Another recent study has been published from the California Agricultural Experiment Station.[4] This reviews the life history and gives general information. The same general remarks will apply to W. J. Baerg's publication[5] from Arkansas. This includes a bibliography.

The most comprehensive study which has appeared is that of D'Amour[6] *et al.* from Colorado. These workers consider the spider and its venom rather thoroughly, and their paper should be read by all who are interested in the black widow and its activities.

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REPORTS

THE RESPONSIBILITY OF ENGINEERING

PRESIDENT ROOSEVELT has addressed to Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, and to the heads of other schools of technology and engineering an open letter that reads:

Events of recent years have brought into clearer perspective the social responsibility of engineering.

In respect of wise use of natural resources such reports as those of the Mississippi Valley Committee, the National Resources Committee and the Great Plains Drought Area Committee have brought out the facts impressively. The enclosed report, "Little Waters," presents in miniature many of the social-engineering problems of soil and water conservation.

In respect of the impact of science and engineering upon human life—social and economic dislocations as well as advance in productive power—the facts are revealed with distressing clearness in public records of unemployment, bankruptcies and relief. The responsibility of scientists has been analyzed in noteworthy addresses such as, among the most recent, those presented at the Tercentenary Celebration of Harvard University and the meeting of the British Association for the Advancement of Science.

The design and construction of specific civil engineering works or of instruments for production represent only one part of the responsibility of engineering. It must also consider social processes and problems, and modes of more perfect adjustment to environment, and must cooperate in designing accommodating mechanisms to absorb the shocks of the impact of science.

This raises the question whether the curricula of engineering schools are so balanced as to give coming generations of engineers the vision and flexible technical capacity necessary to meet the full range of engineering responsibility.

I am calling this matter to the attention of educators of high administrative authority in the hope that it may be thoroughly explored in faculty discussions and in meetings of engineering, educational and other pertinent professional associations.

To this letter President Compton made on October 23 the following reply:

In response to your challenge to educators to give students the necessary "vision and flexible technical capacity," and to engineers to "cooperate in designing and accommodating mechanisms to absorb the shocks of the impact of science," I am sure you will be pleased to know that these are already matters to which progressive educators and engineers have been giving most earnest and constructive attention through their schools and professional organizations. To this end, for example, increasing emphasis is being placed upon fundamentals rather than specialties in undergraduate engineering education, and there has been a notable increase in attention to the study of economics and social science.

I can not but wonder why your exhortation has been directed specifically toward engineers, for surely we would agree that similar breadth of knowledge and training is also urgently desirable among business leaders, economists and politicians—as is also thorough training in fundamentals. For example, there is a tendency in some quarters to make science the major scapegoat of our social ills, from which social planners will rescue us. What are the facts?

Just before the advent of the machine age, social planners were devising resettlement projects and model industrial communities based upon a scheme to employ labor of all children above the age of four years. This was their best solution of the desperate struggle of the masses of the people for the bare necessities of life. Since that time science and engineering have so increased productive power that it has been possible for enlightened public leaders to inaugurate a great program of social security, including child labor laws, universal education, moderate hours of labor, pensions, insurance and unemployment relief on a large scale. These are superimposed on an enormously improved general standard of comfort, health and interest in living. Such achievements of science dwarf into insignificance the "social and economic dislocations" to which you refer, unfortunate as these are and much as these merit the attention which you recommend.

One significant fact is generally unrecognized by those who are chiefly impressed by the fact that science, through machine production, has displaced human labor. It is that such machines are, by and large, products of a relatively old branch of science, mechanics, whereas the present day activities in science are principally in electricity, chemistry, metallurgy, biology and such newer branches as lead to new knowledge, new products, new industries, new employment and improved health and material welfare.

[4] *California Agric. Expt. Station, Bull.* 591, 1935.
[5] *Arkansas Agric. Expt. Station, Bull.* 325, 1936.
[6] *Quart. Review of Biology,* 11: 123, 1936.

There are two basic methods of dealing with "unemployment, bankruptcies" and similar dislocations which you mention, one palliative and the other curative. Both may be needed. The former includes relief, emergency work, and regulation, and operates immediately; the latter aims at creation of new employment, new wealth and new values, and is a longer range program. It is primarily to the latter that engineers and scientists are devoting their major attention, since both logic and past experience demonstrate its social effectiveness, and since it can only be carried on through their type of knowledge and training. Quite properly and of necessity it is the first method which has been the chief concern of the government, since the emergency called for swift action.

We engineers and scientists, however, are disturbed lest the palliative measures be mistaken for the cure, and lest the attention and money devoted to relief and regulation should interfere with simultaneous adequate attention and support to the basic contributions which our sciences can certainly make if given a chance.

As illustrations of our cause for concern, and of the need for broader understanding by political leaders as well as engineers, I would respectfully refer to four events. (1) The engineering and scientific organizations of the country combined to urge that a small portion of the public works expenditures be devoted to research aimed at better designs and materials for public works for the future, in accordance with all enlightened industrial policy. (2) Your Science Advisory Board of prominent engineers and scientists recommended that attention be given to development of scientific knowledge on which can be built the new industries, so urgently desired by your administration to provide employment. (3) Various groups urged that the present efforts to aid the farmer be supplemented by a really adequate attempt to create new markets for farm products through discovery of new industrial uses for these products through research. None of these recommendations was acted upon. (4) Your letter to us calls attention of the public to the "dislocations" produced by science, and quite properly calls on us to try to cure them, but it does not indicate interest in the creative work and permanent values which engineers and scientists continue to regard as their chief contributions to social welfare.

My colleagues and I will do everything in our power to deal with the situations which you have called to our attention: reciprocally we most respectfully urge you and your colleagues in the government to put science to work more effectively for the national welfare, and to encourage its activities in all three of its principal settings —in governmental bureaus, in industry and in educational institutions.

Since your letter was received through the press, it is evidently your desire to call these issues to the attention of the public generally. I assume, therefore, that there is no impropriety in my replying *via* the same route.

SPECIAL ARTICLES

THE HINGHAM RED FELSITE BOULDER TRAIN

IN the northern part of the town of Hingham, Massachusetts, is an area of banded red felsite, fragments of which were carried away by the ice-sheet and deposited in a fan-shaped boulder train that extends southeastward for many miles. In 1904 Professor W. O. Crosby published a map of part of this train extending about six miles from its source. For many years the writer has been mapping the locations of several hundred specimens of red felsite found by him within eight miles of the source. In 1933 two were found in a distant part of Marshfield and later search has revealed others on Cape Cod, Martha's Vineyard and Nantucket, to a maximum distance of eighty-five miles from the source.

As long ago as 1833 Professor Edward Hitchcock found bold outcrops of this rock, which he described "as in the form of ridges." In 1904 Professor Crosby mapped three neighboring ledges, two of which have since disappeared. The only remaining one is small in area and does not stand above the ground surface. There are, however, in that vicinity long walls and ornamental gate posts built entirely of the red felsite.

The rock, which has been called by some geologists the most beautiful in Massachusetts, is deep red to purple, compact and almost flinty, and contains scattered, dull yellow lenticular masses about half an inch long. Weathered surfaces show a distinct flow-structure marked by parallel thin discontinuous sheets or flat lenses of compact red material in a gray or pinkish matrix that is shown by a lens to have a similar flow-structure but on a much smaller scale. Abundant small phenocrysts of quartz and a few larger ones of feldspar are scattered in an aphanitic ground-mass, but there are no other distinguishable minerals. The exact sort of rock has not been determined microscopically, but it is probably a rhyolite or a dacite. As it contains small fragments of rocks of other sorts as well as of the red felsite itself, it is clearly a flow-breccia. It is not much roughened by weathering, but the dark portions are often left in relief, and it is easily distinguished from other rocks. It was one of the favorite materials used by the Indians in making arrow and spear heads.

The margins of the boulder train diverge southeastward, the angle between them being about 60°.