HERMAN V. TARTAR

A SYMPOSIUM - MAY 19 - 20

To Honour The Man and His Work

The

PUGET SOUND CHEMIST

BULLETIN OF THE PUGET SOUND SECTION OF THE AMERICAN CHEMICAL SOCIETY

MAY, 1952

The PUGET SOUND CHEMIST

Published by the Puget Sound Section of the American Chemical Society

Monthly from September through June. Non-member subscription rates, $1.50 year. For non-receipt of copies or change of address, notify Puget Sound Section Secretary. The Puget Sound Section of the A. C. S. assumes no responsibility for the statements and opinions advanced by contributors to its publication. Views expressed in the editorials are those of the editors.

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REMEMBER THESE DATES

1.—THURSDAY, MAY 15, 8:00 P. M.

May Meeting of A.C.S. — local section.
Speaker: Dr. W. H. Urry.
For details see April Puget Sound Chemist

2.—MONDAY & TUESDAY, MAY 19 - 20

Symposium on Colloidal Electrolytes.
Honoring H. V. Tartar.

3.—MON., MAY 19, DINNER - Student Union Bldg.

Speaker: Peter Debye.
For details see Page 8.

4.—FRIDAY & SATURDAY, June 20 & 21

at Oregon State College — Regional A. C. S. Meeting.

The Puget Sound Section of the American Chemical Society is both pleased and proud to hold the forthcoming symposium on Colloidal Electrolytes to honour the work done by, and the man, Dr. H. V. Tartar, whose biographical sketch follows.

EDITOR.

Biographical Sketch

In June Dr. Herman V. Tartar will retire from active duty at the University of Washington after 34 years of service. He took his first job as a chemist 49 years ago. All of his 70 years, save two in graduate study at the University of Chicago, have been spent in the Pacific Northwest. He was born and brought up on a farm in the Willamette Valley.

Dr. Tartar did his undergraduate work at Oregon State College, majoring in Chemistry, and received his bachelor's degree in 1902. Soon thereafter he was appointed chemist of the Oregon State Food Commission at Portland where he established a laboratory for the enforcement of the state pure food law. He continued in this work until 1907 when he became an instructor in chemistry at the Oregon State College. He was gradually advanced to an associate professorship and also became chief chemist of the Oregon Agricultural Experiment Station. After spending two years completing the requirements for the Ph.D.'s at the University of Chicago, he accepted an assistant professorship in chemistry at the University of Washington in 1918. He was given the rank of professor of chemistry in 1929, made director of the departmental laboratories in 1943 and served as executive officer 1946-48, when he reached retirement age for that position.

Dr. Tartar's years have been busily spent in teaching and research mostly in the field of physical chemistry. He loves to teach and enjoys instructing a freshman class quite as much as one for seniors or graduates. His researches cover a wide variety of topics: hop resins, soil chemistry, polysulfides of the alkali and alkaline earth metals, lead arsenates, electrical conductance, overvoltage, arsenates and phosphates of calcium, colloids, electromotive force, oxidation-reduction potentials, chemical equilibria, phase rule studies, and surface tension. During the last 15 years his investigations have dealt almost wholly with solutions of alkane sulfonates and quaternary alkyl ammonium compounds. His research have been published since 1910 and total around 90 papers. He joined the American Chemical Society in 1905 and in 1928 served as chairman of the Puget Sound Section.

For thirty years, Dr. Tartar served as sort of personnel officer for the department of Chemistry and Chemical Engineering at Washington and looked after the placement of graduates in positions. He has always taken a deep interest in student welfare and knows personally many hundreds of the alumni in chemistry and chemical engineering, and has followed their progress in technical work through the years.

In 1907, he married a classmate at Oregon State College, Stella Parsons. They have two children, Virginia (Mrs. T. W. Holway) and Vance. Both are graduates of the University of Washington. Vance has specialized in biology, has his Ph.D. from Yale and is now engaged in cancer research. There are six grandchildren.

Dr. Tartar is still in fine fettle physically, enjoys hiking, motoring and gardening. He likes athletic sports and for many years played handball daily with a group of colleagues. He is usually in attendance at the football and basketball games.

Retirement is hardly in the cards for one of Tartar's activities. He now expects to have a lot of fun playing around the laboratory on researches that appeal to his fancy.

Symposium on Colloidal Electrolytes

Sponsored By The

DEPARTMENT OF CHEMISTRY AND CHEMICAL ENGINEERING

University of Washington, Seattle 5, Washington

IN HONOR OF

Professor Herman V. Tartar

TENTATIVE PROGRAM

Monday, May 19, 1952

10:00 a. m.—Opening Remarks, P. C. Cross, University of Washington.

10:30 a. m.—Discussion on Conductance. C. A. Kraus, Brown University

2:00 p. m.—Discussion on Solubilization and Surface Activity—M. L. Corrin, General Electric Company.

6:30 p. m.—Banquet, Student Union Building.

8:30 p. m.—Address, P. Debye, Cornell University.

Tuesday, May 20, 1952

9:00 a. m.—Discussion on Micelles and Polyelectrolytes, R. M. Fuoss, Yale University.

2:00 p. m.—Discussion on Micellar Size and Shape, P. Debye, Cornell University.

On Monday and Tuesday, May 19-20, 1952 the Department of Chemistry and Chemical Engineering of the University of Washington will hold a symposium on Colloidal Electrolytes, in honor of Professor Herman V. Tartar, who retires this year from active teaching duties.

The program will consist of four discussion sessions, a banquet, and an address by Professor P. J. Debye of Cornell University.

The discussions will be informal, being started n each case by a paper given by one of the participants, but not confined to discussion of the single paper. The discussion leaders will be M. L. Corrin, R. M. Fuoss, C. A. Kraus and P. J. Debye.

Tickets for the banquet (at $2.60 per plate including tax), on Monday evening at 6:30 p. m. in the Student Union Bldg., on the University of Wash ngton campus may be purchased before Thursday, May 15, at the office of the Department of Chemistry and Chemical Engineering, ME. 0630, Ext. 2239, or at the May meeting of the Section on Thursday, May 15.

Partial List of Participants In The Symposium on Colloidal Electrolytes

May 19-20, 1952

E. W. Anacker, Montana State College
A. P. Brady, Stanford Research Institute
M. L. Corrin, General Electric Company
J. L. Culbertson, Wash. State College
P. J. Debye, Cornell University
G. H. Denison, Calif. Research Corp.
R. H. Ferguson, Proctor & Gamble Co.
R. M. Fuess, Yale University
B. P. Geyer, Shell Development Co.
G. D. Halsey, University of Washington
H. J. Harwood, Armour and Company
C. A. Kraus, Brown University
A. L. M. Lelong, Wash. State College
K. J. Mysels, University of So. California
A. B. Scott, Oregon State College
D. Stigter, Univ. of So. California
R. D. Vold, Univ. of So. California.

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INFRARED ANALYSIS — UNIVERSAL TOOL

By Dr. Van Zandt Williams
The Perkin-Elmer Corporation
Norwalk, Connecticut

Continued from Last Month

SORTING ATOMIC GROUPS

Suppose that such methods permit the isolation of a pure but completely new material and knowledge of its structure is desired. Infrared is of further value for its second application—that of qualitative analysis. A large amount of empirical study has shown that characteristic atomic groups, hydroxyl, methyl, nitrile, carbonyl, aromatic ring, and others, have characteristic absorption frequencies in the infrared. These results have been collected and tabulated. By applying this chart to the spectrum of the unknown an experienced infrared man can state that certain groups are present and certain others are not present thus eliminating a large number of specific chemical spot tests. This method, although very useful, must be applied carefully and it cannot give an over all answer unless a matching known spectrum can be found. For such matching purposes agencies as the National Research Council and the Americal Petroleum Institute are building up spectral libraries and making them available to the field.

PILOT PLANT AND PRODUCTION

Suppose that the structure of the unknown compound is determined, that the material has commercial value, and a reaction process is chosen for more efficient production. A rapid method of analysis is necessary in the pilot plant for determination of optimum conditions and through the process plant for intermediate check and final product control. The method is available in infrared spectrometry. The procedure is to obtain the pure spectrum of each component present in the mixture to be analyzed. Analytical frequencies are chosen at which each component in turn has a strong absorption and the others have weak absorptions. Using the pure samples, absorption per unit concentration (extinction coefficient) is determined for each component at each frequency. A set of linear equations is drawn up involving the extinction coefficients and the absorbance values of any unknowns. The unknowns are then measured at each frequency, the resultant values substituted in the equations and the set is solved to give the desired concentrations.

This third application—rapid, accurate, quantitative analysis of complex mixtures—is very probably the most widespread and but least publicized use of infrared spectrometry. Analysts are pressed for time. And a company does not readily publish a method of control analysis that is an advantage over his competitor. But the situation is covered by such statements as the following which are picked up in private conversations: "130 individual infrared analyses in our laboratory manual" . . . "1200 five-to-eight component analyses per month using one instrument on a 16-hour shift" . . . "Three men to an instrument, one to sample, one to operate, one to calculate . . . operating 24 hours a day" . . . "These instruments are loaded and in comes a request for 20 new 12-component analyses a day."

Typical analyses covering a wide range of the chemical field are shown here. From the statement that any organic compound has an infrared spectrum that is very probably unique, and from the illustrations shown it is evident that the method is an obvious first trial in any analytical problem.

TECHNIQUE FOR THE TIMES

The history of infrared development also serves to illustrate its growth and use potential. Although infrared radiation was discovered in 1800 its study remained an academic pursuit until 1930. During the decade 1930-1940 some of the larger chemical laboratories entered the field, but even at the start of World War II it is doubtul that more than thirty instruments existed in the world, of which less than ten were in industrial laboratories. The break came when the petroleum industry realized that infrared

(Continued on Page 12)

could provide rapid, accurate analyses of the C_4 hydrocarbon fraction of interest in the production of butadiene for synthetic rubber. In response to this need, commercial infrared spectrometers became available. This availability of instruments combined with their usefulness, has promoted such a growth that about 1200 instruments exist in the world today and this number is growing at an exponential rate.

Most of these instruments are used by the organic chemical field for the absorption applications discussed above. There are in addition application in the specialized fields. Some publications have appeared from petroleum companies dealing with the infrared spectra of inorganic minerals. Perhaps such studies are aimed at oil prospecting although no definite statements have appeared. There have been reflection studies of inorganics dealing with the identification of gems, the refraction in the infrared. Reflection studies of surface coatings is growing as the military push infrared homing and detecting devices. Emission studies are being applied to determine the kinetics of flames and explosions. Emission techniques are also of increasing importance in temperature measurement either by the one or two color pyrometer method or the combined emission-absorption characteristics of jet flames. Even in absorption studies the field is widening to such accessories as a microcope for the study of single crystals, fibers, cells, and nerve tissues in polarized light.

It is of interest to consider the cost and personnel requirement for an industrial infrared set up.

Instruments range from $6,000 to $12,000 and an additional $1,000 will cover standard sampling accessories and maintenance parts for a period of two years. A very wide range of accessories is available for special problems. The spread in instrument costs represents primarily operational speed and convenience in result presentation. Essentially identical results can be obtained from a $6,000 as a $12,000 instrument although more time and effort may be required to obtain these results in the desired form. There is a notable lack of simple inexpensive equipment for routine measurements as is available in the visible or ultra-violet field. This occurs because even the simplest instruments require expensive components operating stably under conditions close to theoretical limits. Even a simple, inelastic instrument would be expensive and one might as well pay a little more and obtain a versatile instrument.

In spite of the instrument's complexity, expense, and close-to-theoretical operation, it is surprisingly dependable and free of down time. If the spectrometer is in proper condition a technician can operate it without trouble and with a day's training. If it becomes inoperable an intelligent person is required to locate the trouble and often a speicalist to fix it. However, the manufacturers have made sufficient progress that good trouble shooting manuals are supplied and an intelligent person can locate a source of difficulty to obtain repair of replacement parts. Many sites prefer to depend entirely on the manufacturer's service department in any difficulty.

Because the window materials used on the sample cells and instrument houses are subject to attack from atmospheric water vapor it is desirable, but not nessary, to use a space where the relative humidity is kept below 40-50 percent. Since most instruments are internally thermostatted no other special space requirement is involved. Service requirements average 500 watts of 60 cycle power and in certain cases water for source cooling. Space requirements vary but in most cases a 6 by 2½ foot table space will house the equipment and its accessories. A separate room is needed only for protection against unauthorized personnel.

Operating personnel is perhaps the greatest problem since trained infrared spectroscopists are not easily available. The initial instrument investment is rather large, and to realize a return a competent person of Ph.D. caliber or experience should be placed in primary re-

sponsibility. If a man with experience is not available a good organic or analytical chemist can be converted. If the application is primarily chemical in nature it is probably better to have a chemist than a physicist in charge. The instrument, although very useful, does not write out reports, and chemical interpretation is required. The manufacturer can supply the instrument know-how and the maintenance.

The backing personnel for the project leader depends on the nature of the application and the rules of instrument use. If the applications are routine analytical in nature, the backing can be of technician grade with high school education. If the applications are research in nature then B.S. quality help is needed, for spectral interpretation and unknown matching require intelligent mature thinking.

Another question is the decision between having a project unit do all the infrared work, receiving the sample from the organic chemist and reporting the results, or permitting each chemist to obtain his own spectra for his own problem. Both methods are in use. The each-man-to-do-his-work approach is more of a common thing in the smaller sites starting in the field. As the application grows and there is increasing use of a spectral library, and specialized techniques of sampling and analysis, efficiency dictates that a self-contained group act as a service unit for the rest of the laboratory.

A stumbling block to instrument purchase is often the initial proof that the infrared approach is certain to solve a pressing laboratory problem. The technical man can usually decide this from a study, but requires experimental data to convince his management that the expense is justified. He needs infrared results on his problem prior to a purchase commitment. There are only a few consulting laboratories in the country which may provide this proof, but the solution can sometimes be time consuming if the consultant is not in the immediate area. Some manufacturers, realizing this difficulty, have set up their instruments in their own laboratories, to which the cus-

tomer may send his samples or, preferably, bring his samples and obtain his own spectra. Again if this is not convenient, there are plans for limited instruments rental for a period of time sufficient to prove or disprove its potentialities for a problem.

In spite of the seeming initial expense and esoteric nature of the field, it is an almost universal experience that, once a laboratory has 'got its feet wet', it finds an ever increasing use for the facilities. In no other field is the expression heard more often—'we couldn't get along without it'.

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To All A.C.S. Members in the Eleven Western States

The Committee on Awards of the California Section, A.C.S., is charged with the selection of the recipients of the following medals:

The California Section Award
for outstanding contribution to chemistry by an individual who is a resident of the eleven Western states and who will not have attained his fortieth birthday as of July 1, 1952

and

The Gilbert Newton Lewis Medal
for achievement in the theoretical aspects of chemistry by a resident of North America.

In that order this committee may become more cognizant of chemical achievement deserving of the California Section Award, we solicit your suggestions of younger chemists whose high ability is known to you.

Please send your suggestions and documenting vitae to the Awards Committee, California Section, American Chemical Society, 2082 Center Street, Berkeley 4, California well before July 1, the deadline for nominations.

★

A woman is a great help to a man in those troubles he would never have had, had it not been for the woman.

Minutes of the 304th Reg. Meeting of the PUGET SOUND SECTION of the AMERICAN CHEMICAL SOCIETY

Bagley Hall, University of Washington

April 14, 1952

The meeting was called to order at 8:00 p. m. by Dr. P. Cross, Program Chairman.

An announcement of the Regional Meeting at Corvallis, and a request for papers for this meeting was made by Dr. Cross.

The Secretary announced two awards being administered by the California Section. Further information will be published in the "Puget Sound Chemist."

Dr. Cross introduced the visiting lecturer, Dr. Norman Hackerman, of the University of Texas.

Dr. Hackerman spoke on "Mechanism of Corrosion Inhibition." After an excellent summary of the nature of corrosion, Dr. Hackerman gave a very interesting lecture on the methods of inhibiting corrosion. His talk concluded with an informative question period.

The meeting adjourned at 9:15 p. m. followed by a social hour.

Jim C. Drury, Sec.

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LOCAL NEWS

Bob Lent (chairman, Professional Practices Committee) has left Boeing Aircraft Co. as chief chemist, Inspection Laboratory, to accept position of Sales Engineer at Andrew Brown & Co., Seattle (Industrial Paint Mfg.)

Jim Drury has left Lyle Branchflower Co. (Supt. Vitamin plant), to Boeing Aircraft Co., Research Eng. Staff.

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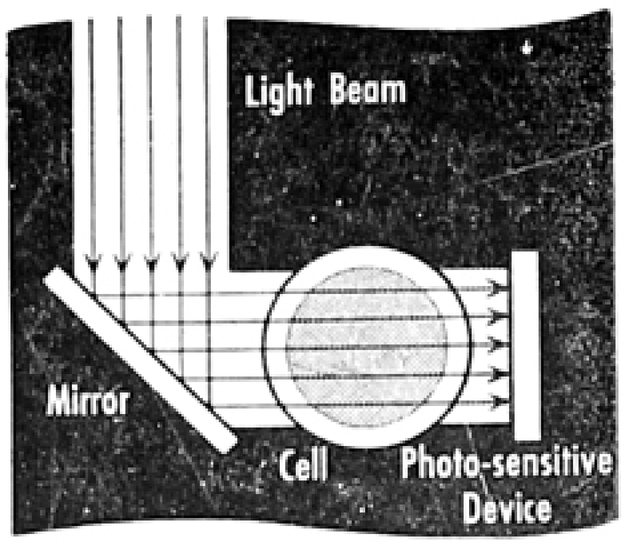
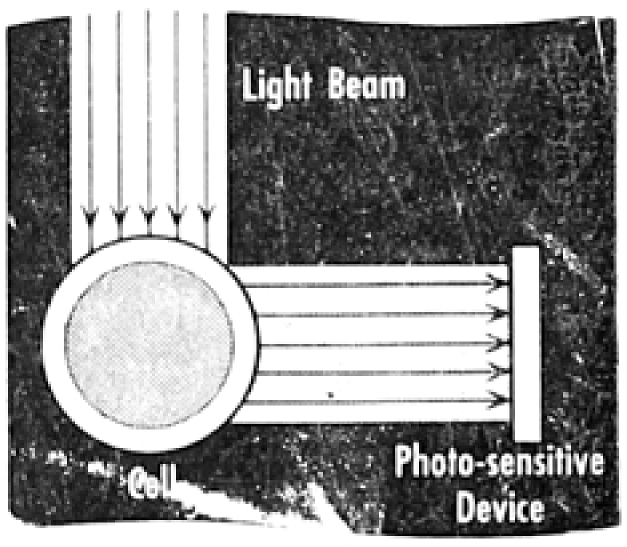


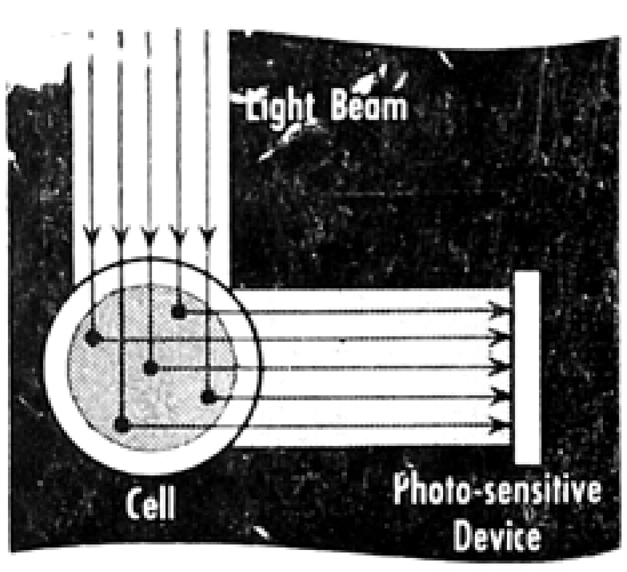
Light of specific wave lengths is absorbed by the unknown in solution. The amount of absorption is measured and related to the concentration.

Fluorometer



Certain wave lengths of light make some substances fluoresce (emit light of a different wave length) which is measured at right angles to the incident light and related to the concentration.

Nephelometer



Dispersed particles scatter the incident light by reflection and diffraction. This scattered light is measured at right angles and related to the concentration of the particles.

This versatile new instrument permits accurate quantitative determinations to be made by any of the three methods shown at left.

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