

color, the yellow wedge absorbing the blue of the spectrum, so that it may be called *minus blue*; the magenta absorbing the green of the spectrum, so that it may be called *minus green*; and the blue or *minus red* wedge absorbing the red of the spectrum. When these wedges are placed over each other in pairs, they will give any color possible, provided that the intensity is adjusted at the same time by the use of a neutral gray wedge, which is supplied as the fourth wedge of the instrument. The instrument can be made with a number of attachments, according to the purpose for which it is required. Thus, colored solutions, colored glasses, and colored papers can

all be measured by suitable attachments. A modified form of the instrument has been designed for use in measuring vegetable oils, notably cottonseed oil. A diagram of the Eastman cottonseed oil colorimeter is shown in Fig. 6.

There is no doubt that colorimeters are just beginning to be used, and that their use will rapidly increase in the industries, and, above all, in the chemical industries. At the same time, the analytical measurement of color by means of the spectrophotometer will increase and will find many applications which are not at present apparent.

SOCIAL INDUSTRIAL RELATIONS

Out-of-Door Education for the Chemist

By H. W. Jordan

SYRACUSE, N. Y.

August is the peak of out-of-door life. Most of us succeed in getting back for two weeks to woods, lake, or seashore to re-create ourselves in preparation for the strenuous demands of laboratory or works, through fifty more weeks. The change and rest of the yearly country outing is only a part of its possible value. Out-of-door education is beginning to be recognized as a most promising means of making common school education the most adequate preparation for social, industrial, city life.

Among proofs of this tendency is a recent article by W. C. Ryan, Jr., Educational Editor of the *New York Evening Post*. Under the title "Summer Camps Blazing Way in Education," he points to these camps—on mountain side and lake shore—as the prophetic symbol of the newer American education. "The value of the outdoor life in the sunshine, amid forests and lakes, with wholesome companionship, is incalculable. The opportunities afforded tend to bring the boy into closer kinship with nature, develop his manliness, stimulate good fellowship and a spirit of generosity. He cultivates self-reliance, self-respect and regard for others." Out-of-door life prepares the boy for coöperative, industrial life.

"Is it not a pity that ideals like these cannot make themselves felt more in our entire program of education for the benefit of all youth, instead of merely for the 5 and 10 per cent of American children who at most profit by them?"

IN OUR PROFESSION OF CHEMISTRY, WE ARE CALLED UPON DAILY TO EXERCISE OUR SENSES AND OUR REASON, AS WE MUST WHEN LIVING OUT OF DOORS—The character of the precipitate, the shade of the dye, the cellular structure of the coke, the fracture of the pig, the intensity of the reaction, these and all chemical or physical conditions must be sharply, correctly observed, and right conclusions must be drawn. Just as, in camp, we need to forecast whether the wind will raise the water at our end of the lake and damage our boats during the night; need to observe the habits of fish, that we do not waste our time drowning worms instead of dropping them overboard at the exact place and hour when fish are keen for food; need to know the lay of the land, the position of the sun and stars, and the growth habits of trees, to guide us back if lost in the woods.

"The good hand fisherman is the man who can feel correctly what is going on at the fish hook out of sight, and can make his motor nerves react quickly to what he feels there," says President Eliot of Harvard.

There is no better boyhood training for a research chemist than a series of summers spent in the woods with councilors of the John Muir and Enos A. Mills type, who love and understand nature, and who saturate the soul of the boy with science of field and forest.

"I raised my four boys in the country to give them an experience that would make them self-sufficient, introspective, capable of doing things on their own initiative. Nothing emphasizes a boy's personality more than to find himself frequently alone and forced to depend on his own resources," says Professor Dallas L. Sharpe of Boston University.

MAN WAS AN OUT-OF-DOOR ANIMAL UNTIL RECENTLY—Furnaces and steam were curiosities to our grandparents seventy-five years ago, to be seen only in the homes of the wealthy. Open fireplaces with a kitchen stove, and sometimes one or two airtight stoves, were the only heating outfits in the best of homes. Fires were of wood, usually out at night. Indoor conditions were a pretty good imitation of out-of-doors, most of the time.

Within the lifetime of not more than four generations, not farther back than our great-great-grandparents, we have shifted from an agricultural, out-of-door people to an industrial, indoor people. This is a chief, fundamental cause of many most pressing problems of government, and of industrial and social life, and of education. We have got under cover so quickly that we have not yet learned how to act. We cannot drop habits of a million years' growth in a century and a half, without sustaining some severe shocks.

In the shift we have acquired a lot of new, high-priced diseases, most of which spring up inside us because we do not get enough exercise. If we work sixteen hours a day on a farm, in a lumber camp, or catching cod and mackerel from a dory, we have no trouble digesting salt pork, fried potatoes, baked beans, Boston brown bread, cream of tartar biscuits, and pie. We need no pepsin tablets or Nujol. We do not have to have our teeth pulled to relieve the distress at our stomachs. And the arches of our feet retain that same old hump they first had several million years ago, when we used our feet to hang head downward from the limbs of trees while picking the scuppernong grapes, thorn plums, and bitter-sweet apples of those days.

OUT-OF-DOOR LIFE COMPELS TRAINING OF SENSES—"The best part of all human knowledge has come by exact and studied observation made through the senses of sight, hearing, taste, smell, and touch. The most important part of education has always been the training of the senses through which that best part of knowledge comes. This training has two precious results in the individual besides the faculty of accurate observation—one the acquisition of some sort of skill, the other the habit of careful reflection and measured reasoning which results in precise statement and record," says President Eliot in his admirable little book, "Changes Needed in American Secondary Education."

Chemistry and the engineering professions require the swift,

sure reaction of the mind through the senses that the boy or girl can get only from self-reliant life, out of doors. City industrial life that limits children's play to the street, that brings them up in homes where heating, lighting, and cooking require only turning a valve, pressing a button, or opening a can, is not educational. It produces mental coma, especially when supplemented by such passive and vicarious sports as moving pictures, professional baseball, or riding to school in some one else's car.

Most of those in our profession who are over thirty were raised under the splendid educational influence of farm or village life. Their minds were activated in the fields and woods, and by doing, alone, the whole of a great variety of real tasks at home.

The younger ones of us, since telephone and trolley days, missed that training. It is unattainable to the youths who to-day are entering chemical and engineering industry, unless we more fortunate older men reorganize public education on its original foundation of the farm, the forest and the wide out of doors. At the beginning of the school year and of the autumn and winter seasons of civic activity, we can do no service of greater value than that of coöperating locally and nationally in practical work directed to that end.

MUCH OF THE ENERGY WE FORMERLY EXPENDED IN EXPLOITING THE VAST NATURAL RESOURCES OF OUR COUNTRY TO THEIR EXHAUSTION IS NOW BEING TURNED DESTRUCTIVELY AGAINST SOCIETY ITSELF—Continuance of profitable industry requires that we devise practical measures to bend that energy back to the land, in organized production of food and the raw materials of clothing and housing; and especially in attainment of education, drawn from farm and forest.

ACCIDENT PREVENTION THROUGH EDUCATION

The National Safety Council has so systematized accident prevention that most industrial plants of Council members protect their machines so well that it almost requires a professional burglar to break into them and get hurt. The result has been reduction of accidents by half, with some member companies reporting seventy per cent less accidents. The annual cost of accidents is therefore an approximate measure of the annual saving. On this assumption, using the figures of 1919, the net annual saving secured that year by safety devices is estimated to be one billion and some odd dollars; \$1,014,000,000 to be exact. This total is reached after crediting \$331,000,000, that need no longer be expended on the twenty-three thousand men killed that year in industry. The saving is a sum that compares favorably with the German reparation payments.

HOW DID THESE 23,000 MEN GET KILLED? We don't know about all of them. But we do know the details of several such deaths near home. In one case a workman dropped a jackknife, which skittered in under the main pulley. He deliberately climbed over, through and under a labyrinth of pipe and wire netting guards that surrounded that pulley. He did not get the jackknife, but he did get killed.

In another case, happily not fatal, a distillation kettle was set with its sampling nozzle pointed into a corner, in order that approach to it should be safe from both sides. The Young Chemist in charge, had occasion to try the oxidizing effect of potassium bichromate. He administered the dose through the sampling nozzle. But, in order to watch the effects more closely, in case there were an eruption, as was anticipated, our chemist got on the back side of the nozzle, up in the corner. He was a Cornell man, too.

He got his wish, for he both observed and experienced the effect. The blast from the nozzle destroyed a perfectly good pair of pants and burned an area on Young Chemist that kept him in bed several weeks. He and the charge in the kettle were thoroughly oxidized.

The men in these accidents and scores of others lacked gumption, and the primeval sense of self-preservation which self-reliant life out of doors compels. A mountain of guards would have been inadequate. The primitive instinct of self-preservation is slipping away from us, under the influence of specialized, industrial, city life. Legislation and legal precedent have passed the responsibility for one's safety over to the other fellow. If I go to sleep on the railroad track, the railroad must pay for the funeral and support my widow until death do us reunite or she marries again.

Here is one proof among many, of the tragic consequences of departing from nature, the farm, forest and stream, as the basis of education to train the senses, including common sense. "One of the best methods of developing the minds of children is practice in the coördinated activities of the brain and the hand," says President Eliot. "If brain, eye and hand are coöperating, the developing mental effect is increased; and the mental action and reaction is stronger still when eyes, ears and hands, and the whole nervous system, the memory and the discriminating judgment are at work together."

Camp life and country compel the child to experience that sort of action and reaction. City education cannot be molded to yield that result. In the accidents cited the victims lacked "discriminating judgment."

As a means of accident prevention to workmen, as a means of sharpening the observation and the reasoning powers of chemists, and as a basis of broader, deeper, sweeter life for all of us, we should restore nature, the out of doors, to the head of our public school curriculum.

Society of Chemical Industry

The program of the annual general meeting of the British Society of Chemical Industry, to be held at McGill University, Montreal, Canada, August 29 to 31, 1921, is as follows:

MONDAY, AUGUST 29

- 10:00 A.M.—Council meeting, McGill University.
- 11:00 A.M.—Annual meeting: (a) Address of Welcome. (b) Reply. (c) General business of the Society.
- 1:00 P.M.—Civic Reception and Lunch.
- 3:00 P.M.—Special visit to McDonald Agricultural College. Supper and Garden Party.

TUESDAY, AUGUST 30

- 10:30 A.M.—(a) Address. (b) Pulp and Paper Symposium (3 papers).
- 1:00 P.M.—Luncheon at Windsor Hotel given by Montreal Section.
- 3:00 P.M.—Visits to various industrial plants.
- 7:30 P.M.—Banquet, Windsor Hotel.

WEDNESDAY, AUGUST 31

- 10:00 A.M.—Special addresses and technical papers.
- 1:00 P.M.—Luncheon at Windsor Hotel, given by Montreal Section.
- 3:00 P.M.—Special Convocation at McGill University.
- 4:00 P.M.—Trip down Lachine Rapids.
- 11:55 P.M.—Leaving by night train to Shawinigan.

THURSDAY, SEPTEMBER 1

- Shawinigan—Visits to Grand Mere and Shawinigan Falls Industries, under the auspices of Shawinigan Falls Section S. C. I.

FRIDAY, SEPTEMBER 2

- Ottawa—Visits and entertainment, under auspices of Ottawa Section.

SATURDAY, SEPTEMBER 3

- Toronto—Visits and entertainment, under auspices of Toronto Section.

SUNDAY, SEPTEMBER 4

- Toronto—Visits and entertainment, and by boat to Niagara Falls, under auspices of Toronto Section.

MONDAY, SEPTEMBER 5

- Niagara—Visits to Industries on Canadian and American sides.