close to the Coast, in the succeeding net of triangles.

The criterion then is whether the directions of the points in the neighborhood of the fault have been measured within accumulated errors of observation of the order of a second of arc. Apparently, for all stations which are close to each other, though distributed on both sides of the fault, any errors in the adopted positions of *Mocho* and *Diablo* would be systematic in their effect upon relative displacements, affecting all stations alike.

In the summations of the changes at the various stations in groups, the computed probable error of a mean displacement is ±0.005″, or half a foot. Such precision is apparently five times that of the yearly zenith telescope results.

In the astronomical observations, one foot on the surface is closely equivalent to one one-hundredth of a second in latitude. In geodetic triangulation, one foot on the surface is equivalent to one second of arc, in the direction of a point forty miles distant.

On these grounds we may conclude that the precise differential results of triangulation are better tests for very small changes on the surface than astronomical observations of an absolute character.

R. H. TUCKER

LICK OBSERVATORY,
SEPTEMBER 30, 1922

CONSERVATION AND MODERN LIFE[1]

THIS is an age of high pressure living, of seemingly increasing complexity. Our modern civilization is making such insistent demands upon us that unless we counter by equally insistent measures of self-restraint we must be overwhelmed. Am I drawing too dark a picture or using too strong words? Look into your own experience and see if your success has not been due, in part, at least, to your resistance of certain tendencies and demands, or your failure in some particular to your inability or disinclination to combat some urge, external or internal. It is true, of course, that our lives must be shaped by the culture in which we live, but it is equally true that we must do our share in shaping that culture. Mere following the line of least resistance, passive floating with the tide helps neither our civilization, our fellows nor ourselves.

This is an era of conservation. Its spirit is in the air. We are coming to realize more and more that we must conserve our resources if we are to maintain a high place in the present organization of the community. This statement holds true whether we consider our material resources or our immaterial assets, whether we look to the preservation of our own status or to the maintenance of society. It is with this necessity in mind, then, that I venture to call to your attention a few facts and principles upon which we may base our attitude toward the broader aspects of conservation. And because there is just as urgent need for conserving the elements which shall minister to our inner lives and experiences as there is for guarding those resources of more material nature I shall not confine myself strictly to those ponderable and tangible features which are usually grouped under the conservation movement.

Now whether we call ourselves conservationists or conservatives is just now of little moment. We shall find much in common in the two terms and the values they subserve. Do not both of them imply the clinging to and the preservation of all that is best in the heritage which has been bequeathed us? And what a rich heritage that has been! To what a wealth of treasure have we become heirs, whether we count our physical resources or those of spiritual natures and use. But with the conservative spirit there must also be mingled a real progressivism. Conservatism easily becomes reactionism, as progressivism is in danger of becoming radicalism if they are not actuated by a keen sense of balance. We find abundant exemplification of these statements in present day politics and in history, in the wastage of natural resources or in their undue withholding from proper use, in extreme tendencies in social life and customs, whether it be a clinging to the habits of the past or a hasty adoption of the fads of the present.

[1] Presidential address read before the Iowa Conservation Association at the Charles City meeting, July 13, 1922.

That there is real need for the conserving of our material resources no one, I feel confident, will dispute. We may classify these resources as those which subserve the necessities of our physical beings and those which minister to our inner and higher needs. I realize, of course, that no hard and fast line can be drawn between these. There is a sense in which all are necessary, since symmetrical development and well-poised usefulness of the human life can be attained only when all the ministry of nature has been offered and received. There are, however, a few materials which are basic and necessary for bodily existence. Such are the soil, the water supply, the coal and iron reserves, the vegetal and animal kingdoms, together with other less conspicuous but perhaps equally vital components of the earth's structure. Life in any form, much less in the highly complex types, can continue and thrive only where these are abundantly available and are put to constant use. Because of this their intelligent application to the needs of modern living and their equally intelligent reservation for the needs of future generations are alike imperative.

I do not propose to burden you with a mass of statistics but I do wish to present just a few facts and figures to show you how important a matter the careful use and husbanding of our natural resources has become. The soil is, of course, the basis of all wealth and civilization. Upon its intelligent cultivation depends the very life of the people. The United States proper includes 1,937,144,960 acres of land, of which 838,591,774 acres are classed as farm land. About 50 per cent. of this area is under cultivation, or about one fifth of the total acreage of the country. On this one fifth, then, the population must depend in large measure for its sustenance. How careful the tillers of the soil should be that this small fraction is put to its best use. Intensive farming, proper rotation of crops, more intelligent tillage, prevention of soil wastage, both mechanical and chemical, increased use of fertilizers—all means must be utilized if the necessary crop yields are to be maintained. At present the western states and Canada are among the foremost exporters of foodstuffs for other lands. What will happen when our own population demands all the food our farms can produce? What will happen when a still further increased population finds that the farming states can not supply its needs? It will not suffice to say that that day will never come. Unless our farms maintain and increase their yields that day will most surely come to us as it has come to other nations. The means I have already suggested will help to postpone that unfortunate time, and in addition the tillable acreage may be increased by irrigation and drainage, the losses due to injurious insects and mammals and to plant diseases may be lessened by increased knowledge, care and skill, and increasingly intelligent animal husbandry may improve the quality and quantity of our meat and dairy products.

Iowa may be proud of having both the largest acreage of improved land of any state in the Union, about 30,000,000 acres, and also the largest percentage of improved land to total area, nearly 90 per cent. This improved acreage is about one and one half times that of Texas and about two and one half times that of California. While Texas may boast of her oil booms and California of her climate Iowa must nevertheless produce the crops that shall help feed the world, for she is in the center of the richest land of the globe. The yield of the farms of the Union in 1920, including live stock on the farms, was $12,974,461,000 and that of Iowa during the same year was $1,175,504,318, about one twelfth of the total. My point in citing these figures is to emphasize Iowa's importance as a food producer and the necessity of maintaining and raising the high standard already set.

In mineral resources our country is wonderfully supplied. Probably no other land has such wide variety in such great abundance. This places upon us a stewardship of magnificent proportions and the responsibility is increased by the fact that to a degree far beyond what is true of the soil, these resources if once dissipated are gone forever. The field that has just raised a crop of oats may raise an equally good crop of corn next year, but the land from which our coal was mined last winter will never yield another such harvest.

The water which drives the turbines of Niagara may some day repeat its cycle but the gasoline that drove your car to this conference will never serve that purpose again. Yet in face of these facts millions of gallons of oil are used needlessly or are wasted in other ways. It is estimated that for every ton of coal mined thus far one half ton to one and a half tons have been wasted. We all know how carelessly iron products are handled. Machinery is exposed to the weather, tin cans are allowed to rust away, though the tin is worth large sums, and in many other ways there is a constant loss. It has been estimated that our petroleum supplies will be practically exhausted in a quarter of a century, that the available coal resources will be mined out in another hundred years and that perhaps half a century will see the exploitation of the best and most accessible of our iron ores. These estimates are based on productions similar to those of recent years. Should the output largely increase, the periods of availability will be correspondingly shortened. In this connection it may be well to state that mineral production in the United States advanced from a value of nearly $2,400,000,000 in 1915 to a value of over $6,700,000,000 in 1920, an increase of nearly 300 per cent.

In connection with the minerals and their consumption let me call your attention to the great field of service in the improvement of power-saving machinery. It is said that our steam engines utilize only 20 per cent. of the available power in the coal used. Our systems of heating are equally wasteful and must be improved if we or our posterity are not to suffer. It will not do to be thoughtless optimists. We must mingle foresight and prudence with our typical American hopeful front toward the future.

Other resources which must be held in higher esteem and cherished with greater care and foresight are our water supplies, our forests and other timber resources, together with all other beneficial plants and flowers and native animals. I shall only mention these, as they are to be discussed by more able advocates later at these sessions. I may call your attention in passing, however, to the recent news dispatches reporting nearly 400 forest fires in the far west, many of which, no doubt, were preventable, and to recent statements that insects annually destroy a billion dollars' worth of crops, a waste which the native birds would greatly reduce if given a free hand. I wish chiefly to emphasize here the point which I made earlier, that the beauties and creatures of nature which minister to our ethical and esthetic senses are as truly worthy of our care and attention as are these material necessities of which I have spoken. The world would be a cheerless habitation if it contained only iron and coal and oil and similar basic articles, so-called. Our bodies must be cared for, it is true, but are not our minds and our spirits of equal value? Shall we not then care for the things which help them to grow as well as for these others?

This leads me to another thought akin to that with which I began this address. This is an age of high-pressure living. Is it not of even greater importance that we conserve ourselves than that we care for the things of the world about us? Let me dwell for a moment then on this topic. We need to conserve our physical powers—by correct living, by judicious husbanding of all the gifts with which we are blessed, by scornful repudiation of all things which tend to weaken or break down our bodily endowments. They are ours not to waste but to use. Service is one of the pass words of the day. But service demands preparedness, and preparedness means careful training, self-restraint, symmetrical development. Again, we must conserve our mental powers and faculties. Never was there greater need of well-directed judgment, of poise, of balance, of a high sense of personal responsibility. I feel well-nigh heartsick at times at the inaneness and mental vacuity of such a mass of our young people, at their shallowness of thought and feeling, at the seeming lack of any sense of responsibility and obligation to the world in which they live and to generations yet to come. I can only hope that experience will deepen and broaden their minds and make them more fitted to fulfill those duties which must rest upon them. We are passing through a period of revulsion and reaction from the

tension of the past few years, which may account in part for the condition of which I have just spoken. Financially, industrially, politically, socially we are being driven by shifting winds and carried by changing currents. Shipwreck may be avoided, but clear thinking, cool judging, wise acting must be the pilots at the wheel.

Once more, we must conserve our spiritual ideals and attainments. This is no time for narrowness of outlook. If ever there was a time when broadness of vision was demanded it is to-day. I wonder if you realize to what extent intolerance, the backward look, narrow minded conservativeness are dominating or attempting to dominate the spiritual life of the day. This too, doubtless, is a passing wave, a manifestation of the reaction which is affecting other aspects of life. But its tendencies are dangerous. They are destructive rather than constructive. They tend to shut men out from the higher realms of spiritual life and thought rather than to welcome them and to incite them to the greatest attainment. The founders of our faith and the builders of our nation were men and women whose heads were set forward on their shoulders, not backward. They advanced into the unknown and made of it a patrimony for those who followed them. They held fast the freedom they had obtained and persistently aspired for more. Had it not been so, picture to yourselves, if you please, the history of the past three hundred years. If we abate the struggle or lose the winnings they have made, picture for yourselves again, if you please, the history of the future. Broad-mindedness, altruism, charity, faith, compounded with intelligence and a rational appreciation of the temper and needs of the time, these must be components in the lives of the men and women of to-day who are to shape the destinies of to-morrow.

I have attempted very briefly to summarize some of our resources, the dangers of their abuse and our obligation for their careful utilization. I have also tried to make clear our debt to the future, in the necessity of preserving to posterity as much as possible of the splendid gifts which we have received from a bountiful Creator. I have given you an impressionistic sketch rather than a detailed portrait. I am not a prophet of disaster and I fully believe that as new emergencies arise they will be met by new resources. But I do believe that the duty is laid heavily on each of us to do what in us lies to avert or at least to postpone these emergencies and by living hopefully, bravely, carefully and with our faces toward the light of the future, to conserve every resource, material and spiritual, that may contribute to an aspiring and inspiring life.

JAMES H. LEES

IOWA GEOLOGICAL SURVEY,
DES MOINES, IOWA

THE PRESENT SUPPLY OF BIOLOGICAL STAINS

As many requests have been received for information as to where stains can be obtained at present it seems well to publish a brief note listing the various manufacturers and dealers in this line at present.

Frequent inquiries are made concerning Grübler's stains. In this connection it can be said that there are at present on the market some stains of undoubted Grübler origin and others that are reputed to come from this source. There will undoubtedly be longer lists of Grübler's stains to be obtained as soon as it is easier to import them than at present; but as all of the recent investigations on stains point to the equal quality if not superiority of the American stains, there is no need of looking specially for the reintroduction of the German products. For this reason the domestic market conditions are most important at present. To understand these conditions it must be remembered that there are three different classes of concerns to deal with in this matter: (1) the basic manufacturers, (2) the specialists in biological stains and closely related chemicals, and (3) the dealers in general laboratory supplies.

The basic dye manufacturers are of little concern to the biologists, with two exceptions. These two are:

Calco Chemical Co., 136 Liberty Street, New York City.

National Aniline and Chemical Co., 40 Rector Street, New York City.

Both of these have departments that prepare