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Chemistry during the early days of Michigan State University,
the pioneer land-grant university**

Robert E. Maleczka, Jr.
Organic Seminar, August 29, 2012



MSU organic chemistry lab 1895

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Celebrating the Sesquicentennial of the Land Grant College Act Symposia

2012 Biennial Conference on Chemical Education (BCCE)
Pennsylvania State University, University Park, PA
July 29, 2012

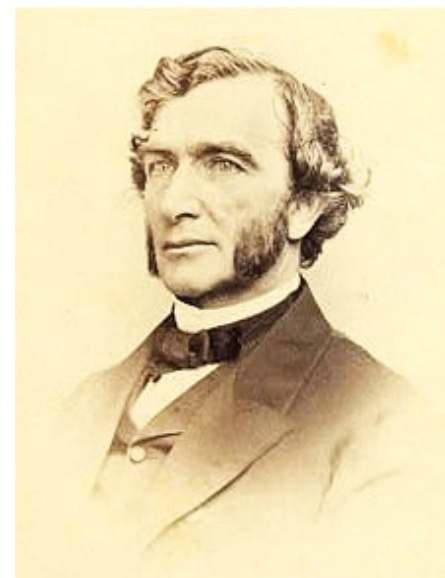
244th American Chemical Society National Meeting
Division of the History of Chemistry, Philadelphia, PA
August 29, 2012

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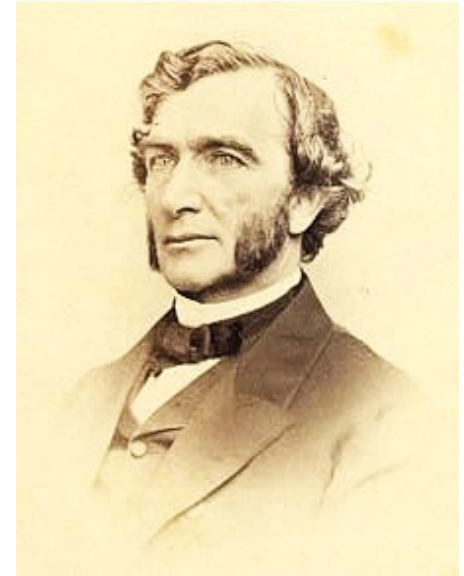
Sponsored by Vermont Congressman Justin Morrill, **the Morrill Act** was officially titled "An Act Donating Public Lands to the Several States and Territories which may provide Colleges for the Benefit of Agriculture and the Mechanic Arts"



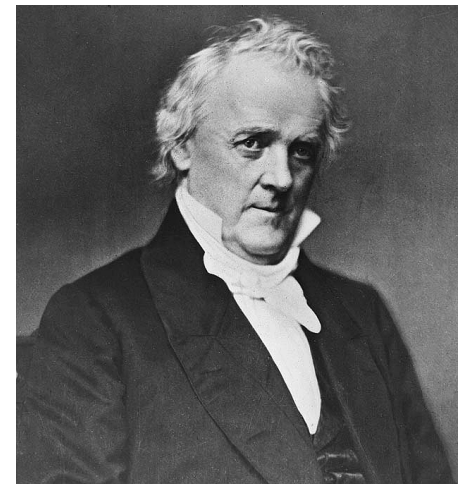
Senator Justin Morrill

A Short History of the Morrill Land-Grant College Act

- First proposed by Morrill in 1857, the bill allocated 17,400,000 acres (70,000 km²) of land based on the number of senators and representatives each state had in Congress
- Passed by Congress in 1859
- Vetoed by President James Buchanan



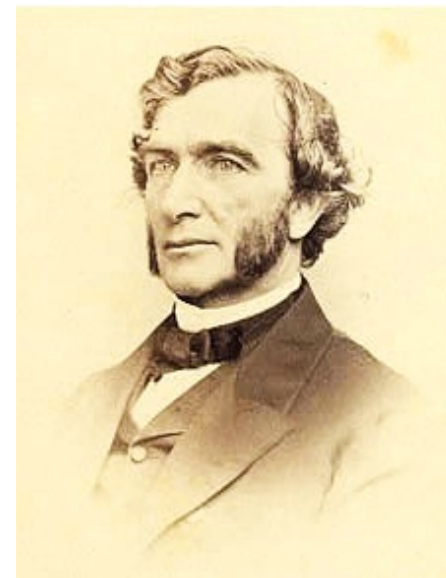
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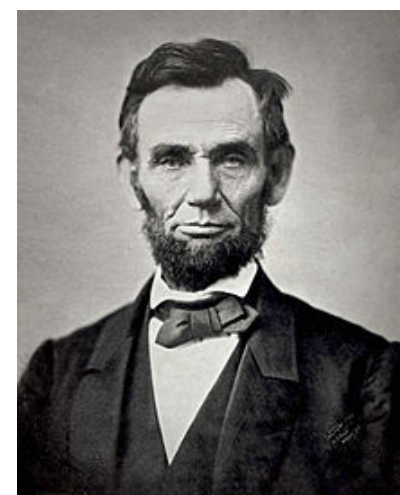
President James Buchanan

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- Passed by Congress in 1859
- Vetoed by President James Buchanan
- 1860, Abraham Lincoln elected President of the United States
- 1861, The American Civil War (North vs. South) breaks out
- Morrill resubmits his act
- July 2, 1862, the Morrill Act is signed into law by Abraham Lincoln
- 1890 the second Morrill Act is passed
- 1994 Native Americans colleges achieve "land-grant" status

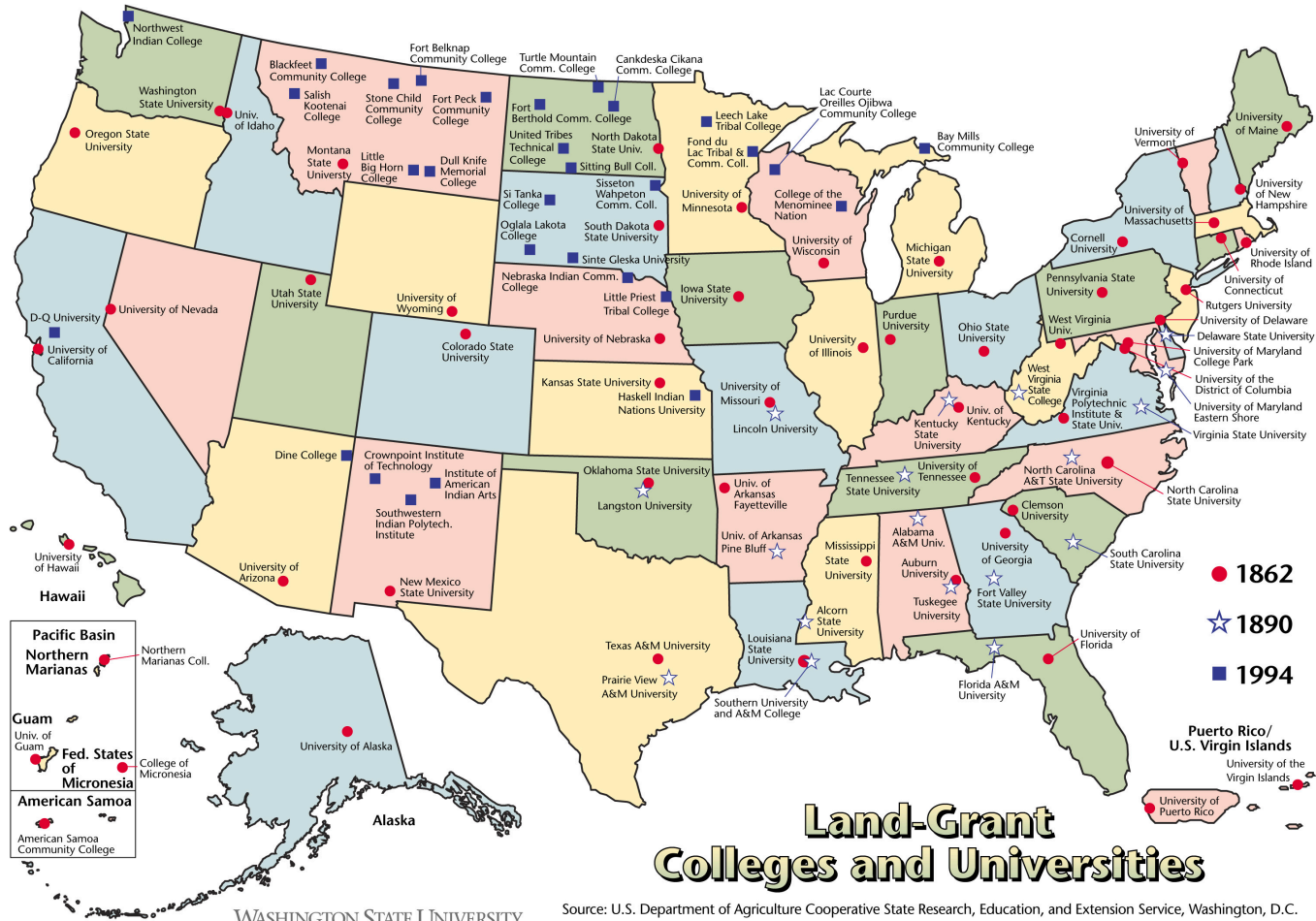


Senator Justin Morrill



President Abraham Lincoln

A Short History of the Morrill Land-Grant College Act



Michigan State University ... What's in a Name?



- February 12, 1855: The Agricultural College of Michigan is founded
- March 15, 1861: name officially changed to State Agricultural College
- June 2, 1909: and then to Michigan Agricultural College (M.A.C.)
- May 1, 1925: & then Michigan State College of Agriculture and Applied Science (MSC)
- July 1, 1955: and then to Michigan State University of Agriculture and Applied Science
- January 1, 1964: and finally to Michigan State University (MSU)

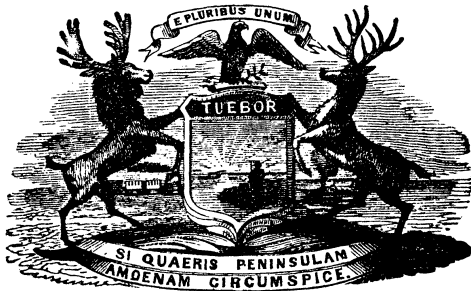
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**The State Agricultural Society of Michigan –
Incorporated by the State Legislature March 31, 1849**

TRANSACTIONS
OF THE
STATE AGRICULTURAL SOCIETY,
WITH REPORTS OF
COUNTY AGRICULTURAL SOCIETIES,
FOR 1850.



PUBLISHED BY ORDER OF THE LEGISLATURE.

J. C. HOLMES,
SECRETARY MICHIGAN STATE AGRICULTURAL SOCIETY.

LANSING:
R. W. INGALS, STATE PRINTER.

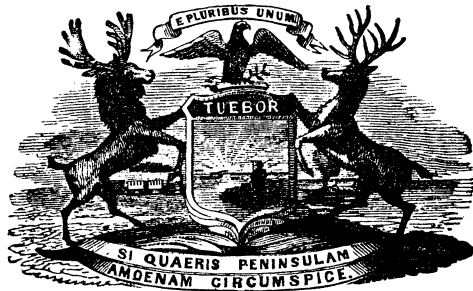


Resolved, That our legislature be requested to take such legislation as shall appear necessary or expedient for the establishment of a State central agricultural office, with which shall be connected a museum of agricultural products and implements, and an agricultural library, and as soon as practicable, an agricultural college and a model farm.

John C. Holmes
Executive Committee Meeting Minutes
December 19, 1849

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The reasons for this are founded on the facts, that agriculture lies at the foundation of every other department of human industry; that, comprehensively viewed, it is in itself both an art and a science.

John C. Holmes
Executive Committee Meeting Minutes
December 19, 1849

**The State Agricultural Society of Michigan Formally Petitions the
State Legislature for a State Agricultural College in Michigan
January, 1850**

*To the Honorable the Senate and House of Representatives
of the State of Michigan:*

The undersigned, in behalf of the Executive committee of the State Agricultural Society, respectfully asks your attention to the subject of establishing an agricultural college in this State; ...



The Michigan Constitution of 1850

Sec. 11. The legislature shall encourage the promotion of intellectual, scientific and agricultural improvement; and **shall, as soon as practicable, provide for the establishment of an agricultural school.** The legislature may appropriate the twenty-two sections of salt spring lands now unappropriated, or the money arising from the sale of the same, where such lands have been already sold, and any land which may hereafter be granted or appropriated for such purpose, for the support and maintenance of such school, and may make the same a branch of the University, for instruction in agriculture and the natural sciences connected therewith, and place the same under the supervision of the regents of the University.



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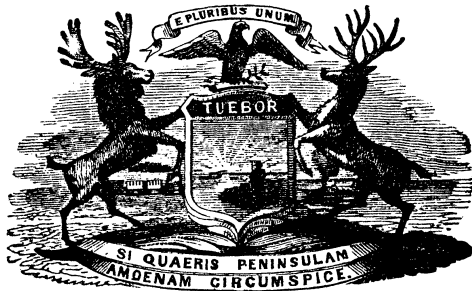
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Practical Farming vs. Scientific Farming

Practical Farming vs. Scientific Farming

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LANSING:
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Much has been said, and written, concerning the necessity and propriety of agricultural schools ... But the best school, and the most efficient, perhaps, at least under present circumstances, and for long years to come, is, or should be, at home, on the farm, amid the operations of practical farming.

Hon. Justus Gage

Many branches of science have a direct connection with agriculture. Chemistry, so indispensable to a good manufacturer and merchant, are just as useful to the farmer.

Prof. Haven

East Lansing vs. Ypsilanti vs. Ann Arbor

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East Lansing vs. Ypsilanti vs. Ann Arbor

Sec. 11. of the 1850 Constitution: The legislature shall ... provide for the **establishment of an agricultural school** ... and may make the same **a branch of the University**



DR. HENRY P. TAPPAN,
FORMER PRES. OF U. OF M.
1852-63.

“In anticipation of this legislative grant, we have accordingly organized an Agricultural School. The following subjects are embraced in the agricultural course:

1st Daily lectures on Chemistry, (elementary and experimental)
Chemistry applied to the arts, meteorology and climate

2nd Geology and Mineralogy

3rd Animal and Vegetable Anatomy and Physiology

4th Organic Chemistry and the theory and practice of agriculture”

H. P. Tappan
1852 letter to the Agricultural Society

East Lansing vs. Ypsilanti vs. Ann Arbor

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“Chemistry is another of the branches contemplated by the law and indispensable to the scientific farmer. But the erection and furnishing of a chemical laboratory is necessarily expensive ... (and) would be simply the duplication of apparatus already furnished in the University.”

A. Winchell
University of Michigan

East Lansing vs. Ypsilanti vs. Ann Arbor

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DR. HENRY P. TAPPAN,
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“If you ask for my private sentiments in regard to a separate Agricultural School, I will state them frankly, for I have nothing to conceal on this subject ... it is better to have one great institution, than half a dozen abortions.”

H. P. Tappan
1853 address to the Agricultural Society

East Lansing vs. Ypsilanti vs. Ann Arbor

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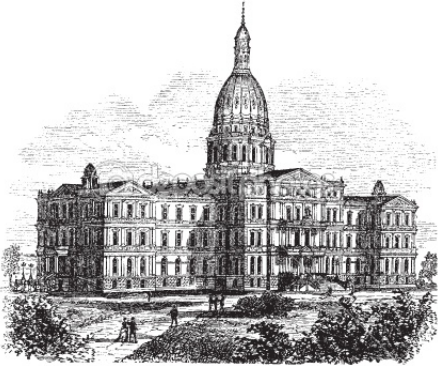
John C. Holmes, Secretary
Michigan Agricultural Society

Following visits to the University of Michigan and the Normal school, a committee of the Agricultural Society suggested:

*“petitioning our Legislature at its next session for an appropriation of moneys arising from the sales of Swamp Lands, sufficient for the purchase of a farm, where **scientific and practical agricultural education** will be taught on a scale corresponding with our increasing wants and growing State.”*

Report to the Agricultural Society
January 26, 1854

February 12, 1855 – The Legislature Acts



Section 1. *The People of the State of Michigan* enact, That the President and Executive Committee of the Michigan State Agricultural Society, be and are **hereby authorized to select, a location and site for a State Agricultural School, within ten miles of Lansing**; and subject to such approval, contract for and purchase for the State of Michigan, such lands, not less than five hundred acres, nor more than one thousand acres, in one body, **for the purpose of an experimental farm and site for such Agricultural School.**

Sec. 5. The course of instruction in said college shall include an English and scientific course, natural philosophy, **chemistry**, botany, animal and vegetable anatomy and physiology, geology, mineralogy, meteorology, entomology, veterinary art, mensuration, leveling and political economy, with book-keeping and the mechanic arts which are directly connected with agriculture ...

Tuition in said institution shall be forever free to pupils from this State, and any number of pupils may be admitted who shall apply from any part of this State.



This act shall take effect immediately.

Approved by Governor Kinsley S. Bingham, February 12, 1855

1856 – The First Two Faculty Members are Hired



John C. Holmes
Superintendent of Horticulture



Lewis R. Fiske
Professor of Chemistry

May 13, 1857 – The College Formally Opens (and the Morrill Act is first proposed)

Entrance requirements:

Minimum age: 14

Required primary school education: Higher arithmetic, geography, English grammar

Preferred primary school education: Algebra, natural philosophy, rhetoric

Tuition and Fees:

In-state tuition: free

Out-of-state tuition: \$20

Matriculation fee: \$5

Room cost: \$4 per year

Board cost: ~\$2 per week

School Term:

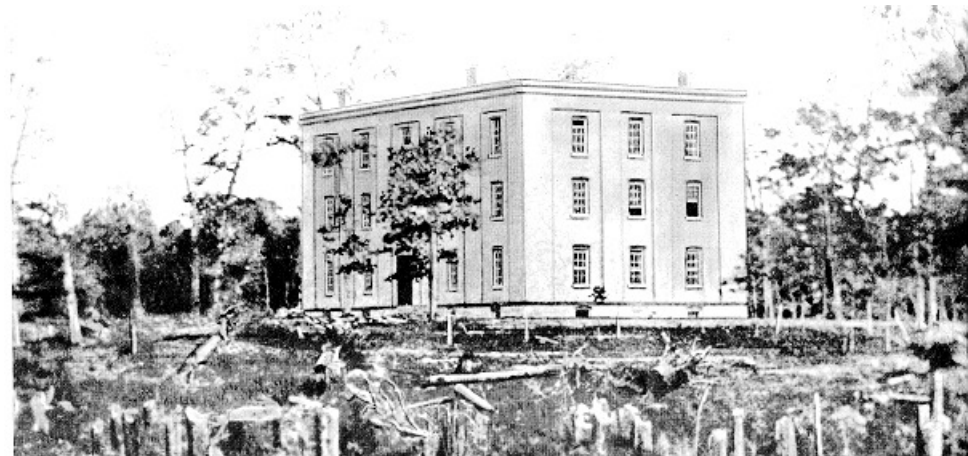
First term: April—October

Second term: December—February

Manual Labor:

Every student will be required to devote a 2.5–4 hours of each day to manual labor, for which he will be entitled to receive an equitable remuneration.

College Hall – 1857



May 13, 1857 – The College Formally Opens College Courses



M.A.C. Class of 1861

First Year:

Geometry,
Meteorology,
History,
Trigonometry & Surveying,
Elementary Chemistry,
English literature, Book-keeping

Second Year:

Physics,
Vegetable Physiology,
Horticulture,
Rhetoric,
Civil Engineering,
Botany,
Mineralogy,
Inductive logic

Third Year:

Drawing and Rural Engineering,
Geology,
Mental Philosophy,
Astronomy,
Zoology,
Moral Philosophy

Fourth Year:

Analytical Chemistry,
Animal Physiology,
Political Economy,
Agricultural Chemistry,
Entomology,
Veterinary Medicine,
Economy of Domestic Animals,
Agricultural and Geographical Botany,
Technology,
Household and Rural Economy

May 13, 1857 – The College Formally Opens The Chemistry Courses

ELEMENTARY CHEMISTRY

Chemical Forces,
Laws of combinations,
Properties of Bodies,
General discussion of the facts and phenomena
belonging to Inorganic and Organic Chemistry

ANALYTICAL CHEMISTRY

General Analysis,
Analysis of Soils,
Analysis of Minerals,
Analysis of Manures,
Analysis of Plants,
Analysis of Artificial Manures



M.A.C.
Logo

AGRICULTURAL CHEMISTRY

Formation and composition of soils,
Composition of plants as determining the
Chemical condition of the soil,
Composition of the air, and its relations to
vegetable growth,
Connection of heat, light, electricity with the
growth of plants,
Nature and sources of the food of plants,
Chemical changes attending vegetable growth,
Chemistry of various processes of the farm, as
plowing, draining, &c.,
Exhaustion of soils,
Methods of Chemically improving soils—by
1st Mineral manures, 2nd Vegetable manures,
3rd Animal manures, 4th By indirect methods,
Rotation of Crops,
Chemical composition of the various crops and
their uses as food,
Feeding, housing, and care of stock,
The Chemistry of the dairy,
Nutritive and fattening qualities of the different
articles of food,
Preparation of food for animals and man

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Chemical Forces,
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M.A.C.
Logo

AGRICULTURAL CHEMISTRY

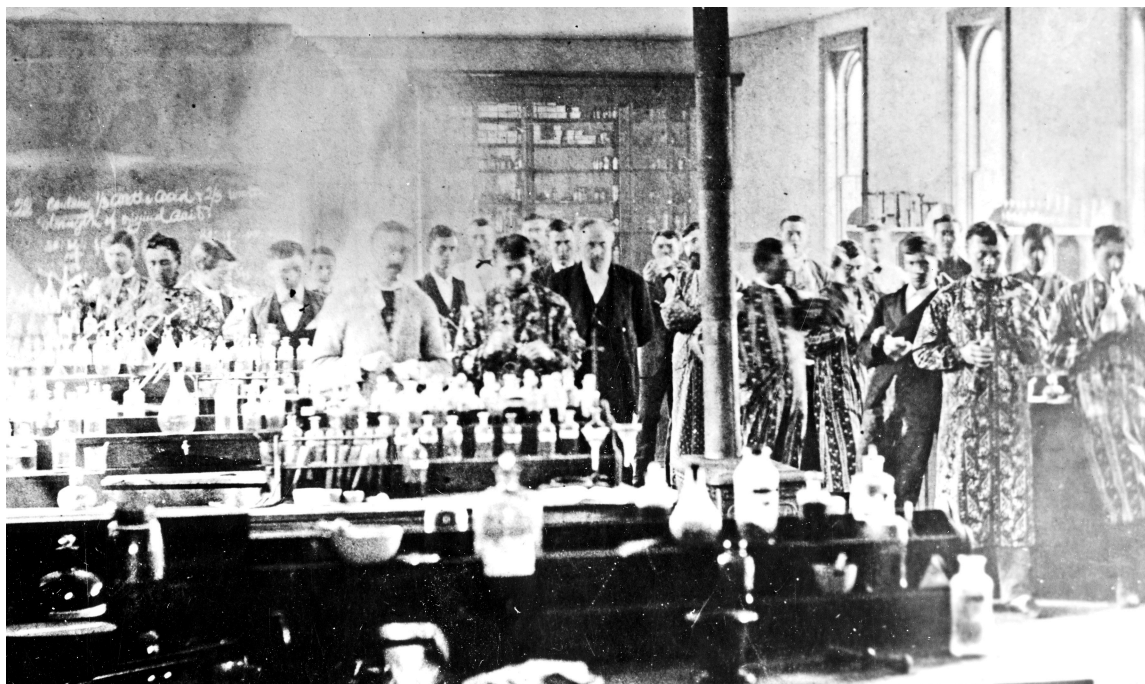
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The Laboratory

From the Catalogue of the State Agricultural College:

*“The professional character of the College demanded that **extensive provision be made for instruction in Chemistry** and researches in the Chemical principles of Agriculture.*

A very full set of apparatus has therefore been procured affording all the aid required in Elementary Analytical and Agricultural Chemistry.



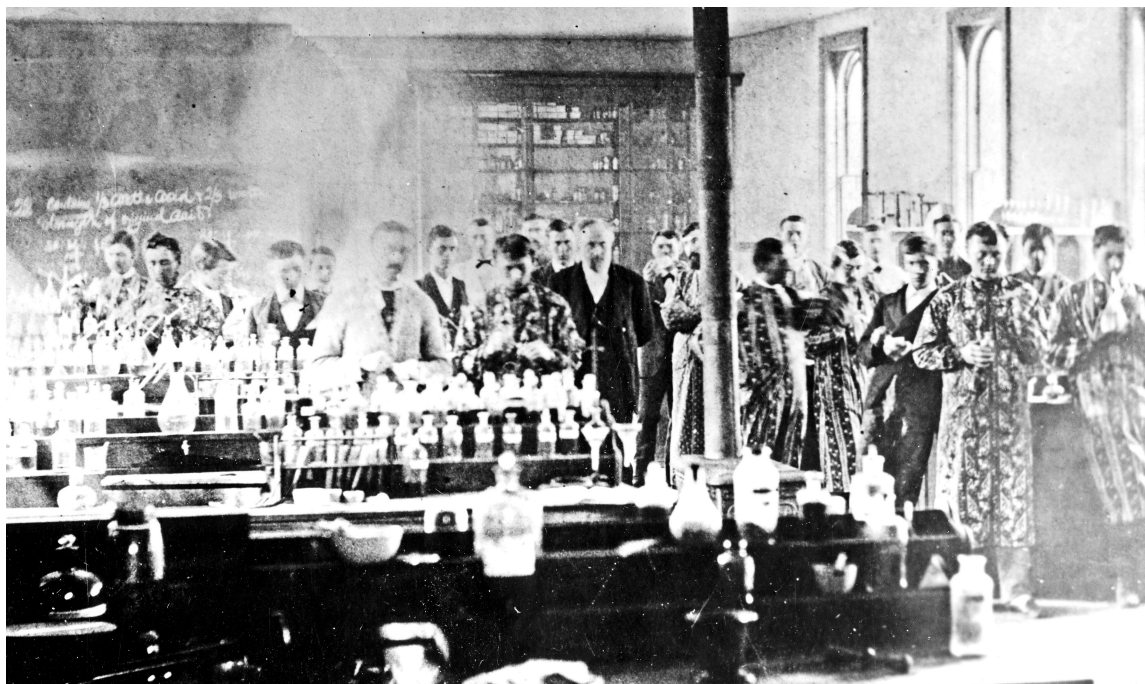
M.A.C. Chemistry Lab 1875

The study of Elementary Chemistry is pursued by means of text books and lectures, with experiments illustrating the principles and facts of the science.

*In prosecuting Chemical Analysis the student spends **three hours a day in the Laboratory** applying with his own hands the tests required to determine the composition and properties of bodies thus securing a practical knowledge of the methods employed in these investigations.”*

The Laboratory

“Chemistry even at that early day was taught by practical work in the laboratory. We had one lecture or recitation a day and in addition two hours daily of laboratory work. In the lecture the professor accompanied his presentation of the subject by carefully planned demonstration experiments greatly to our edification and occasionally to our amusement In the laboratory we plunged at once into the qualitative analysis of unknown substances.

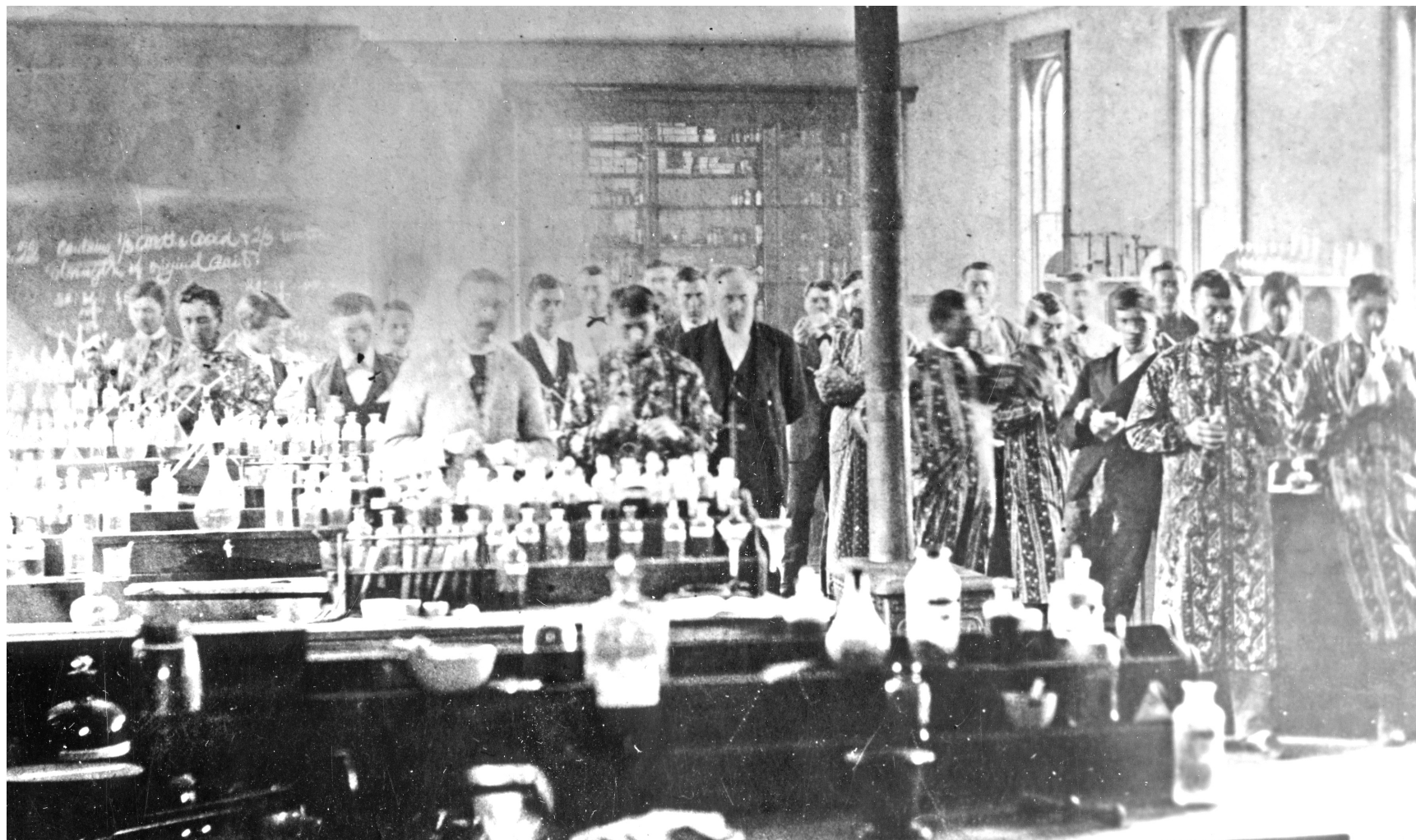


M.A.C. Chemistry Lab 1875

*We learned to handle chemicals and apparatus by the very simple plan of actually handling them ourselves. **Of course we broke apparatus and blew up things rather often but finally we learned to be careful and no one was killed or seriously hurt in the process”***

Impressions offered at MSU’s semi-centennial celebration
by C.E. Bessey, M.A.C. student 1868–1869

M.A.C. Chemistry Lab 1875

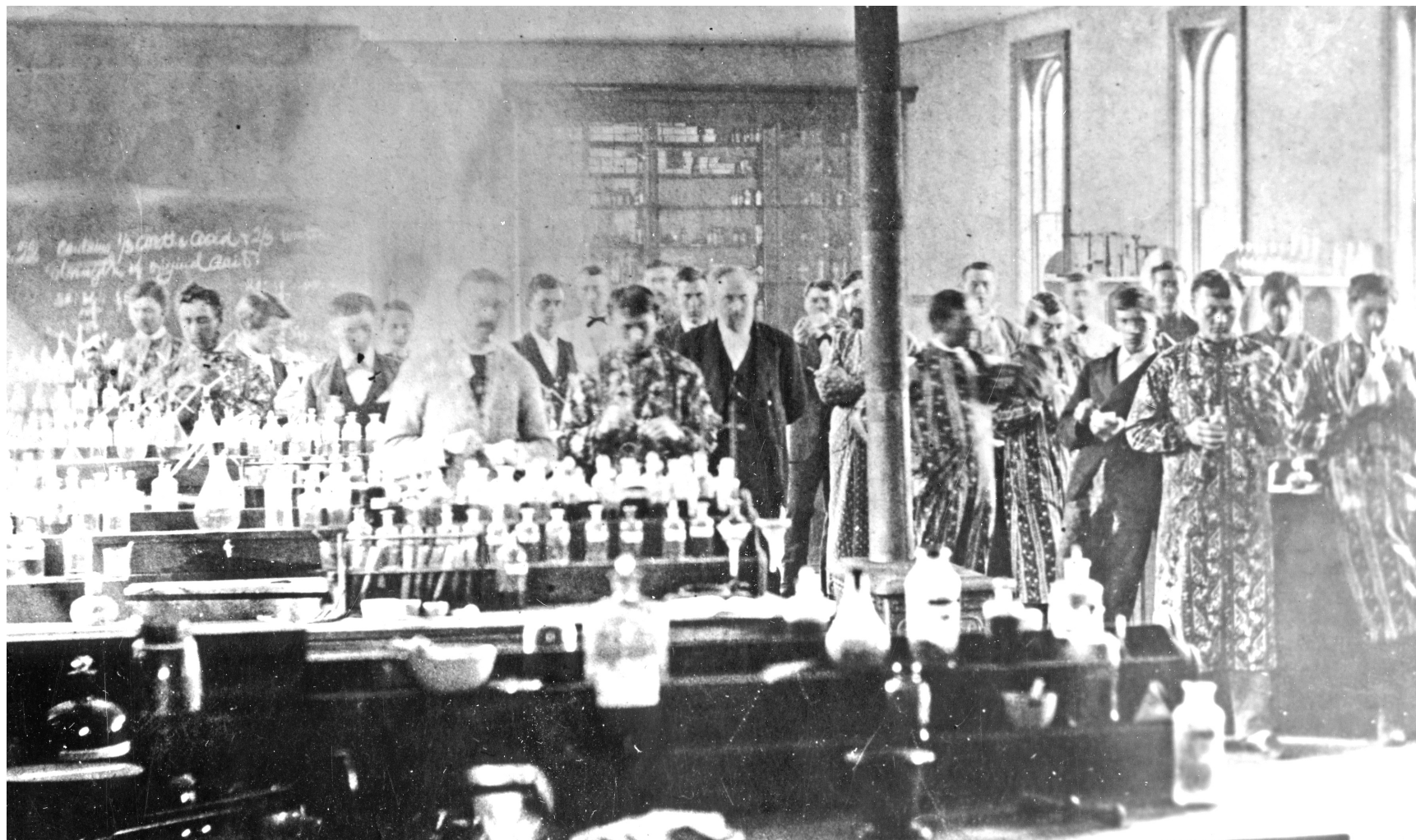


M.A.C. Chemistry Lab 1898

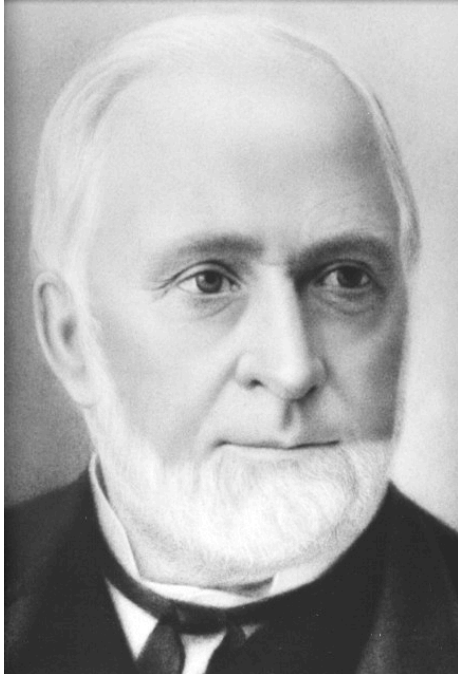


Class of 1898

M.A.C. Chemistry Lab 1875



Robert C. Kedzie



Born in Delhi, NY 1823

Emigrated with his parents to Michigan 1826

A.B. Oberlin college 1847

Principal Rochester Academy 1847–1848

M.D. University of Michigan 1851

Practicing physician, Vermontville, MI 1851–1862

In 1862, Kedzie enlists in the 12th Michigan Infantry, where he is appointed assistant surgeon.



Michigan State Memorial –
Shiloh National Military Park



Also in 1862, Lewis Fiske, who had been named President of the College in 1859, resigns.

Kedzie is appointed Professor of Chemistry and department head, a position he would hold until his death in 1902.

The Morrill Land-Grant College Act

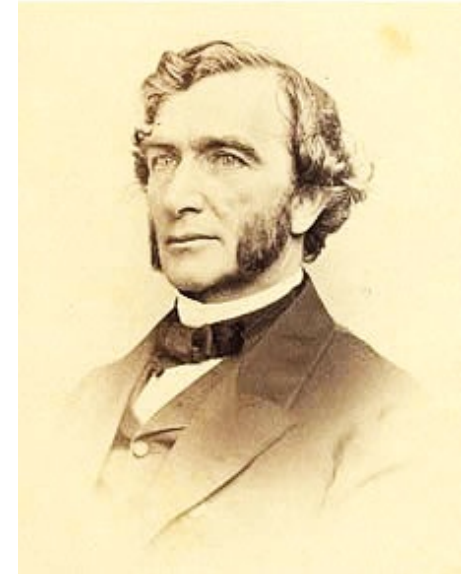
The 1862 Morrill Act provided Michigan 240,000 acres of Federal land (30,000 acres for each Michigan's six congressmen and two senators).

In 1870, M.A.C. received \$2,779.89. in proceeds from the first sale of some of these lands.

Also in 1870, women are admitted for the first time

The sale of Morrill Act lands also enabled the State to grant M.A.C. \$10,000 to build a chemical laboratory. The "Chemical Fort" was inhabited in 1871.

Robert C. Kedzie established many of the building's revolutionary design elements, including a ventilating chimney, the first of its kind in the United States; it was infused by steam jets for positive airflow and connected to evaporating hoods to draw off any aforementioned fumes.



Senator Justin Morrill



The Chemical Laboratory or "Fort"

The Morrill Land-Grant College Act

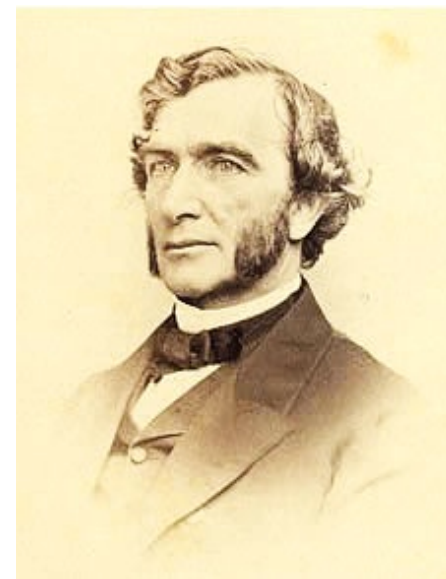
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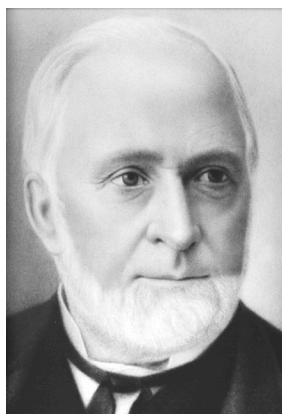


Senator Justin Morrill



The Chemical Laboratory or "Fort"

Some Research Highlights of Kedzie the Scientist and Consumer Champion



The Father of Michigan's Sugar Beet Industry: Kedzie determined that the local climate was very close to that in Germany's sugar beet region. Small experimental fields were planted with imported seeds. The beets were sent to Kedzie, who found they contained 12–16% sugar and the crop would be profitable to the farmer.



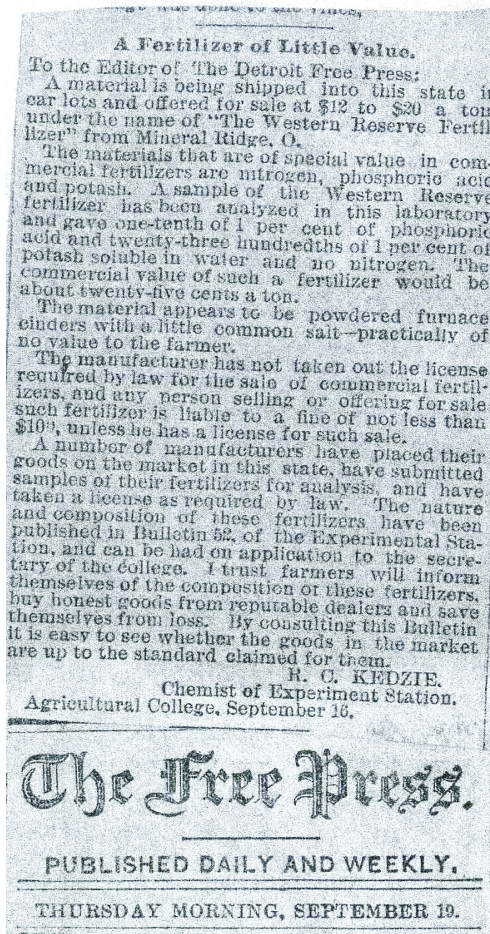
Methods of Inspecting Kerosene Oil: He also investigated kerosene oils for explosives and invented a simple tester for finding their flash point. This work led to legislation safeguarding consumers against inferior (and dangerous) illuminating oils.

Shadows from the Walls of Death: He determined that wallpaper made with a colorant called "Paris green" contained enough arsenic that over time occupants of a home papered in Paris green could absorb a fatal dose.

Analysis of Commercial Fertilizers: Kedzie's group ran many analyses of commercial fertilizers, and was instrumental in having a law passed compelling manufacturers to affix to all fertilizers sold in Michigan a label stating the chemical composition of the contents.



Some Research Highlights of Kedzie the Scientist and Consumer Champion



"A material is being shipped into this state in car lots and offered for sale at \$12 to \$29 a ton under the name of 'the Western Reserve Fertilizer' from Mineral Ridge O.

*The materials that are of special value in commercial fertilizers are nitrogen, phosphoric acid, and potash. A sample of Western Reserve fertilizer has been analyzed in this laboratory and gave **one-tenth of 1 percent phosphoric acid and twenty-three one hundredths of 1 percent potash soluble in water and no nitrogen.** The commercial value of such a fertilizer today would be about twenty-five cents a ton.*

The material appears to be powdered furnace cinders with a little common salt – practically of no use to the farmer."

R. C. Kedzie
Agricultural College
September 16, 1889

Some Research Highlights of Kedzie the Scientist and Consumer Champion

ON WITH THE DANCE.

Dr. Kedzie and the Western Reserve Fertilizer Co. Will Have a Legal Tilt.

THE COLLEGE CHEMIST TO BE SUED

For Damages Placed at \$50,000, on Account of His Statements Concerning the Company's Fertilizer.

General Agent Pew, of the Western Reserve Fertilizer Company, leaves for Ohio to-night, just as full of grit and fight as when he sailed into the State a few days ago to cross lances with Dr. Kedzie of the Agricultural College. The two gentlemen have had a very interesting little set-to during the last two days over the doctor's recent published statement in regard to the Western Reserve Company's fertilizer, and which Mr. Pew characterizes as unjust and untrue.

ON WITH THE DANCE

Dr. Kedzie and the Western Reserve Fertilizer Co. Will Have a Legal Tilt.

THE COLLEGE CHEMIST TO BE SUED

For Damages Placed at \$50,000 on Account of His Statements Concerning the Companies Fertilizer

Lansing State Journal
October 2, 1889

Some Teaching Highlights of Kedzie the Educator

A photograph of a handwritten title in cursive script on a piece of paper. The text reads "Methods of Teaching in Physical Science".

Methods of Teaching in Physical Science.

Courtesy MSU archives

A photograph of a handwritten note on lined paper. The text is written in cursive and reads: "Experiment - illustrate demonstrate - & make your scholars help you & work with you. In after years they will rise up & call you blessed.".

Experiment - illustrate
demonstrate - & make your
scholars help you & work with
you. In after years they will
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Courtesy MSU archives

Some Teaching Highlights of Kedzie the Educator

**Chemistry Professor Robert C. Kedzie Delivers a Lecture on Gasoline in
M.A.C.'s Chemical Laboratory – 1892**

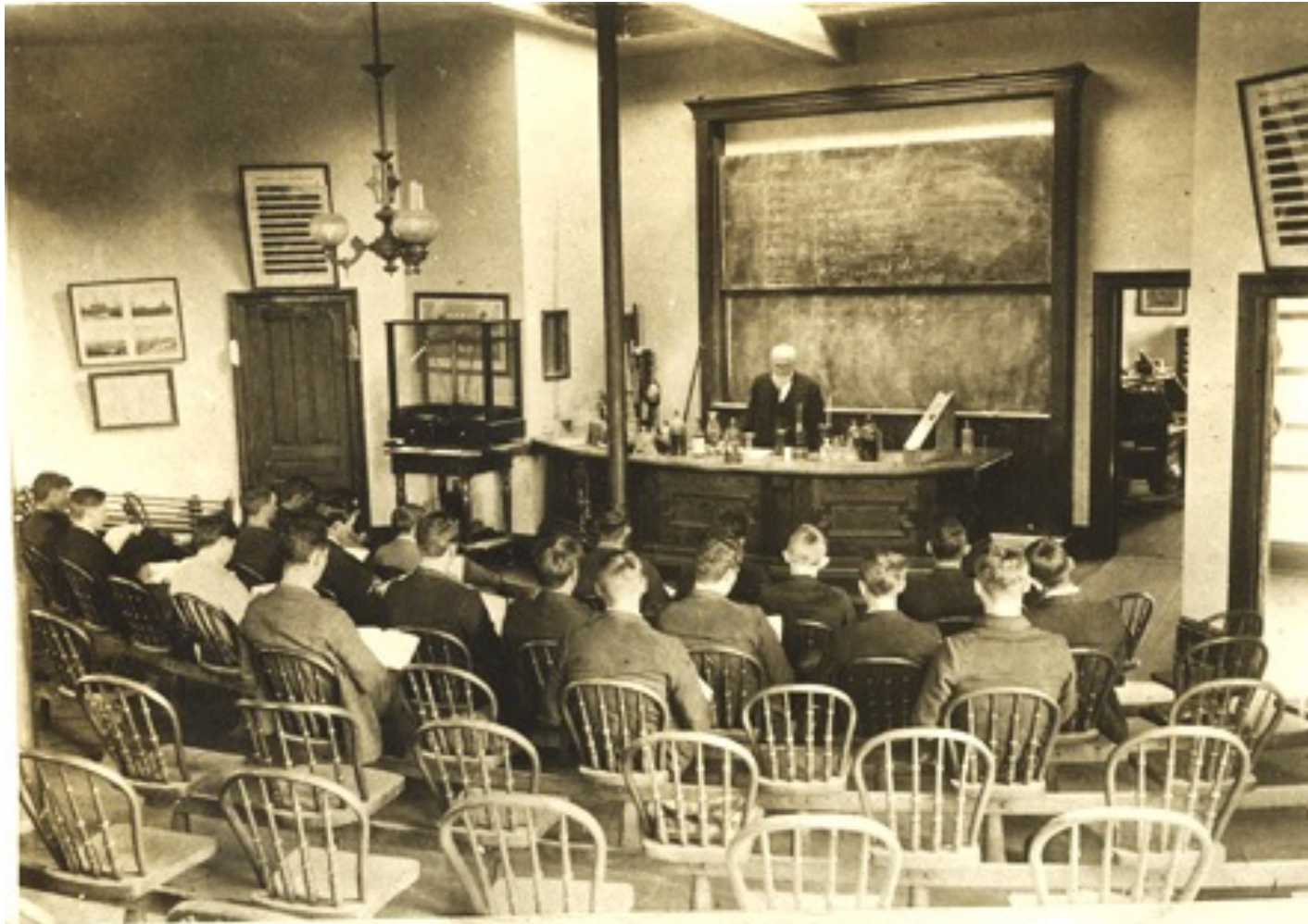
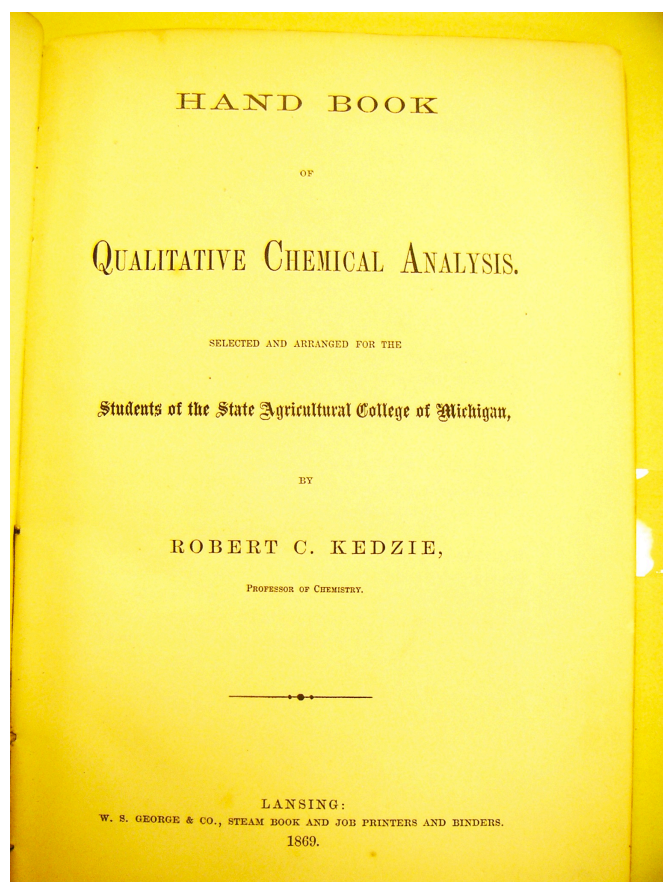


Photo courtesy MSU archives

Some Teaching Highlights of Kedzie the Educator



Courtesy MSU archives



Courtesy MSU archives

Some Teaching Highlights of Kedzie the Educator & Consumer Champion

Kedzie gave his class in analytical chemistry samples of various commercial preparations for analysis as part of the work of the course. The sophomore class in 1882 analyzed, among other samples, Coaline. The students determined that “the only cure for sea Sickness” consisted of 2 cents worth of sodium carbonate with a few drops of nitrobenzene for odor.





One Last Kedzie Anecdote

Kedzie's membership in scientific/medical societies and boards include:

Michigan State Board of Health (President)
Sanitary Council of the Mississippi Valley
American Public Health Association (President)
American Medical Association (Vice-President)
Michigan State Medical Society (President)
Society for the Promotion of Agricultural Science
Association of Agricultural Colleges (President)
Michigan House of Representatives
AAAS (Chair of the chemistry section)

American Chemical Society

THE AMERICAN CHEMICAL SOCIETY.

XIV.—PROCEEDINGS.

Regular Meeting, May 1, 1879.

The Committee on Delinquents reported that the following gentlemen had not paid their initiation fees or dues, and recommended that they be dropped from the rolls of the Society, and be requested to return all copies of the PROCEEDINGS which they may have received :

ALLYN, J. G.	KEDZIE, ROBT G.
BEDFORD, P. W.	KEDZIE, WM. K.
BROWN, JOHN J.	KIMBALL, J. P.
BAYLIS, JAMES C.	LATTIMORE, S. A.
BORDEN, SPENCER.	LOUGHLIN, J. ENEU.
CAMPBELL, DOUGLASS.	LOWE, C. B. F.
CECH, DR. C. O.	MANSFIELD, J. M.
CHARLTON, T. J.	MARVIN, J. B.
CHAPELLE, E. de la.	McMURTRIE, WM.
CARSON, J. P.	MITCHELL, HOWARD W.
DOUGLASS, SAM'L T.	MERTZ, HENRY NEY.
DEELEY, ROBERT.	McCREE, WM.
EASTWOOD, JOHN T.	MUNZIGER, P.
FORBES, FRANCIS.	MUZARD, LEAR.
GRABOWSKY, JULIAN.	MOTT, VALENTINE.
HART, EDWARD.	NEALE, ARTHUR T.
HAMILTON, HUGH.	NEWTON, ISAAC.
HILGARD, EUGENE W.	ROEPER, C. M.
HINRICHS, GUSTAVUS.	SPANGENBERG, F.
HINSDALE, R. G.	STILLMAN, O. B.
HAGUE, J. D.	STANTON, WILLARD S.
JAMESON, HENRY.	THALBERG, JOHN.
JONES, T. W.	WALLACE, SHIPPEN.
KAMMERER, FRED.	WUTH, OTTO.
KING, CHAS.	

The Impact M.A.C. Chemistry Alumni on Other Chemistry Departments



William K. Kedzie

Established the Department of Chemistry and Physics, Kansas State Agricultural College (1873)



William W. Daniells

First Professor of Chemistry, University of Wisconsin (1868)



Frank J. Annis

Established the Department of Chemistry of the Agricultural College of Colorado (1879)



Edwin C. DeBarr

Established the Department of Chemistry, Norman Territorial University, (1892)



Frank S. Kedzie

Michigan Agricultural College Chemistry Department Chair 1902–1915
College President 1915–1921

A Very Short History of MSU Chemistry after Robert C. Kedzie



Frank S. Kedzie

Michigan Agricultural College Chemistry Department Chair 1902–1915

I am instructed by the State Board of Agriculture to inform the several departments of the College that overdrafts on department accounts will no longer be permitted. This notice should not be interpreted by you as in any way charging or intimating that you have permitted such overdrafts to be made but is intended simply to state the position of the Board in reference to this matter. I would suggest that, in case you find it necessary to use more funds than have been apportioned to your department that you make application to the Board for an additional apportionment before reducing your funds to too narrow a margin.

Yours truly,

A. M. Brown, Secretary.

Agricultural College, Michigan.

June 27, 1906.



A Very Short History of MSU Chemistry after Robert C. Kedzie

First JACS paper: Reed, H. S. *J. Am. Chem. Soc.* **1907**, *29*, 1626.

THE DETECTION AND DETERMINATION OF BENZOIC ACID IN KETCHUPS, FRUITS AND CIDERS.

BY HARRY S. REED.
Received Sept. 6, 1907.

The following methods were worked out by the writer on occasion of being called upon to determine the presence of, and quantity of benzoic acid, in certain fruits, ketchups, ciders, etc. They are presented in the hope that some one may find them useful.

Detection of Benzoic Acid.—For this purpose a modification of Mohler's test is used. One hundred g. of the substance under examination is acidified with dilute sulphuric acid and thoroughly and repeatedly extracted with chloroform. The chloroform extract is separated from the water solution each time as far as possible by means of a separatory funnel. The last traces are then spun out with a centrifuge. The success of both qualitative and quantitative determinations depends largely on the care with which the extraction is made.

A Very Short History of MSU Chemistry after Robert C. Kedzie

First JACS paper: Reed, H. S. *J. Am. Chem. Soc.* **1907**, 29, 1626.



Courtesy MSU archives

A Very Short History of MSU Chemistry after Robert C. Kedzie

Undergraduate chemistry major established 1921, first graduates in 1924

Ph.D. program in chemistry started 1922

First Ph.D. thesis: “Silica gel” Benjamin Levi Smits (1926)

Also in 1926 the Kedzie Chemical Laboratory opens

Second Ph.D. thesis & first by a female graduate student: “The potential of the mercury, mercurous bromide electrode and the activity of hydrobromic acid in water” Julia Loomis Matthews (1930)

First Ph.D. thesis by an international student: “Contributions to aluminum chloride in organic chemistry” Tso-yung Hsieh (1935)

A Very Short History of MSU Chemistry after Robert C. Kedzie

NITROSULFONIC ACIDS OF *p*-XYLENE.

2119

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF THE MICHIGAN AGRICULTURAL COLLEGE.]

THE TOLYL ESTERS AND TOLUIDIDES OF THE NITROSULFONIC ACIDS OF *p*-XYLENE.

BY RALPH C. HUSTON.

Received July 9, 1915.

In an earlier paper, by Karstlake and Huston,¹ three nitrosulfonic acids of *p*-xylene were described. These were prepared by the nitration of *p*-xylenesulfonic acid, or the sulfonation by means of chlorosulfonic acid of nitro-*p*-xylene. Separation of the products was effected by fractional crystallization of the sulfonchlorides from ether and petroleum ether. The configuration was determined by reducing the free acids to the corresponding aminosulfonic acids.

J. Am. Chem. Soc. **1915**, *37*, 2119.



Ralph C. Huston, Ph.D.

A Very Short History of MSU Chemistry after Robert C. Kedzie

[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY, MICHIGAN STATE UNIVERSITY]

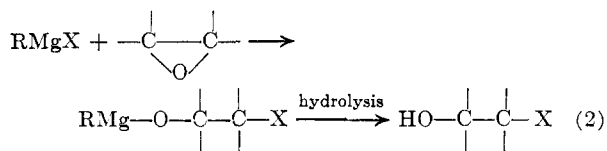
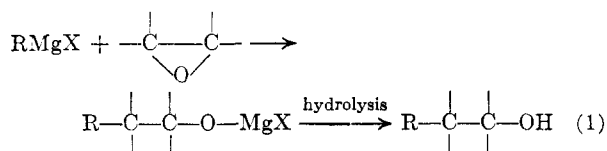
The Reaction of Some Organomagnesium Iodides with 1,2-Epoxypropane

FRANCIS E. EVANS^{1,2} AND RALPH C. HUSTON³

Received January 5, 1959

Several Grignard reagents prepared by the reaction of an organic iodide with magnesium in the presence of anhydrous ether were treated with one and two molar equivalents of 1,2-epoxypropane to give an alcohol and an iodohydrin. In all cases, the yield of the iodohydrin was greater than that of the expected alcohol. Only when two molar equivalents of epoxide were present was the yield of alcohol significant. The reaction of the dioxane soluble portion of the Grignard reagent (R_2Mg) with two molar equivalents of epoxide to yield an alcohol was also investigated.

It has been shown⁴⁻⁶ that the reaction of a Grignard reagent with an epoxide occurs in such a manner that either the organo-magnesium bond or the magnesium-halide bond may be attacked by the epoxide (1,2). The resulting products are mixtures of an alcohol and a halohydrin.



When Grignard reagents obtained from organic chlorides,⁵ bromides,⁶ and iodides⁴ were treated with epoxyethane (ethylene oxide) in equimolar quantities the products were predominately the expected alcohols, indicating mainly reaction at the organo-magnesium bond. Halohydrin, presumably formed by reaction at the magnesium-halide bond, was produced in all cases, but in surprisingly increased yields when Grignard reagents prepared from iodides were used. The yield of both the expected alcohol and the halohydrin were increased when the reaction was carried out between two moles of epoxyethane and one mole of the Grignard reagent.

(2) Present address: Research and Development Department, National Aniline Division, Allied Chemical Corp., Buffalo, N. Y.

(3) Deceased, April, 1954.

(4) R. C. Huston and A. A. Agett, *J. Org. Chem.*, 6, 123 (1941).

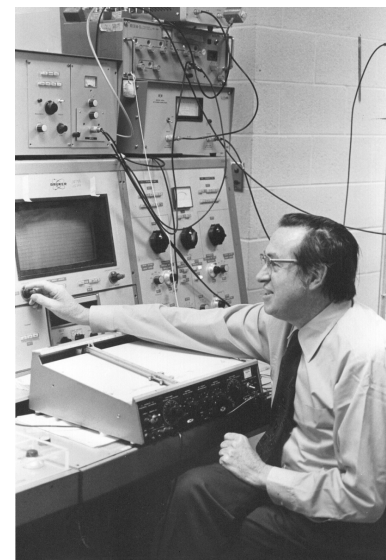


Ralph C. Huston, Ph.D.

J. Org. Chem. 1959, 24, 1178.

A Very Short History of MSU Chemistry after Robert C. Kedzie

Max T. Rogers (1917–1985), a native of Alberta, Canada, was professor of physical chemistry at MSU from 1946 to 1984. Always keen on new instrumental techniques and the types of information that they could give concerning molecular structure, Max designed and built the first NMR machine (40 MHz) at MSU, in the Kedzie Chemical Laboratory in 1956.



Max T. Rogers



Harold Hart

Harold Hart was born in New York City (1922). He too joined the MSU Chemistry Department in 1946, retiring in 1987. An organic chemist, Harold was first to synthesize cyclopropyl-lithium, provided the first example of a [1,4]-sigmatropic rearrangement, whose stereochemistry was consistent with orbital symmetry conservation, and made many contributions to the field of benzyne chemistry. The author of ~200 papers, Harold served on many editorial boards and was the Editor-in-chief of *Chemical Reviews* from 1967 to 1977.

Karabatsos, G. J. *Chem. Rev.* **1977**, 77, 3A–4A.

MSU Department of Chemistry Today

Research areas include:

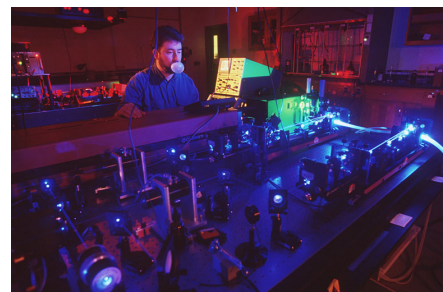
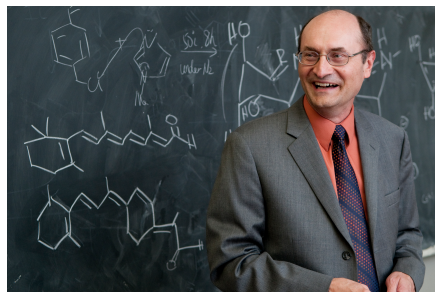
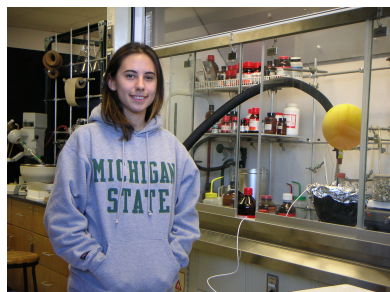
Analytical, Biological Chemistry, Chemical Physics,
Inorganic, Nuclear Chemistry, Organic, Physical

~ 40 Chemistry faculty

~ 240 Graduate students

~ 25 Post-doctoral associates

Complex Materials, Computational Chemistry, Catalysis,
Energy, Green Chemistry, Health, Nuclear Chemistry,
etc.



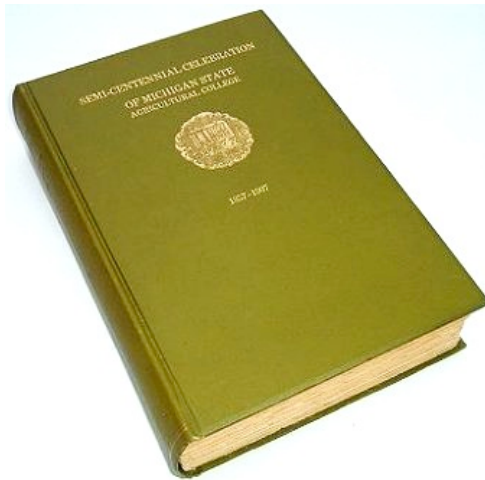
... But Before We Finish



1855 or 1857?



1855 or 1857?



Semi-centennial celebration of Michigan State Agricultural College

1857-1907

1855



Acknowledgments

MSU Archives

Roger Egolf (Penn State University) for organizing the BCCE & ACS symposia

The ACS Division of History of Chemistry

The American Chemical Society

Pennsylvania State University

Professor Gavin Reid for the suggestion

