been paid to geothermal development until very recently, when a major project was begun in New Zealand [*Science* **126**, 440 (6 Sept. 1957)]. Taking advantage of an extremely favorable set of natural and economic circumstances on the North Island, the New Zealand government in 1950 launched a widely publicized program to utilize geothermal steam to produce electric power on a large scale. The apparent success in New Zealand (the schedule calls for initial power deliveries this year) triggered a rash of exploration and development schemes in a number of other widely scattered locations around the world. In Mexico, Iceland, El Salvador, Chile, Fiji, the British Windward Island of St. Lucia, and at the aforementioned Big Geysers, drilling programs are in the planning stages or already underway.

The "hot land" at Big Geysers involves 3200 acres extending for about 5 miles along the north side of a fault-line canyon. The release of pressure on the magma below at the time of faulting undoubtedly accounts for the presence of hot rocks relatively near the surface. Proving the presence of steam at a very shallow depth are five active fumerole areas and eight 500- to 600-foot wells drilled with primitive equipment in 1923–25 by a group of local men (among them, the late Luther Burbank) which are today still issuing steam with undiminished force. In 1955, leasing the land from the owners, Geyser Development Company, the Magma Power Company of Nevada drilled a test hole to a depth of 603 feet and also encountered steam. But financial difficulties retarded further exploration. In late 1956 Magma entered into a contract with the newly formed Thermal Power Company under which Thermal agreed to invest a minimum of $230,000 in test drilling, thereby acquiring a one-half interest in the lease. As it stands at the moment, Thermal is about to put down its first deep well, utilizing modern equipment of the type that has plumbed depths of from 1000 to 3000 feet in Italy and New Zealand. To supervise the operation, the company has retained as its consulting engineer Earl P. English, formerly vice president of Bechtel Corporation and consultant for Bechtel in recent drilling of New Zealand wells.

The Big Geysers project is still in the early, speculative stage and the aim is merely to test the energy potential of the property by drilling at many different locations and varying depths. Only after the results are in on this exploration and testing can plans be forthcoming for the economic utilization of the steam. Nonetheless, close observers exhibit a cautious optimism, pointing out that the eight old shallow wells, together with Magma No. 1, are blowing an estimated 6000 kilowatts of energy into the air; to duplicate this in a modern power plant would require the burning of 240 barrels of fuel oil or 1,444,000 cubic feet of gas per day. Temperatures at the 600-foot level have been determined at 600 degrees, and if the heat gradient continues to rise in proportion to depth, 1000- to 1500-foot bores might be expected to have very high temperatures and yield at least the equivalent of 4000 kilowatts per well (New Zealand wells have averaged 6000 kilowatts). So far Big Geysers steam, even for existent shallow bores, has proved to be dry, in contrast to the wet steam found in other areas; wetness constitutes a turbine corrosion hazard. Further, engineering reports on the region state that wells can be drilled as close together as 150 feet without reducing the production of their neighbors, and that the ultimate potential of the property could easily exceed 30 wells, or 100,000 kilowatts, should a substantial portion of the property prove productive.

If such results can be achieved, geothermal steam can compete very favorably in power production. For despite the large hydroelectric projects, both planned and under construction, California is very likely to continue chronically power-short as her population and industrialization maintain their phenomenal rate of increase. Geothermal steam shares with all other energy sources generating electric power the 300- to 400-mile transmission limit due to line loss, but it has a double advantage over hydrogeneration in not being subject to the vagaries of seasonal stream flow or the conflicting water requirements of irrigation vs. power development. Similarly, the sharp increases in fuel prices in the past few years, plus the need for boilers, which constitute 30 to 40 percent of overall power-plant costs, give geothermal steam a real advantage over standard thermal plants.

MICHAEL P. MCINTYRE
Department of Geography,
San Jose State College

Physical Review Letters

The *Physical Review* has announced that, beginning with the 1 July issue, "Letters to the Editor" will no longer appear in the *Review* but will be published in a supplemental semimonthly journal tentatively called *Physical Review Letters*. Because offset printing will be used, it will be possible to publish letters within 2 to 3 weeks after receipt instead of the present 6 to 10 weeks. The new *Physical Review Letters* will also contain abstracts of *Physical Review* articles that are scheduled for future publication.

Initially *Physical Review Letters* will be sent to all subscribers of the *Physical Review*. However, beginning in January 1959, a subscription price of $5 for members of the American Physical Society and $10 for nonmembers will be charged. At that date the publication charge in *Physical Review Letters* will be set at $30 instead of the present $25 per page.

A fast-publishing journal such as *Physical Review Letters* may become very popular with authors and could soon grow beyond reasonable bounds. Therefore the same strict standards that are now in operation for "Letters to the Editor" will be maintained for the new publication. It is expected that, on the average, only about 15 letters will be acceptable for each issue. "Letters" will be accepted only if they contain important new discoveries or deal with topics of high current interest in rapidly changing fields of research. All other contributions, no matter how short they may be, should be submitted for publication as articles in the *Physical Review*. Subscriptions for the new journal will be handled by the American Institute of Physics, 335 E. 45th St., New York 17, N.Y.

Suggestions on Undergraduate Biology Courses

The Committee on Educational Policies of the Division of Biology and Agriculture, National Academy of Sciences–National Research Council, has recently published reports on new approaches to the teaching of systematic botany and parasitism. The studies were prepared (with the aid of a National Science Foundation grant) to test an idea for meeting the recurrent problem of keeping teaching abreast of scientific advances [*Science* **125**, 809 (26 Apr. 1957)]. One method, the committee suggested, is to invite an *ad hoc* panel of competent individuals, each expert in a different branch of a given subject, to redefine course objectives and content. This tactic merely adapts the research symposium to consideration of teaching problems, with the hope of encouraging continuing experimentation and re-evaluation in teaching by individual instructors.

Members of each panel found, despite wide initial differences of view, that they could develop interesting new syntheses of content, with suggestions for adaptations to different teaching situations. The botanical report (published in the *Plant Science Bulletin*, January 1958) takes a broad view of systematic biology that should also interest zoologists. The parasitism report (published in the *Journal of Parasitology*, February 1958) looks toward a basic course on the biology of parasitism. More generally, the committee believes that the reports illustrate the

value of the approach and recommends that groups concerned with any biological areas consider the organization of similar *ad hoc* panels to help stimulate re-examination of undergraduate courses. A limited number of reprints of the two reports are available from the committee, 2101 Constitution Ave., NW, Washington 25, D.C.

Winds in the Upper Atmosphere

Using rockets which release confetti-like aluminum chaff more than 50 miles above the earth, Army scientists are plotting winds in the upper atmosphere. With this new method, developed at the U.S. Army Signal Engineering Laboratories at Fort Monmouth, N.J., a cloud of chaff is released and tracked by radar to produce a fast and accurate wind profile. The chaff has been swept along at some 200 miles an hour by the winds. Continuous measurements have been made from the maximum altitude of 283,000 (about 54 miles) down to levels of less than 100,000 feet.

The results of recent tests at White Sands, N.M., and Patrick Air Force Base, Fla., show that the metallic chaff method can provide an unbroken map of wind speed and direction—the first time this has been possible at such altitudes. Findings on winds within the test zones show that they are generally easterly and have about the same speed as the westerly "jet streams" found at altitudes of 30,000 to 40,000 feet. Hans J. aufm Kampe and Dudley E. Cline of the Army Signal Corps, one a physicist and the other an engineer, have been active in the development of the new wind-measuring technique.

Proposed Legislation

Of the many bills introduced in Congress, some have a special relevance to science and education. A list of such bills recently introduced follows:

HR 11261. Establish a self-liquidating scholarship loan fund to enable highly qualified high-school graduates in financial need to receive a college education. Keating (R-N.Y.). House Education and Labor.

HR 11329. Amend title IV of Housing Act of 1950 to authorize loans under college housing loan program for construction of science buildings and libraries at educational institutions. O'Brien (D-N.Y.). House Banking and Currency.

HR 11392. Create a Department of Science and prescribe its functions and establish a U.S. Science Academy within such department. Christopher (D-Mo.). House Government Operations.

HR 11271. Provide for establishment of Bureau of Older Persons within Department of Health, Education, and Welfare; authorize federal grants to assist in development and operation of studies and projects to help older persons. Ullman (D-Ore.). House Education and Labor.

HR 11414. Amend section 314(c) of Public Health Service Act, to authorize Surgeon General to make certain grants-in-aid for support of public or nonprofit educational institutions which provide training and services in fields of public health and in administration of state and local public-health programs. Rhodes (D-Pa.). House Interstate and Foreign Commerce.

HR 11363. Amend Communications Act of 1934 to prohibit subliminal projection by television stations. Hosmer (R-Calif.). House Interstate and Foreign Commerce.

S 3537. Encourage discovery, development, and production of manganese-bearing areas in U.S., its territories and possessions. Martin (R-Iowa). Senate Interior and Insular Affairs.

S 3539. Amend part VI of subtitle C, title 10, U.S.C. to authorize Secretary of Navy to take possession of naval oil shale reserves. Allott (R-Colo.). Senate Armed Services.

S 3606. Provide financial assistance to the states for educational purposes by returning to the states a portion of federal income taxes collected therein. Proxmire (D–Wis.). Senate Labor and Public Welfare.

HR 11776. Provide for national security through programs designed to increase the number of students in mathematics, science, engineering, and modern foreign languages in institutions of higher education. Provide additional facilities for teaching of such subjects. Assist teachers to increase their knowledge. Byrd (D–W.Va.). House Education and Labor.

HR 11785. Strengthen national defense, advance the cause of peace, and assure the intellectual pre-eminence of the United States, especially in science and technology, through programs designed to stimulate the development and increase the number of students in science, engineering, mathematics, modern foreign languages, and other disciplines. Provide additional facilities for the teaching thereof. Promote the development of technical skills essential to national defense. Assist teachers to increase their knowledge and improve their effectiveness. Gray (D–Ill.). House Education and Labor.

HR 11830. Provide for a federal program of loans to encourage and assist able and needy students to continue their education beyond the high-school level. Lane (D–Mass.). House Education and Labor.

HR 11833. Encourage expansion of teaching and research in education of mentally retarded children through grants to institutions of higher learning and to state educational agencies. May (R–Conn.). House Education and Labor.

HR 11854. Provide a federal grant program to assist the states and localities in the construction of schools. Engle (D–Calif.). House Education and Labor.

S 3582. Authorize the establishment of a Youth Conservation Corps to provide healthful outdoor training and employment for young men and to advance the conservation, development, and management of national resources of timber, soil and range, and of recreational areas. Humphrey (D–Minn.), Murray (D–Mont.), Neuberger (D–Ore.), Proxmire (D–Wis.), Jackson (D–Wash.). Senate Labor and Public Welfare.

S 3588. Amend title VI of the Public Health Service Act, as amended, in order to make certain clinics in rural areas eligible for federal aid to diagnostic or treatment centers. Payne (R–Me.), Flanders (R–Vt.). Senate Labor and Public Welfare.

S 3595. Amend section 406 of the Federal Food, Drug, and Cosmetic Act in order to provide that maximum concentrations for certain color additives used in coloring oranges be prescribed by regulation. Holland (D–Fla.). Senate Labor and Public Welfare.

HR 11835. Provide for holding a White House Conference on Aging to be called by the President of the United States before 31 December 1958, to be planned and conducted by the special staff on aging of the United States Department of Health, Education, and Welfare with the assistance and cooperation of other agencies of that department and of other departments and agencies represented on the Federal Council on Aging. Assist several states in conducting similar conferences on aging prior to the White House Conference on Aging. Rodino (D–N.J.). House Education and Labor.

S 3593. Amend the Atomic Energy Community Act of 1955 in order to authorize the Atomic Energy Commisison to dispose of certain property for college purposes. Gore (D–Tenn.), Kefauver (D–Tenn.). Joint Atomic Energy.

S 3604. Amend the act of 3 March 1915, which established the National Advisory Committee for Aeronautics, and establish the National Astronautics Agency. Case (R–S.D.). Special Committee on Space and Astronautics.

HR 11860. Amend the act of 3 March 1915, as amended, to increase the scope of the activities of the National Advisory Committee for Aeronautics (renamed in this act the National Advisory Committee for Aeronautics and Astronautics),