calorific Recovery Anaerobic Process (CRAP) who had been working on transforming manure to methane but changed their operation to produce feed and liquid fertilizer instead.

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Sometimes the frustrations of working with compounds comes out in the literature. Harold Shechter at Ohio State University was working on a compound (Figure 13) that was particularly difficult to crystalize. In a communication to the editor of *JACS* (*22*), Shechter describes the compound: "Alcohol 11 is an (expletive deleted) unstable compound."

A delightful title that must have made perfect sense to chemists but gives everyone else an immediate chuckle appeared in *C&EN* during the days of beginning environmental awareness (*23*). A particularly egregious incident involved a suit for damages against Hooker Chemicals and Plastics, Hooker Chemicals, and their parent company, Occidental Petroleum, for dumping chemical waste into Love Canal near Niagara Falls, NY. The news article bore the title: "New York sues Hooker over Love Canal."

Some other titles and phrases are more ambiguous. From ChemAbstracts (91:7398y) in 1979 comes the title: "Dating Heavenly Bodies and Monte Carlo Models." In an article about resolving racemic ketones we find the phrase describing "six ketones and a chiral copulate." The phrase 'chiral copulate' stopped me dead in my tracks when reading and my first thought was: this has to come from a French journal. Indeed the phrase was coined in *Bull. Soc. Chim. France* (*24*).

Corrections can be interesting, too. The address given with a particular paper -- Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California 91125 -- (*25*) was not acceptable to *Analytical Chemistry*. A correction consisting of the complete address was printed (*26*): "There is an unfortunate omission in the address of the place of work as given on page 2060. The complete address should read: Lunatic Asylum, Division of Geological and Planetary Sciences, California Institute of Technology …" Now this is the correct address, because the laboratory was the place where the moon rocks were stored.

My time has expired, but whimsy in science fortunately goes on. Let me close out the symposium with a quote from Isaac Asimov that also reflects on the whimsical mind and its observations of the peculiar:

"The most exciting phrase to hear in science, the one that heralds the most discoveries, is not 'Eureka!' but 'That's funny …'

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