ways. Principal attention thus far has been focused on the gross toxicity created by certain compounds. Questions relating to the possible subtle physiological effects of small quantities of metallic ions, chemical compounds and certain natural-occurring substances in water have not been answered.

Concerning the public health implications of water quality it would also be desirable to intensify research on disinfection techniques. With good reason, heavy reliance has been placed on the employment of chlorine for this purpose in the United States. Its virtues as a bactericide are well established. But the same cannot be said concerning the effectiveness of chlorine as a virucide. Present concern with virus infections that may be transmitted through water carriage (hepatitis, for example) would seem to justify emphasis on the exploration of techniques applicable to virus disinfection.

Technological developments

Fundamental principles for the purification of waste waters developed a century ago—gravity settling of solids, chemical precipitation and biological oxidation—continue to be applied to this day. But this is no reason to presume that technology has been static or that current practices are outmoded or inadequate. Significant advances have been made in design of components and in operating techniques. And it can be said that increasing advantage is being taken of new developments in physics, chemistry, electronics, mechanical engineering, and allied technologies.

For example, recent discoveries associated with the performance of polymer chemicals known as polyelectrolytes is already finding application for the improvement of coagulation practice in waste treatment. Use of chemicals for treatment of sewage is an old art and was widely exploited in England in the 1880's and shortly thereafter in the United States. Current experimentation with the use of polymers suggests that we are on the threshold of a new era in the employment of flocculation techniques for pollution control.

Meantime, under the leadership of the Public Health Service a host of so-called advanced waste-treatment processes are being investigated. This program is oriented primarily to long-range needs for safeguarding water quality, when conventional methods of waste treatment, coupled with reliance upon the assimilative capacity of streams, may not prove adequate to meet ultimate requirements for multiple reuse of water. However, the work has short-range implications as well in providing means for removal of so-called refractory pollutants.

Basic objectives of the program are to develop processes for treating waste effluents in such fashion as to (1) concentrate the contaminants and provide for their permanent disposal; and (2) produce purified effluents of such quality that it is suitable for direct reuse.

Among the possibilities for accomplishing these objectives are techniques employing principles of adsorption, electrodialysis, emulsion separation, evaporation, extraction with solvents, foaming, freezing, hydration with gas, ion exchange, and oxidation.

From the standpoint of technological adequacy this research program is believed to be "doomed for success," because some of the processes already show capability of meeting the objectives. The