HOW MAY LOCAL INTEREST IN CHEMISTRY BE INCREASED?

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There is a local chemistry of vital interest which no textbook can give, which few teachers know and fewer teachers teach. Take advantage of this to interest your community in chemistry.

Having built up a chemistry department in a so-called classical and literary community from an enrollment of seven to one hundred and sixty, a department that has grown five times as fast as the school, and in which we have almost as many pupils studying chemistry as all the other advanced sciences—including botany, zoology, physical geography and physics—combined, I may be pardoned for offering the following suggestions on how to increase the local interest in chemistry.

- I. Lectures to pupils on "Some Interesting Chemical Experiments," "Soda Water," "The Air We Breathe," "The Water We Drink," "The Food We Eat," "The Clothes We Wear."
- II. A series of practical experiments on "Tests for Food Constituents," "Water Analysis," "Milk Analysis," "Tests for Adulterants in Foods," "Soap Making," "Testing Cloth Fibers," followed by a written report on investigations made at home on foods, cloth and labels on canned goods, in place of the regular monthly tests.
- III. A board of food inspectors who purchase foods in the local market and test them under my supervision and hand me written certified reports of their findings.
- IV. Lectures before boys' clubs, mens' clubs and women's clubs on timely topics as "Adulterants in Foods and Simple Kitchen Methods for Their Detection," and lectures before student bodies on such subjects as "Science and Warfare," "How Chemistry Helped to Win the War."
- V. Articles in the local papers on "Our Local Food and Milk Supply."
- VI. An annual chemistry exhibit or open house.
- VII. Visits to a model bakery, a model dairy and a modern ice plant.
- VIII. Large display cards on the laboratory walls with such inscriptions as the following:

The chemistry pupil is not so easily duped by fake "dopes" and fake "docs."

The chemist has run the food fakir to earth.

A knowledge of chemistry is an aid to good health.

By applying chemistry Rockefeller saw millions in crude petroleum oil.

Soap that makes the whole world clean contributed by chemistry.

Baking power, the leaven of civilization, a product of chemistry.

Millions saved annually because chemistry gave us the fire-extinguisher.

Disinfectants to stop the spread of contagious diseases and anaesthetics to make possible the most delicate and difficult operations, produced by chemistry.

Every tint of the rainbow for dyeing fabrics and clothing given us at little cost by chemistry.

This splendid building is possible because of chemistry. It has contributed the concrete in the foundations and walls, the brick, cement and iron lath, the tile of the roof, the copper drains and down-

¹Read before the chemistry section of the High School Conference at the University of Illinois, Nov. 19, 1920.

spouts, the steel beams and girders, the glass for the windows, the mosaic tiling for the floors, the iron and brass bolts and screws, hinges, locks, electrical fixtures, tinting for the walls, paint for the woodwork and the heat that makes it comfortable.

IX. A bulletin board on which are posted photographs of noted living scientists, articles taken from magazines and newspapers, jokes, cartoons—almost anything pertaining to chemistry or the value of an education. This is not only chemistry up-to-date but chemistry up-to-the-minute.

X. A serious attempt to show the applications of each day's lesson to industry and everyday life—a serious attempt to vitalize chemistry.

To put new life into old chemistry you must not only know chemistry and love to teach chemistry but you must also live your chemistry. The pupil will catch your enthusiasm and will realize that it is a privilege to know, that it is a wonderful world in which he lives; that the world was not built by chance. He will understand the world better and will therefore be the better fitted to live in it; his mind will be on things worth while, and to him finding out will be fun and work will be living.

But I have been asked to tell you especially about our chemistry exhibit or open house. Through public lectures, newspaper articles and the pupils I had succeeded in taking the chemistry department to the parents, but I wished further to bring the parents to the chemistry department that they might have a more definite and intimate knowledge of it and therefore take a more personal interest in it.

The English department caught the attention of the community through the annual public class play, the music department through the annual opera, the athletic department through football, but the attention of the public was never definitely directed toward other departments. I suggested that indoor athletics, manual training, household arts, the art department and all the sciences unite in a public exhibit or keep open house. I knew that the parents would come for one if not for the other and while we had them there we knew they would look in on the chemistry department and we prepared to have something for them to look at when they looked. Between five hundred and one thousand people were present at our first exhibit and the next year saw an unusual increase in the number of pupils enrolled in the chemistry department. The exhibit has been repeated several years with the same marked success.

As soon as one exhibit is over I begin to think of and plan for the next. To succeed with anything it must be uppermost in one's mind. If, when you get an idea, you put it down on paper and carry that paper with you so that it is always at

your finger's end, you will have plenty of material when the time comes. It is best to give the exhibit toward the end of the school year when the pupils are more skilled in laboratory work and have a better working knowledge of chemistry. The experiments are taken largely from the regular work, but enlarged, perfected and made practical. Special effort is made to introduce things of local interest.

Just before one of our exhibits it was reported that at a banquet held in Chicago some one had put arsenic in the soup and most of the guests were poisoned. One of my pupils made some soup, put arsenic in it, tested for, and found it. At the exhibit he showed and explained his results, but I did not let him make the experiment in the presence of the guests because of the danger involved. Testing cigarettes for nicotine and the papers for arsenic and arranging an apparatus to smoke the cigarette are always of great interest to the boys and this demonstration does more good than a lecture on cigarette smoking.

It is better to develop some definite subject.

At our last exhibit the subject was "Some Applications of Chemistry to the War." I chose this because it was uppermost in people's minds. "Practical Applications of Chemistry," "Some Applications of Chemistry to Industry," "Some Interesting Chemical Experiments," "Chemistry in the Home" are topics we have had. I begin to talk to the pupils about this at least one month before the date of the exhibit and post a suggested program on the board. I ask them to add anything they think would be good and, if approved by me, I let it go on the program. There are always some interesting and valuable suggestions. One boy suggested an exhibit on bacteria as he expected to be a physician. He gave a most interesting and commendable demonstration of bacteria responsible for contagious diseases and handled the microscope with unusual skill in preparing slides for the guests. A girl suggested an exhibit on the composition of man in which we should have bottles containing samples of the elements in man and the exact amount in the average body of one hundred and fifty pounds in weight. This proved to be very interesting and instructive. Another pupil designed and constructed a large, original and successful working model of Hiero's fountain. It ran for two hours or more and with a jet at least two feet high and could be varied at will. Another prepared a case of radiographs and photomicrographs. He made a cabinet for them electrically lighted and placed it

permanently on the laboratory wall. One day when a boy fell and broke his wrist this boy made an X-Ray plate of it for the doctor which distinctly located the fracture. Another was testing a sample of vinegar to find the per cent of acetic acid when suddenly he gave a scream. He had taken his burette where there was a good light to get an accurate reading when he discovered that it was alive. There were millions in it. We soon had them under the microscope and then we used the projection lantern to throw them on the screen. You can imagine the excitement. He had discovered the vinegar eel.

I ask those who are willing to be responsible for certain topics to write their name after it and I always have more volunteers than I have room to allow to take part. This gets the pupil to do the thing in which he or she is interested and they gladly read and spend extra time on their topic. Of course, they must talk it over with me and be sure that their experiment is a success or it cannot go on the program. On a separate sheet of paper for each I write all the questions which I can think of that any visitor might ask them and they must be certain that they can answer these questions. A card explaining what the pupil is doing is tacked at the top of his desk. A printed program and a hygrometer calendar is handed to each visitor as he arrives. This exhibit is given at night.

The following points about the exhibit should be emphasized:

- I. More than five hundred persons came to the exhibit where not more than four or five visit the regular recitation and laboratory work during the year.
- II. It is interesting to the teacher as well as the pupil and I learn more from it than the pupil. It helps to keep one out of the rut.
- III. It gives a number of boys and girls an opportunity to show their ability who do not ordinarily take part in public affairs or athletics.
- IV. It acquaints the community with the splendid equipment and facilities of the chemistry department.
- V. It impresses the public with the practical value of chemistry.
- VI. The pupils take pride and pleasure in doing and explaining these things and a new and practical interest in chemistry is awakened.
- VII. Parents and teacher meet under most favorable conditions.
- VIII. It increases the enrollment materially.
- IX. The best things that have ever been said in the public press about me and my work have been said by those who visit this exhibit. The value of such unsolicited praise in its influence on the community is immeasurable.

Of course this is advertising but it certainly is legitimate and it gets results.

CHEMISTRY EXHIBIT, 1915.

This is an attempt to give you an idea of the work done and a demonstration of how it is done.

LECTURE ROOM.

- I. The list of experiments recorded in the top row to the right as you enter shows the list of experiments made by each pupil during the

year. (Each pupil makes eighty experiments and analyzes twenty unknowns.)

II. Below the experiment records are reports on investigations made at home, including the interpretation of labels on canned package and bottled goods and the testing of cloth fibers, etc.

III. Above the north blackboard are colored charts showing the relative amounts of food values in the most common foods.

IV. The analysis of milk collected from Oak Park wagons.

This analysis is in charge of Kent Early, assisted by Robert Helmle and Brice Barber.

LABORATORY.

Pupils are working as they do in regular laboratory work. Each experiment presented tonight has been made by every pupil.

- I. Making nitric acid.
 - II. Testing candies.
 - III. Testing vinegar.
 - IV. Analyzing water.
 - V. Testing extracts, coffee, butter.
 - VI. Weighing a hair.
 - VII. Making hydrogen—a constituent of water.
 - VIII. Making oxygen—the other constituent of water.
 - IX. Testing foods for food value.
 - X. A study of bases.
 - XI. Making soap.
 - XII. Making ammonia.
 - XIII. Making bromine.
 - XIV. Testing cloth fiber.
 - XV. Finding the percent of wool in a piece of cloth.
 - XVI. The distillation of wood and coal.
 - XVII. Analyzing unknowns.
 - XVIII. Making carbon dioxide, the gas in soda water.
 - XIX. A study of hard waters.
 - XX. Making hydrochloric acid.
 - XXI. Distilling water.
 - XXII. Analyzing tooth powders.
 - XXIII. Testing sausage, hamburger, dried apricots, peaches, apples, and pears.
 - XXIV. A study of saturated solutions.
- The Hiero fountain was designed by Fleetwood Albright and constructed by Fleetwood Albright and Kenneth Birkin.
- The siphon fountain was also constructed by Birkin and Albright.
- The exhibit on "The Composition of Man" was prepared by Elizabeth Fuller.

The microphotographs and radiographs and the exhibition case in which they are displayed is an original piece of work by Harvey Morrow.

1916.

LECTURE ROOM.

- I. The analysis of milk from Oak Park dairies is made by Walter Blount and Marshall Wilson.
- II. Fire extinguishers are demonstrated by Gordon Hurst and Chauncey Grainger.

LABORATORY.

1. Arsenic in cigarette papers and nicotine in the tobacco.
2. An inexpensive, automatic still.
3. Alcohol in patent medicines.
4. Can you hard boil eggs and cook potatoes on Pikes Peak?
5. Convection currents in water when heated.
6. The manufacture of illuminating gas.
7. To compare the quantities of gas given off by different brands of baking powder.
8. Methods of extracting oils.

9. Making corn syrup from starch.
10. Making and distilling alcohol. The yeast plant.
11. Various ways to dye cloth.
12. Making library paste.
13. Photography.
14. How we know the composition of the sun.
15. Crystals.
16. Writing with electricity.
17. Testing cotton, silk, wool and linen.
18. Making soap.
19. Separating water into hydrogen and oxygen.
20. Chlorine, the gas used in gas bombs.
21. The ammonia fountain.
22. As the microscope sees it.
23. An acetylene gas plant.
24. Etching designs on glass.
25. Glass blowing.
26. Silver and copper plating.
27. What makes them go?
28. Some simple interesting experiments.

1917.

LECTURE ROOM.

I. Above the north board are colored food charts showing the relative amounts of food value in the most common foods.

II. The manufacture of illuminating gas from soft coal demonstrated by Arthur Jones and George Madill.

LABORATORY.

Pupils are working as they do in regular laboratory work.

1. Detecting arsenic in soup.
 2. Acetylene gas.
 3. Nicotine in cigarettes.
 4. Phosphorus from match heads.
 5. Silver plating.
 6. Alcohol in patent medicines.
 7. Testing candies.
 8. Testing vinegar.
 9. Analyzing water.
 10. Testing extracts, coffee, butter, etc.
 11. Making hydrogen, a constituent of water.
 12. Making oxygen, the other constituent of water.
 13. Testing foods for food value.
 14. Making soap.
 15. Ammonia, the cleaning agent.
 16. Bromine, for gas bombs.
 17. Chlorine, for gas bombs.
 18. Testing cloth fiber.
 19. Carbon dioxide, the gas in bread and soda water.
 20. Hydrochloric acid, the acid in the stomach.
 21. Distilling water.
 22. Testing hamburger, dried peaches, pears, apples, etc., for sulphur compounds.
 23. Neutralizing an acid by a base.
 24. Radium.
- A demonstration of photographic work by Charles Hudson and Thomas Hildebrand.

Some studies of bacteria by George Wantz.

An exhibit of the composition of man.

MARCH 14, 1919.

Theme: Some applications of chemistry to the war.

RECITATION ROOM.

Here will be found many souvenirs and trophies of the war which the young people will be glad to show and explain to you.

LABORATORY.

The pupils will demonstrate the following and will be pleased to answer your questions.

1. Signal lights, smoke screens, star shells, James Quigley.
2. Oxygen for the pulmotor, oxygen helmet and oxy-welding, Arthur Matthews.
3. Hydrogen for balloons and oxy-hydrogen blow torch, Genevieve Hipp.
4. Filling toy balloons with hydrogen, Douglas Gordon.
5. Matches used 100 years ago, Laurence Mills.
6. The electrolysis of salt, (lye, chlorine and hydrogen), Willard Vaughn.
7. Chlorine for gas warfare, bleaching, and for purifying water, Thomas Empey.
8. Soapmaking (glycerine for nitro-glycerine), Roy Farwell.
9. Bromine for gas warfare, Miles Stybr.
10. Nitric acid for nitro-glycerine, dynamite and smokeless powder and T. N. T., Lawton Tabor.
11. Sulphuric acid for nitro-glycerine, dynamite and smokeless powder, David Johnson.
12. Gunpowder, Earl Larsen.
13. Ammonia for nitric acid and as refrigerant, Munson Emery.
14. Saltpeter for gun powder and fertilizer, Ormand Lyman.
15. Iodine to reduce swellings, antiseptic in operations, Marion Hall.
16. Ether as anaesthetic in surgical operations, Lester Lloyd.
17. Chloroform, anaesthetic in surgery, Howard Root.
18. Fulminate of mercury to discharge explosives, Frederick Hart.
19. What the boys had to drink in France, Gerry Bates.
20. The composition of man, William Cary.
21. Fire extinguishers, dry, wet, pyrene, Arthur Lomas.
22. Sensitive ink used by spies and for telling fortunes, Florence Shafer.
23. Photography, John Huff.
24. The electrolysis of water, hydrogen for balloons, oxygen for helmets and welding, John Phillips.
25. Testing vinegar, vinegar eels, Ruth Macauley.
26. Testing cloth, cotton, silk, wool, linen, Gladys Watts.
27. Silver plating, Kathryn Ratcliff.
28. Radium for radiolite watches (dark room), Norris Gathercoal.

AN EXPERIMENT TO DETERMINE THE DRIVING TORQUE OF AN AUTOMOBILE.¹

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If an automobile or chassis is accessible to members of a physics class, the following problem will prove to be very interesting and practical.

Power equals Force x Velocity (ft. per minute)

Horsepower equals Force x Velocity divided by 33000

Neglecting the loss in transmission, the power of the engine will be the same as the power of the driving or rear wheels. If the last equation is used to determine the horsepower developed at the tires of the rear wheels, the force factor is the push exerted by the rear tires against the road. This push is known as the "trac-

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