

Profile: Evald Laurids Skau



A dedicated researcher whose goal was excellence

The American Oil Chemists' Society will hold its annual meeting in 1987 in New Orleans, which has long been a favorite meeting site of AOCS members and their spouses. The Southern Regional Research Center of the USDA has played a key role in all New Orleans meetings since the SRRC's founding in 1941. One of the very active members for many years, until his death in 1980, was Dr. Evald Laurids Skau, ably assisted by his wife, Becky. The following is condensed from two presentations by Charles H. Fisher and Gene Sumrell at the Evald L. Skau Memorial Symposium on Industrial Uses of Fats and Oils and Analytical Methodology at the 72nd annual meeting of the AOCS held May 17-21, 1981, in the Fairmont Hotel in New Orleans.

Evald Laurids Skau, or "Ev" as he was known to his many friends, was unusually competent in science and in several other areas as well. He demonstrated great courage and persistence in carving out an outstanding career in spite of physical problems that would have overwhelmed most others. He was also an individual of concern: concern about his fellow man, about society as a whole, and about the need for science to contribute to the solution of the major problems of the era.

Ev's physical problems should not cause anyone to conclude that favorable circumstances were lacking. In fact, there were many favorable circumstances. He had a great deal going for him, such as talent, knowledge, research savvy,

energy, zeal and a real understanding and love of chemistry. Other important assets included the love and support of his wife, Becky, and her family, and the affection and loyalty of his associates.

Ev also had the advantage of regarding his chosen field not narrowly as a means of earning a living, but as an enjoyable and exciting adventure—and one of the best means of benefiting mankind.

In 1939, when Ev Skau cast his lot with the Southern Regional Research Laboratory (the name was changed later to Southern Regional Research Center—SRRC), the United States was facing World War II and desperately needed domestic sources of rubber and other critical materials.

Agriculture was plagued with surplus crops. Natural fibers soon would be losing the textile competition to the new chemical fibers from petroleum. Pollution and health problems would become more conspicuous and the need for answers would become more pressing.

Ev Skau contributed important advances in science and technology on these topics during the next 40 years, contributions recognized by numerous awards: the USDA Superior Service Award in 1955; the American Institute of Chemists' Honor Scroll Award in 1975; the Trinity College Alumni Medal for Excellence in 1975; and recognition in 1981 as an eminent chemist by the American Chemical Society's Division of History.

He was born on May 13, 1897, in Hartford, Connecticut. His parents had immigrated separately to the United States, met and married in Hartford, where Ev's father was a machinist whose education had stopped with high school. Throughout his life, Ev loved to relate that he, with his doctorate degree, could never beat his father at checkers.

Ev's early education was at the Chauncey Harris School in Hartford. He received a B.S. degree in 1919 and an M.S. in 1920, both from Trinity College, and his doctorate in 1925 from Yale.

It was at the Southern Regional Research facility that Ev met his future wife, Dorothy Beckemeyer, a skilled and successful professional librarian. The two Skaus lived, worked, entertained and traveled together from their marriage on April 28, 1945, until his death on July 10, 1980.

For those who knew Evald Skau, he stood tall among men, and it is somehow difficult to remember his physical handicaps. A disease in early childhood stunted his growth and caused curvature of the spine. Beginning in about 1944, he was confronted with intermittent painful and disabling physical problems for the remainder of his life. Yet despite these problems, Ev participated in the affairs of technical societies, including the American Oil Chemists' Society, the American Chemical Society, the American Institute of Chemists, and Sigma Xi.

Skau's research career spanned 60 years, from the research for his master's thesis at Trinity College in

1920 to the publication of two papers in 1980 (1,2). He was author or coauthor of more than 200 papers and patents, along with chapters in several books and encyclopedias. His peer-reviewed publications usually were accepted with few suggested changes or criticism. He was meticulous in his work and writing. His manuscripts were worked and reworked until they said exactly what he wanted them to say.

His research career can be divided roughly into three periods: work done before his employment by the USDA in 1939; work done during his 28 years with the department; and work from his so-called retirement in 1967 at the age of 70 until his death. During that last 13 years he served the SRRC as an adviser while adding 68 papers and patents to his publication record.

Dr. Skau's doctoral dissertation was entitled "The Freezing Point-Solubility Relations of Geometrical Isomers" (3), which provided the background for a series of a dozen papers on the "Purification and Physical Properties of Organic Compounds." Published in the early 1930s (4,5), these earned Evald Skau an international reputation on purification and criteria of purity of organic compounds. The research involved theoretical and experimental investigations in phase rule, calorimetry and thermodynamics, and was used in the establishment of secondary international temperature standards. He did some of this research in Munich and Frankfurt, Germany, and at the International Bureau of Physico-Chemical Standards in Belgium under a Guggenheim Fellowship in 1930-31.

From some sophisticated organic chemical research during this period while he was a Fellow with the International Cancer Research Foundation at Yale in 1937-39, Skau produced a series of papers published in the *Journal of Organic Chemistry* on the preparation of cholesterol derivatives and investigation of their chemistry and biological properties.

During this period, he invented an ingenious device for use in the recrystallization of organic com-

pounds, which he called a "centrifugal filtration device," but which many chemists, including Harvard's Louis Fieser, refer to as the "Skau Tube." Dr. Skau published his first paper on this tube in 1929 (6), but he and others continued to modify and improve it through the years (7). He did not patent the original, but he did file and obtain a patent in April 1977 on one of the later modifications (8).

Dr. Skau headed the Physical Chemistry Section at the SRRC

"One paper was written by Skau while he was encased in a complete body cast. . ."

from the time it opened in 1941 until his retirement in May 1967. One of the first major projects was the "Emergency Rubber Project," an attempt to find a domestic source of rubber to replace supplies cut off from the East Indies and Southeast Asia during World War II. At the SRRC this effort centered on producing rubber from the golden-rod plant. Though other synthetic rubbers eventually won the race to commercialization, a good golden-rod rubber was produced in pilot plant quantities at the SRRC. Dr. Skau and his group published a series of papers on these studies at the end of World War II (9,10).

Dr. Skau and his coworkers applied physical chemical studies to practically every major problem researched at the Center during the years he was active there. The two principal areas of work at SRRC were cotton and vegetable oils.

One important area of work with cotton textiles is cotton-moisture relations, since virtually all the properties of cotton textile materials vary with moisture content

and therefore with the relative humidity of the prevailing atmosphere. Dr. Skau's contributions were such that he was invited to present a paper at a Gordon Research Conference in New London, New Hampshire, in 1949, entitled "Calorimetric Investigation of the Cellulose-Water Relationship in Textile Fibers." He was the first of many SRRC scientists invited to present papers at Gordon Research Conferences. Dr. Skau also was invited in 1957 to present a paper entitled "Utilization Research to Improve and Control the Quality of Textile Fibers" at the 42nd Annual Conference of the Textile Institute in Bournemouth, England.

Dr. Skau and his group made important contributions to research on cyclopropene fatty acids in cottonseed oil during the 1960s. They published many papers on analytical methodology for cyclopropene fatty acids. One paper, published in 1965 (11), described a spectroscopic method that could be used with crude or refined cottonseed oil, and gave determinations of cyclopropenoid acid content with an accuracy of $\pm 0.01\%$. This method later was cited as the most accurate method for determination of cyclopropene fatty acids in cottonseed oil. Dr. Skau and his team received a memorandum of commendation for their analytical work in this area from the director of the USDA Southern Division.

In the 1950s, Dr. Skau and his group made, for that time, an astonishing discovery that the amide of morpholine and oleic acid, or of mixtures of fatty acids high in oleic acid, such as selectively hydrogenated cottonseed oil fatty acids, were very good plasticizers for polyvinyl chloride and certain other plastics (12,13). This led to an extensive investigation of amides of long chain fatty acids and secondary amines, to a large number of publications and patents, and to the production by industrial companies of several N-substituted long chain fatty amides as specialty plasticizers (14).

Furthermore, many of the N-substituted fatty amides proved to have antimicrobial properties, which

added another dimension to the research, since these materials could serve a dual function, e.g., as plasticizers and antifungal agents (14-16).

Dr. Skau and his group had papers on such diverse topics as winterization of cottonseed oil and peanut oil; on pore-size distribution in textiles and partially acetylated cotton fabrics (17). One paper entitled "Possible Contribution of Shape to the Swelling and Moisture-Sorption of Cotton Fiber," was written by Skau while he was encased in a complete body cast—his brain was working and he could move his arms and eyes, and those were his essentials for writing a paper (18). Many of his papers are concerned with binary freezing point data of a variety of types of organic compounds, but particularly of long chain fatty acids and their derivatives. Some are concerned with phase relationships of mixtures of long chain N-substituted fatty amides as plasticizers for polyvinyl chloride and bear on compatibility of plasticizers in PVC.

One piece of research illustrates well his ability to do basic research directed toward a mission and to put the results to practical application. During the 1940s, SRRC staff members Alton Bailey, Reuben Feuge and others did considerable research on solvent refining and solvent winterization of vegetable oils. As with other problems which received attention at SRRC, Dr. Skau applied his physical chemical knowledge and expertise and that of his group to these problems, and published a number of papers on winterization and processing of glyceride oils using various solvents and solvent mixtures and on solvent refining of vegetable oils in general.

When the Ranchers Cotton Oil Co. of Fresno, California, began working out a process for solvent refining cottonseed oil in the early 1950s, company officials consulted with the various SRRC scientists who had been doing this kind of research. Dr. Skau's approach to this problem was a basic research approach in which he used his data to derive various equations, leading

to a paper in industrial and engineering chemistry in 1955 (19) presenting a general equation that could be used to calculate densities or compositions of glyceridic oils in any one of 23 organic solvents. The group used this equation to calculate a complete set of data on the specific gravities from 40 F to 110 F for any glyceridic oil in commercial hexane (the solvent selected for use by Ranchers) at intervals in 1% and published that data in a 27-page brochure issued in August 1955 (20). This information was put to immediate use at the Ranchers Cotton Oil plant, which began solvent winterization that year.

Ten years later, a letter was received by Leo Goldblatt, at that time chief of the Oilseed Crops Laboratory in which Dr. Skau's group was located, from George Cavanagh, then director of research for Ranchers, stating (in part), "I have exhausted my supply of the fine Specific Gravity and Concentration Tables prepared by Evald Skau some years ago. If these tables are still in print, I would appreciate receiving about 20 copies of them. Over a period of years, I have scattered these tables all over North and South America."

Bear in mind that this letter was written 10 years after the brochure was published. Many of us have our research forgotten in 10 years. But this brochure by Evald Skau and his coworkers has not only been scattered over North and South America by Cavanagh and others, but over the rest of the world where oil mills operate. The center has received requests for and mailed out more than 1,400 copies of the brochure since it was published.

Though dedicated to research, Skau also found time for hobbies. He enjoyed playing cards and chess, sports, theater, opera and dining in New Orleans' famous restaurants. He was an accomplished raconteur which, combined with his knowledge of many topics, made him a delightful conversationalist, a man who made friends easily and kept them for life.

He enjoyed different types of music, especially classical music. As in all his endeavors, his interest was not passive but active, and he

played the mandolin, banjo, ukelele and violin. After hearing a tune, he could easily score the music on paper.

He enjoyed fiction and detective stories, reading them not only in English, but also in German and French, both for fun and to retain his proficiency in these languages. One summer at Cornell he read Hans Christian Andersen's work in the original Danish.

He was a member of the Society of American Magicians. While in the hospital, he would startle an unsuspecting nurse by appearing to swallow a pill, then making the pill miraculously reappear in his hand. Even in the most trying situations, his sense of mischief created laughter for others.

Ev Skau loved bowling, golf, tennis and billiards. It is reported he played billiards with Becky's father for her hand in marriage. Becky's father is reported to have said that he lost that game on purpose.

It is difficult to overstate his achievements. When Dr. Guido Hilbert was administrator for the four regional USDA research centers, he said that Ev Skau had the best mind among the 500 members of the Southern Center. Ev's passion and admiration for research may have been due to his understanding of research in its broadest sense. Some scientists think of research narrowly and insist that only fundamental research, unrelated to practical promise, is worthy of effort. Ev Skau had a more complete and sophisticated view of research. With his vision, he understood that at least some research can cover a broad spectrum, characterized by intellectual challenge, acquisition of new fundamental information and also potential for improving the lives of human beings.

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Desert Section holds charter meeting

More than 50 persons participated in the charter meeting of the Desert Southwest Section of the AOCS, held Feb. 20, 1986, in Phoenix, Arizona.

USDA's Anson Thompson described the present status of research on cuphea, a native American plant being studied as a potential commercial source of lauric oils. Michael Cox of Vista Chemical discussed the role of surfactants in cleaning products.

The section's first charter membership certificate was presented to Arnold Gavin, who is scheduled to be installed as AOCS President during the 1986 annual meeting in Honolulu this month.

Jack Hudson of The Dial Corp. has served as organizing chairperson for the section. Committee members have included Frank Flider of JMC Technologies Inc., program chairman; Debbie Winetzky of The Dial Corp., secretary-treasurer; Eric Jungermann, consultant; Carole Whittaker, Hyder Jojoba Inc.; Aaron Herrick, The Dial Corp.; John Murphy, The Dial Corp.; and Arnold Gavin, EMI Corp.

The Desert Southwest Section is expected to be involved in planning for two AOCS meetings to be held in Phoenix during 1988. During January 1988 the AOCS will be participating in an international conference on jojoba; during May 1988, the AOCS annual meeting will be held.

Development of commercial cuphea varieties will require addi-

tional germplasm collection and evaluation, Thompson told the group. Germplasm has been acquired from fewer than half the wild varieties of cuphea, he said. Wild varieties of cuphea flower over a long period of time and seed pods easily shatter in wind or rain, Thompson said, noting that while these are excellent survival characteristics for a wild plant, they are negative factors in a commercial crop. Researchers will be seeking strains that can be combined to produce a variety with desirable fatty acid content, a uniform flowering time and seed pods that resist shattering until harvest. USDA is maintaining its cuphea germplasm collection at Ames, Iowa. Cuphea eventually may produce 2,000-3,000 pounds of seed an acre, with about 35% oil content, of which about 60% could be lauric oil, USDA has estimated. But Thompson emphasized that much work remains and it will be ten years or more before cuphea is ready for planting as a commercial crop.

Cox discussed the various functions surfactants can perform in cleaning products, including serving as wetting agents, foaming agents, emulsifying and solubilizing agents, soil liquefaction agents, and others. Cox described how some surfactants can stabilize foam while others do the opposite, how surfactants can be used in ore flotation, how they help remove soil from substrate, and other speciality purposes.

The Desert Southwest Section

will hold its second meeting in early June. The event will be a "guest night," with a program designed to be of interest to members' spouses and guests.

Norcal Section marks 35 years

The AOCS Norcal Section will mark its 35th anniversary with a dinner meeting on June 6, 1986, in Spencers Restaurant in Berkeley, California.

Organizers are seeking as many as possible of the 57 attendees at the first meeting to participate in the anniversary celebration. The group organized as the Northern California Oil Chemists before AOCS had established guidelines for local affiliates, but became an



AOCS President Joyce Beare-Rogers talks to Norcal meeting.



Norcal members (from left) Ralph Pruett, George Cavanagh and Dick Purdy

affiliated section soon thereafter. J.A. Kneeland of Pacific Vegetable Oil (PVO) Co. served as initial chairman, with A. J. da Valley of

Pacific Paint and Vanish Co. and J.E. Blum of Durkee Famous Foods serving on the steering committee.

Topics discussed at the 1951 inaugural meeting included determination of color in vegetable oil, the status of a new edible oil called safflower, and discussion of papers presented at the national AOCS spring meeting earlier in the year.

Persons who have information or something to contribute to the meeting should call Dick Purdy (415-883-6510).

AOCS President Joyce Beare-Rogers attended the group's February meeting, talking briefly about her views on AOCS and also on her nutritional research with the Canadian government.

Glen Fuller of the Western Regional Research Center was elected section chairperson, with Penny Wells of KabiVitrum Inc. chosen as chairperson-elect. Other officers for 1985-86 will be Blake Hendrix,

Dennis Taylor, Larry Brickman, John July and Dave McClung.

Antioxidant talk

At the Northeast Section meeting March 18, AOCS member Joseph Fioriti summarized the current status of antioxidants in a talk, "Antioxidants and Shelf-Life Stability of Foods."

Fioriti, who is senior research specialist at General Foods Corp.'s Technical Center in Tarrytown, New York, described the various antioxidants available to the food processor and illustrated the way they can be used to increase shelf-life of foods; he particularly stressed the use of antioxidants in frying oils and described techniques used to measure the shelf stability of various products. The meeting was held at the Robin Hood Inn, Clifton, New Jersey.

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President's Club and Honor Roll

The AOCS members listed here have qualified for the 1985-86 AOCS President's Club or Honor Roll. Members who recruit at least one new member qualify for the President's Club; those recruiting three or more qualify for the Honor Roll. President's Club and Honor Roll members receive recognition at AOCS annual meetings. Forms for use in recruiting new members are available from AOCS Headquarters, 508 S. Sixth St., Champaign, IL 61820 USA.

Eleven	A.B. Herrick	D.R. Erickson	K.Y. Lai	D.W. Schmadeke
A.P. Menasian	D.M. Holcomb	W.E. Farr	G. Liepa	D.N. Schmidt
Ten	J.J. Kabara	D. Firestone	E.R. Lowrey	K.F. Schoene
D. Meiners	H.A. Martin	F. Friedrich	F.E. Luddy	G.E. Severson
Nine	L.J. Monty	E. Fritz	E. Lusas	W.B. Sizer
M.A. Gorman	T.L. Mounts	J.P. Galloway	M. Maclellan	M.H. Sopora
Seven	R.T. Penning	J.K. Gilpin	J. Mai	B. Sova
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F.C. Naughton	F.W. Sosulski	J.M. Gonzalez	A.C. McConnell	R.O. Stevens
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A.C. Peng	K.T. Zilch	L.S. Gray Jr.	D.B. Min	H. Stupel
Four	One	L. Hall	D.T. Munsey	J.F. Suriano
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	R.W. Delashmit	D.R. King	E.F. Sanders	
	M. Eijadi	F.X. Kicken	H.F. Schleutker	

New Members

The following persons had applied for membership in the American Oil Chemists' Society through mid-March 1986. If an applicant was invited to join AOCS by a current member, that member's name appears in parentheses at the end of the listing. The new members' listing is published bimonthly.

Andrea R. Anderson, Ohio State University, Columbus, Ohio (Peng)
 Vigyan P. Bhardwaja, The Tata Oil Mills Co., Madras, India
 M.A. Bhatt, Shaw Wallace & Co. Ltd., Bombay, India
 Dale D. Carr, Hatco Chemical Corp., Fords, New Jersey
 Olger A. Chaves Garita, University of Costa Rica, San Ramon, Costa Rica
 E-Mean Chiu, Rutgers University, New Brunswick, New Jersey (Ho)
 Zvi Cohen, Ben Gurion University, Sde Boqer, Israel


James Coon, EMI Corp., Des Plaines, Illinois (Tandy)
 Patricia Crane, Best Foods, Union, New Jersey (Martin)
 Steven K. Darnell, Harshaw/Filtrol Partnership, Jackson, Mississippi (Hastert)
 Lance A. Daugherty, Nabisco Brands Inc., Indianapolis, Indiana (Jordan)
 Roy Jan De Vries, Acidchem (M) Sdn Bhd, Butterworth, Malaysia (Berger)
 Stan C. Dresler, Centrico Inc., Bensenville, Illinois (Suriano)
 Jih Fang, Ohio State University, Columbus, Ohio (Peng)

Gregory P. Fenner, University of Maryland, College Park, Maryland
 Max O. Funk, University of Toledo, Toledo, Ohio
 Jess R. Galloway, Murray-Carver Inc., Dallas, Texas (Galloway)
 Raymond J. Gibler, AG Processing Inc., Sergeant Bluff, Iowa
 Robert S. Humphreys, Southern Cotton Oil, Memphis, Tennessee (McConnell)
 Mun-Yhung Jung, Ohio State University, Columbus, Ohio (Min)
 Janice L. Kaiser, Dart & Kraft, Glenview, Illinois (Widlak)
 Ketan F. Karani, Bombay Extractions Ltd., Bombay, India
 Elizabeth M. Kay, University of Saskatchewan, Saskatoon, Canada (Sosulski)
 Thomas I. Kennedy, Pennwalt Corp., Houston, Texas
 Margaret E. Kolenkiewicz, Kansas State University, Manhattan, Kansas

Kim R. Lantz, Central Soya, Decatur, Indiana (Strayer)
 Edward E. LeFebvre, Commonwealth of Virginia, Richmond, Virginia
 Douglas Lehfeld, Best Foods, Union, New Jersey (Martin)
 Barry A. Martin, Pioneer Hi-Bred Int. Inc., Johnston, Iowa (Wilson)
 Salvatore Marzo, Quaker, Chiari & Forti, Silea, Italy (Cantafora)
 Susan T. Mayne, Cornell University, Ithaca, New York
 Jose I. Maziero, Masiero Industrial S.A., Sao Paulo, Brazil
 Stanley L. Moore, NL Industries Inc., Houston, Texas
 Stephen J. Morris, Johnson-Loft Engineers Inc., San Rafael, California (Johnson)
 Johannes Nieuwenhuis, Unilever N.V., Rotterdam, The Netherlands
 Bob J. Olsen, Olsen's Agricultural Laboratory Inc., McCook, Nebraska
 Thomas F. Osberger, Hoffman-La Roche, Nutley, New Jersey (Gormley)
 Barbara A. Pagliocca, Dynamit Nobel of America, Rockleigh, New Jersey
 Gustavo F. Pauker, Lloreda Grasas S.A., Cali, Colombia (Feldhaus)
 Frank A. Pimenta, Geo Chem Laboratories Ltd., Bombay, India
 Judy E. Price, Beatrice Grocery Group, Fullerton, California (Kicken)
 Sungsoon Pyo, Ohio State University, Columbus, Ohio (Peng)
 Anthony Rodarte, Texas Testing Laboratories Inc., San Antonio, Texas
 Marilyn I. Schnepf, Virginia Polytechnic Institute & State University, Blacksburg, Virginia (DiMarco)
 Jennifer L. Shoup, Ohio State University, Columbus, Ohio (Peng)
 Roger D. Sinram, A.E. Staley Manufacturing Co., Decatur, Illinois (Orthofer)
 Gregory N. Smallwood, The Core Team, Ankeny, Iowa (Smallwood)
 Keith J. Smith, American Soybean Association, St. Louis, Missouri
 Emil A. Stavinoha, Sani-Fresh

International, San Antonio, Texas
 Kevin J. Swanson, Archer Daniels Midland Co., Des Moines, Iowa (Guymon)
 Harry A. Theobald, self-employed consultant, Boca Raton, Florida
 Jeffrey A. Thomas, Ohio State University, Columbus, Ohio (Peng)
 Charles B. Ungermann, Harshaw/Filtrol Partnership, Pleasanton, California (Taylor)
 Vivekanand S. Vadke, University of Saskatchewan, Saskatchewan, Canada (Sosulski)
 Randy A. Vermilya, Lubrizol Corp., Wickliffe, Ohio (Terry)
 Vincent D. Reardon, Avon Products Inc., Suffern, New York
 Deborah S. Winetzky, The Dial Corp., Scottsdale, Arizona (Besemer)
 Hsuehli Wu, Rutgers University, New Brunswick, New Jersey (Ho)
 Kejian Wu, Rutgers University, New Brunswick, New Jersey (Ho)
 Chor Sang Yang, Mechem Technical Laboratory Services, Singapore (Oh)
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