photochromic glasses, on the other hand, the species formed by irradiation at room temperature is completely unstable, and subsequent heat treatment precipitates no colloidal silver.

All of the photochromic properties of a given glass, including the wavelengths to which it responds, fading rates, and so on, vary between wide limits, depending on its thermal history.

The thermal history, beginning with the initial cooling of the glass melt, controls a number of critical factors that determine photochromic behavior, including not only the size and number of microcrystals but also the chemical composition and the atomic arrangement within each crystal (*7*). There is a complex interplay between nucleation and growth of the molten salt droplets; between relative solubilities of various ions in the glass, in the molten salt, and in the crystal; and between rates of diffusion of ions between glass and salt. In addition, interfacial phenomena may be important, since these particles are so small that they consist essentially of surface.

Research is in progress on the correlation of these phenomena with photochromic behavior. The problems of analysis are difficult, since the particles we are investigating are so small and occur in such low concentrations that they are exceedingly difficult to detect and are inbedded in a large mass of glass (Fig. 7).

Potential Applications

The most obvious potential uses for photochromic glasses in which darkening is reversible appear to be uses as material for windows, sunglasses, and other objects where dynamic control of sunlight is desired. Perhaps such glasses can be adapted for use in devices employing optical memory, in self-erasing display devices, and as "light-valves" in many types of new optical systems or in other systems in which variations of the amount of light can be used as a control or a monitoring device. Research has been going on for several years in the Corning laboratory on the complex interactions between the photochromic behavior of hundreds of glasses and environmental factors such as sunlight intensity, temperature, and atmospheric haze, with the objective of perfecting glasses for specific uses of these types (Fig. 8) (*8*).

Several years of research on photochromic silicate glasses sensitized by silver halide have led to the conclusion that these glasses possess combinations of properties (reversible photochromism, chemical durability, and transparency, or opacity, if desired) which make them potentially useful for light-control devices where long operating life is required. The small size of the silver halide crystals and the rigid, impervious, chemically inert nature of the glass matrix appear to be vital requirements for maintaining reversibility. These characteristics prevent loss of the colored photolytic products by side reactions with moisture or gases, or by diffusion.

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9. We are indebted to our co-workers in the Research and Development Division of the Corning Glass Works for their many contributions.

News and Comment

NSF: New Program Aims to Speed Process for Transforming Good Institutions into Excellent Ones

A major departure from the general postwar pattern of federal support for science education is about to get under way in the form of the National Science Foundation's science development program. Although the funds involved are, at least at this point, relatively small, the scientific, educational, and political implications are quite large—so large, in fact, that it is probably safe to say that the success or failure of this program is going to have a far-reaching influence on the evolution of higher education in the United States.

Briefly, the object of the science development program is to speed up the complex process whereby good institutions become excellent ones. Heretofore, federal agencies, including NSF, have indirectly contributed to this process through support of research projects at particular institutions. The rationale for project support was that the federal government was seeking research results—and, accordingly, research competence was considered the principal criterion for allocating funds. The rich got richer through this process, but for a long time it provided the granting agencies with an effective defense against political pressures for spreading the wealth on a geographical, rather than a quality, basis. Those pressures have been building up over the past few years, partly because of the cries of the have-nots, but also because of the need for new educational facilities to meet the federal government's technical and scientific aspirations. The result is that NSF, with a good deal of caution and with Congress looking on carefully, is about to embark on an effort specifically aimed at promoting institutional excellence, rather than at supporting particular research groups or projects.

Although the science development program is still in its formative stages, with the first grant yet to be made, one thing is clear: it obviously is not intended for the rich (the NSF announcement states that "institutions already recognized as being outstanding in science should continue to depend on ex-

isting programs for assistance"), but then, neither is it designed for the near-bankrupt. The intention is to work with less-than-first-rank institutions that are demonstrably on the way up, and to add to their present momentum through grants that will supplement their own development efforts. The down-and-out and those with nothing to show but ambition are not invited to apply.

For the institutions that fall into the aspiring middle class, NSF is currently planning ten to 15 five-year grants, generally not in excess of $5 million per institution. The eligibility requirements are stiff, but they are combined with wide-ranging flexibility on the use of the money.

Those who seek the grants must not only spell out what they have been doing to help themselves but must provide assurances that, once NSF drops out of the financial picture, they will have the resources to carry on. And, while NSF does not set forth specific goals to be achieved with its money, it wants to know "specifically, what will have been upgraded?" with the aid of the grant.

Outside of that, though, NSF is wide-open to proposals for using the money for anything from janitorial services to equipment and salaries. Significantly, undergraduate institutions are invited to apply, along with graduate schools, and proposals can be for strengthening single departments, a group of related departments, or the entire science program of an institution or for establishing new departments.

In any case, NSF realizes that its difficulties with Project Mohole and the now happily resolved financial irregularities of one of its grantees, the American Institute of Biological Sciences, has given it something of a reputation to live down on Capitol Hill. Both incidents were trivial compared to the bloopers that regularly turn up in the space- and defense-related research fields, but Congress clearly expects a higher order of competence and purity when it comes to higher education and fundamental research, and, in working out the science development program, NSF would rather go slow than go wrong.

Still to be worked out is the advisory apparatus for deciding who gets the grants. Since the program involves a venture into the political jungle of the hungry have-nots, a respected and disinterested advisory body is NSF's best protection against possible attacks by the losers. A number of possibilities are now under consideration, including the establishment of a new panel, or of a panel composed of members drawn from existing NSF advisory groups.

Although the House last year forbade NSF to undertake new programs, thus blocking plans that probably would have had the science development program now under way, it is apparent that NSF is proceeding with the informal blessings of its congressional appropriations subcommittees. The committees are yet to make public their verdicts on the budget, but NSF says that it has $3 million to devote to the program this year and expects to have $25 million for the coming fiscal year.

Various interpretations have been offered of last year's harsh treatment, but whatever accounts for it, it appears that Leland Haworth, who became NSF director last summer, has worked out a good relationship with the legislators who control NSF's financial fortunes.—D. S. GREENBERG

Daddario Committee: Hearings To Be Held on Overhead Support and Geographical Distribution

Now that the House Science and Astronautics Committee has completed its annual task of reviewing the space program, it plans to resume its inquiry into the general problems of science and government.

Under the chairmanship of Emilio Q. Daddario (D–Conn.) the committee's subcommittee on Science, Research, and Development has staked out two troublesome problems for hearings starting 5 May: (i) geographical distribution of federal research and development grants and contracts, and (ii) indirect costs and overhead for basic research grants and contracts. The hearings, which are expected to last about 5 days, will concentrate on testimony from representatives of federal agencies. Later hearings will bring in other witnesses.

The subcommittee has also announced the appointment of a Research Management Advisory Panel "which will act as a special task group for the committee in pointing the way to improve research management." The members are:

James B. Fisk, president, Bell Telephone Laboratories, Inc.

James M. Gavin, president, Arthur D. Little, Inc.

Samuel Lenher, vice president, E. I. duPont de Nemours & Company.

Wilfred J. McNeil, president, Grace Line, Inc.

Don Price, dean, Graduate School of Public Administration, Harvard.

C. Guy Suits, vice president and director of research, General Electric Corporation.

Jerome B. Wiesner, former White House science adviser, dean of science, M.I.T.

Michael Michaelis, formerly of the White House Office of Science and Technology and now Washington representative of Arthur D. Little, Inc., will serve as executive director.

Meanwhile, the Daddario committee's running mate in the field of congressional investigations of science, the Elliott committee (or the House Select Committee on Government Research), is proceeding with its ambitious studies of ten areas of federal involvement in research-related matters (*Science*, 14 Feb. 1964). No date has been set for additional hearings, but it is likely that some will be held before the committee's mandate comes up for renewal in December. For both Daddario's and Elliott's committees these are critical months. Eventually there is going to be some congressional sorting out of jurisdiction over government research programs, and the committee that can show the best stuff will be in a good position to claim the prize when the Elliott committee's renewal is before the House. Needless to say, there is no love lost between the two groups.

—D.S.G.

California: Junior Colleges Are the Key to State's Own Version of an Open Door Policy

One of the less obvious reasons why California's system of public higher education has been a pacesetter is that California is further along than most other states toward solving one of the touchiest problems of expansion—selective admissions.

In many state systems—in the Midwestern and Border states, for example—the question of whom to admit and whom to exclude from which public institutions of higher education is a difficult and politically volatile issue.

A familiar pattern followed by many states was to differentiate institutions by function. A university was estab-