

3. McMaster, W. J., Scott, A. I. and Tripett, S., *J. chem. Soc.*, 1960, 4628.
4. Raistrick, H., Robinson, R. and White, D. E., *Biochem. J.*, 1936, **30**, 1303.
5. Perkin, A. G., *J. chem. Soc.*, 1898, 672 and 1028.
6. Robertson, A. and Waters, R. B., *Ibid.*, 1929, 2239.
7. Spoelstra, D. B. and Van Royen, M. J., *Rec. trav. chim.*, 1929, **48**, 370.
8. Asahina, Y., Asano, J. and Ueno, Y., *Bull. chem. Soc. Japan*, 1942, **17**, 104.
9. Dalal, S. R. and Shah, R. C., *Chem. and Ind. (London)*, 1956, 664.
10. —, Sethna, S. M. and Shah, R. C., *J. Indian chem. Soc.*, 1953, **30**, 463.
11. Davies, J. E., Kirkaldy, D. and Roberts, J. C., *J. chem. Soc.*, 1960, 2169.
12. Ramanathan, J. D. and Seshadri, T. R., *Curr. Sci.*, 1960, **29**, 131.
13. Pillay, P. P. and Lekshmi, A., *Bull. Res. Inst., University of Kerala*, 1957, **5A** (i), 40.
14. Yates, P. and Stout, G. H., *J. Amer. chem. Soc.*, 1958, **80**, 1691.
15. King, F. E., King, T. J. and Manning, L. C., *J. chem. Soc.*, 1953, 3932; 1957, 563.
16. Ashley, J. N., Hobbs, B. C. and Raistrick, H., *Biochem. J.*, 1937, **31**, 385.
17. Lund, N. A., Robertson, A. and Whalley, W. B., *J. chem. Soc.*, 1953, 2434.
18. Ross, D. J., *Newzealand J. Sci. Technol.*, 1950, **32 B**, 39.
19. Bringi, N. V., Dave, K. G., Karmarkar, S. S., Kurth, E. F., Mani, R., Ramanathan, V. and Venkataraman, K., *Sci. Proc. roy. Dublin Soc.*, 1956, **27**, 100.
20. Seshadri, T. R., *Curr. Sci.*, 1957, **26**, 239.
21. Aghoramurthy, K. and Seshadri, T. R., *J. sci. industr. Res. India*, 1954, **13 A**, 114.
22. Ahluwalia, V. K. and Seshadri, T. R., *Proc. Indian Acad. Sci.*, 1956, **44 A**, 1.
23. Rao, G. V. and Seshadri, T. R., *Ibid.*, 1953, **37 A**, 710.
24. Jain, A. C., Mittal, O. P. and Seshadri, T. R., *J. sci. industr. Res. India*, 1953, **12 B**, 647.
25. Seshadri, T. R., *Experientia, Suppl. II*, 1955, 258.
26. Posternak, T., *Helv. chim. Acta*, 1936, **19**, 1336.
27. Aghoramurthy, K. and Seshadri, T. R., *Proc. Indian Acad. Sci.*, 1952, **35 A**, 327.
28. Bate-Smith, E. C. and Swain, T., *Chem. and Ind. (London)*, 1950, 1132.
29. Mull, R. P. and Nord, F. F., *Arch. Biochem.*, 1944, **4**, 419.
30. Grover, P. K., Shah, G. D. and Shah, R. C., *J. sci. industr. Res. India*, 1956, **15 B**, 629.
31. Pankajamani, K. S. and Seshadri, T. R., *Ibid.*, 1954, **13 B**, 396.

SOLAR ENERGY

THERE are two chief methods of harnessing solar energy. The first is the direct method or the "greenhouse" method known to all horticulturists. The interior of the greenhouse heated by the sun's rays, reflects long infra-red waves to which the glass is opaque. The heat of these rays is caught as it were in a trap: it cannot escape and tends to accumulate in the glassed-in space. This method, therefore, allows the sun's rays to enter through a glass surface and prevents the radiation of bodies heated by the sun from escaping. The direct method can produce temperatures up to 150° C.—however, the practical working temperatures are kept at a lower level between 60° and 80° C.

The second method is by concentration of the solar rays on suitable collectors whereby temperatures ranging from several hundred to a few thousand degrees can be obtained. Two types of collectors are generally used: (i) The 'flat' collector consisting basically of a dark plate, insulated on the side away from the sun, and protected from the wind on the side facing the sun by a transparent pane. The plate may heat either liquid-filled pipes attached to it or air. (ii) The 'focusing collector' uses mirrors in order to concentrate the sun's rays upon a small receiving object with a dark surface. In general, the focusing collectors must be continually manoeuvred to follow the sun's movement.

The design and efficiency of the collectors have been improved in recent years by the use of new materials and of darkened selective surfaces with low radiating power, thus leading to higher operative temperatures. Glass, anodised aluminium and new plastics aluminised in a vacuum have been used for focusing collectors.

A third type of collector, suitable for very large surfaces, has been studied in France and in Israel. This is the 'solar pool', a shallow basin with a darkened bottom whose operation is based upon the principle of water density. By dissolving salts in the water at the bottom of the pool, a very salty layer is obtained while the top layer remains unsalted, the difference in density preventing them from mixing. The top layer keeps an even temperature, because it loses its heat at the same rate as it stores it, but the heat generated in the salty water at the bottom of the pool does not escape and it can be used as a source of power.

Conversion of solar heat into electricity through thermocouples has reached a high degree of development, thanks to improvements resulting from basic research in solid state physics. Progress in this field of solar converters has been particularly noteworthy in US and USSR under their programme of space research.—(UNESCO).