by pollarding, coppicing or root-suckers, are being closely investigated. The pamphlet deals with the financial and industrial aspects, period of collection of the leaves and grading, drying, still under experiment, storage, packing and transport.

Leaflet No. 64, on "The Growing of *Cryptostegia grandiflora* as a War-time Emergency Crop", describes another and more important war-time object, namely, the production of rubber. *Cryptostegia grandiflora* is indigenous to Madagascar and probably to Africa. The plant is described as a scrambler; it grows erect until about 1½ ft. high and then it climbs and scrambles until after some years it can again stand by itself. It is therefore greatly helped in its early development if it has something to climb on. It was imported into India many years ago as a garden plant for its flowers. It has since run wild in many places, generally in arid or semi-arid climates; for example, Kalka near Delhi, Muttra near Poona, Hyderabad (Sind), etc., with a rainfall of 5–25 in. and elevations up to 1,500 ft. In such situations it was noticed that the best development occurred on land subject to local inundations, but it obviously could withstand arid conditions. A survey by the Indian Agricultural Research Institute revealed the fact that it was present in all parts of India in various soils; namely, black, brown, red, laterite, Indo-Gangetic alluvium, sands, clays, acid and alkaline soils; in all climates without regard to temperature, rainfall, humidity, light, wind and exposure; on river banks and where the subsoil water table is high—an amazing power of adaptation. It is considered probable that a well-drained fertile soil with a gentle slope at about 1,000 ft. elevation and a rainfall of 60 in. will suit it best, particularly if it can be irrigated during periods of dry weather.

Since the Japanese occupation of Malaya and the Dutch East Indies, which deprived the Allies of some 90 per cent of their supplies of raw rubber, much work has been done on the possibilities of developing additional war-time supplies of vegetable rubber. The *Cryptostegia* in question has proved a most promising plant, and in the past eighteen months or so experimental work has been carried out and large-scale experience gained. Most of the publications on this work have been academic rather than practical. The present pamphlet, it is emphasized, only sets out to give the information at present available, based on a year's practice in planting plantations of the plant for the sole purpose of obtaining the maximum production of rubber in the minimum time, the question of costs not being of primary importance. A better plantation technique will be a matter for the future should this type of cultivation be found remunerative after the War. The seed is sown in nurseries and the seedlings put out at the outbreak of the rains when about two months old. They are planted in lines or double lines about 6 ft. apart to allow room for the tapping operations to be undertaken. Each row has a simple form of fence 4 ft. 6 in. high on which the plants can climb. Since the object is to obtain maximum results in the shortest time, dense planting is necessary. "Tapping," it is said, "has of necessity to be of a few shoots per bush; therefore we have to grow these shoots at such a height and by such an arrangement that the labour can tap as many shoots as possible in the smallest area with the minimum of trouble."

The pamphlet gives full details of all the operations necessary to form a plantation and to exploit it, but emphasizes the fact that the methods at present employed are the results of, and therefore to some extent due to, the fact that during the past year it has been a 'rush-job'. From the descriptions given of the work it seems to be very satisfactory, and to reflect great credit on the careful research work which has enabled it to be carried out at so critical a time for the Allies' rubber resources.

FLINT KNAPPING

TO fashion a flint implement both knowledge of the tricks of the trade and skill in execution are required. Watching the flint knappers at Brandon can teach the student many a 'wrinkle', but any attempt to do likewise soon demonstrates the over-riding importance of long and patient practice. The Pitt Rivers Museum authorities at Oxford have recently issued their first Occasional Paper on Technology, and it is entitled "The Manufacture of a Flint Arrowhead by Quartzite Hammer-stone"*. The author is Sir Francis Knowles and the work is plentifully illustrated. One can only regret that the writer had not the chance to collaborate in a more extensive work with M. Contier who, though he has, so far as I know, published nothing, is perhaps the most skilful maker of flint tools in existence.

M. Contier is, or was, an ornamental stonemason with a workshop in the outskirts of Paris; but he was also a pupil of Breuil in the typology of flint implements, and the combination has been very fruitful. It was he who showed that the single-faceted, highly inclined striking platform of the so-called Clacton technique involved the swinging of a nucleus against a stone anvil; while the right-angled platform of the Levallois implements could be produced by vertical blows on the nucleus with a hammer-stone. Again, it was Contier who discovered the possibilities of the 'wood technique': the striking of the core, held in the hand, with a baton of wood instead of with a hammer-stone, whereby flaking similar to that long recognized as characteristic of Acheulean tools can be produced. Actually, the use of the softer hammer partially resolves the phenomenon of percussion produced by a stone hammer into that of pressure. A dictum of Contier's used to run—the Chellean technique is that of the anvil, but Acheulean man held the flint core in his hand and hit it with a wooden baton. He also, like Dr. Leakey, had definite views as to how the various types of burins were made.

But Contier was essentially a craftsman. Sir Francis Knowles, though with a limited, definite objective, has given us the written word upon this subject of technique. He is concerned only with the manufacture of arrowheads, using a quartzite hammer-stone, not an iron hammer as do the knappers of Brandon. His paper is the book of words for doing this. He tells us how to choose the materials, how to hold and hit them, how to 'turn the edge' of the flake, etc. His instructions are indeed what a cook would call the 'recepe' for the production of a complicated and beautiful piece of craftsmanship. Very definitely papers of this kind have value; still far too little is known about the material flint and the various ways in which it can be fractured. Incidentally, anyone who has tried his hand at it will know the difficulty of describing in words

* Pitt Rivers Museum, University of Oxford. Occasional Papers on Technology, 1: The Manufacture of a Flint Arrow-head by Quartzite Hammer-stone. By Sir Francis Knowles. Pp. 38+6 plates. 5s.

knapping techniques and processes, and Sir Francis is to be congratulated that in the work under notice the reader, with only a very little concentration, will readily appreciate the way the author sets to work to make his specimens. M. C. BURKITT.

GEOPHYSICS AND GEOMORPHOLOGY IN U.S.S.R.

THREE numbers of the *Bulletin de l'Académie des Sciences de l'URSS*, Série Géographique et Géophysique (Nos. 4–5, 1941; No. 2, 1943; No. 3, 1943), which have recently reached us, give some idea of the progress made in geophysics and geomorphology in U.S.S.R. For convenience the papers are grouped under four headings: (1) Atmosphere, (2) Hydrosphere, (3) Lithosphere, and (4) Climatology.

(1) *Atmosphere.* A. M. Obuhov (453; 1941) presents a mathematical study of the energy distribution in the spectrum of a turbulent flow; M. E. Schwez, in his first paper (467; 1941), gives a mathematical study of the vertical velocities in a moving air mass, and in the second paper (No. 2, 55; 1943), a mathematical study of the velocity of wind and the turbulent diffusion; S. L. Ponisovski (432; 1941) discusses the state of the *E*-layer of the ionosphere at twilight; A. J. Driving, A. V. Mironov, V. M. Morozov and I. A. Khvostikov, in their study of the polarization and absorption of light in natural fogs (No. 2, 70; 1943), have found a discrepancy between observation and theory which they propose to solve by postulating the presence of submicroscopical droplets.

(2) *Hydrosphere.* Mathematical treatment of turbulence is attempted by M. Millionshchikov (433; 1941), who discusses the turbulent heat conduction of sea water; by W. Stockmann (483; 1941), who discusses the horizontal components of velocity of sea currents; and by K. V. Shutilov (447; 1941). L. S. Leibenson (411; 1941) presents a mathematical treatment of the movements of gas-containing liquid in a porous medium.

(3) *Lithosphere.* Magnetic anomalies in the Moscow region are discussed by A. G. Kalashnikov (No. 2, 83; 1943), thermal anomalies in the earth's crust caused by strata and rock masses of different thermal conductivities are discussed by N. N. Korytnikova (No. 3, 115; 1943); a new method of measurement of temperature in salt mines is proposed by S. A. Kraskovsky (No. 3, 134; 1943); a mathematical study of the processes of freezing and thawing is given by S. S. Kovner (No. 3, 143; 1943); and V. V. Beloussov (No. 3, 147; 1943) outlines a new hypothesis of the development of the earth's crust as due to the migration of radioactive elements. J. A. Skvorzov (Nos. 4–5, 501; 1941) discusses the methods of geomorphological analysis and mapping; and V. V. Galitzky (No. 2, 89; 1943) gives an account of the geomorphology of the Kara-Tau region (north-west Tian-Shan).

(4) *Climatology.* The problem of the gradual rise of the temperature of the arctic regions is discussed by B. L. Dserdsejevsky (No. 2, 60; 1943) and the effectiveness of synoptical weather predictions is discussed by M. A. Omshansky (No. 3, 161; 1943).

All papers are provided with summaries, either in English or German, but some of these summaries are too brief to be of much value. S. I. TOMKEIEFF.

FORTHCOMING EVENTS

*(Meeting marked with an asterisk * is open to the public)*

Tuesday, November 14

SOCIETY OF CHEMICAL INDUSTRY (joint meeting of the CHEMICAL ENGINEERING GROUP, the AGRICULTURE GROUP, and the INSTITUTION OF CHEMICAL ENGINEERS) (at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1), at 2 p.m.—Conference on "Grass Drying" (Dr. S. J. Watson: "Grass Drying—Chemical Aspects"; Mr. A. Goldberg and Mr. A. C. Bartelli: "Grass Drying—Engineering Aspects"; Mr. D. Fairclough: "Grass Drying—The Farmer's Viewpoint").

CHADWICK LECTURE (at the Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1), at 2.30 p.m.—Mr. Guy Howard Humphreys: 'Some Modern Trends in Sanitary Engineering" (Bossom Gift Lecture).*

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 5.15 p.m.—Mr. Christopher F. C. Hawkes: "Prehistoric Britain", (ii) "The Later Prehistoric Centuries".

ILLUMINATING ENGINEERING SOCIETY (at the E.L.M.A. Lighting Service Bureau, 2 Savoy Hill, Strand, London, W.C.2), at 5.30 p.m.—Mr. J. N. Aldington: "Bright Light Sources".

INSTITUTION OF CIVIL ENGINEERS (ROAD ENGINEERING DIVISION) (at Great George Street, Westminster, London, S.W.1), at 5.30 p.m.—Mr. A. H. D. Markwick: "The Basic Principles of Soil Compaction and their Application".

Wednesday, November 15

ROYAL SOCIETY OF ARTS (at John Adam Street, Adelphi, London, W.C.2), at 1.45 p.m.—Dr. L. Hartshorn: "High-Frequency Heating".

INSTITUTE OF FUEL (at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1), at 2.30 p.m.—Mr. B. F. Karthauser: 'The Development and Design of Shell Type Boilers".

BRITISH INSTITUTION OF RADIO ENGINEERS (NORTH-EASTERN SECTION) (at the Neville Hall, Westgate Road, Newcastle-upon-Tyne), at 6 p.m.—Mr. A. H. Hoult: "Theory of Rectification".

SOCIETY OF CHEMICAL INDUSTRY (FOOD GROUP) (joint meeting with the CARDIFF SECTION and the CARDIFF SECTION OF THE ROYAL INSTITUTE OF CHEMISTRY) (at the Newport Technical College, Clarence Place, Newport, Mon.), at 6.30 p.m.—Dr. E. B. Hughes: "Chemistry in the Kitchen".

SOCIETY OF CHEMICAL INDUSTRY (BIRMINGHAM SECTION) (joint meeting with the ROYAL INSTITUTE OF CHEMISTRY) (in the Chamber of Commerce, New Street, Birmingham), at 6.30 p.m.—Mr. C. W. Bonniksen: "Some Properties and Applications of Alginic Acids and Alginates".

Thursday, November 16

CHEMICAL SOCIETY (at Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Mr. G. M. Phillips, Mr. J. S. Hunter and Mr. L. E. Sutton: "Investigation of the Occurrence of the Co-ordinate or Dative Link by Electric Dipole Moment Measurements"; Mrs. G. A. Gilbert, Mr. F. Smith and Mr. M. Stacey: "A Constitutional Synthesis of Cellobiose and Gentiobiose".

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 2.30 p.m.—Sir James Jeans, O.M., F.R.S.: "Old and New Descriptions of the Astronomical Universe", (iii) "Galaxies".

ROYAL SOCIETY OF ARTS (INDIA AND BURMA SECTION) (at John Adam Street, Adelphi, London, W.C.2), at 2.30 p.m.—Dr. R. Maclagan Gorrie: "The Place of Mechanized Equipment in Indian Soil Conservation".

LONDON MATHEMATICAL SOCIETY (at the Royal Astronomical Society, Burlington House, Piccadilly, London, W.1), at 3 p.m.—Prof. S. Mandelbrojt: "On the Regularization of Sequences".

ROYAL SOCIETY (at Burlington House, Piccadilly, London, W.1), at 4.30 p.m.—Sir Harold Hartley, F.R.S.: "Antoine Laurent Lavoisier" (Lavoisier Bicentenary Lecture).

CHEMICAL SOCIETY (in the Department of Chemistry, University College of North Wales, Bangor), at 5.30 p.m.—Prof. R. D. Haworth, F.R.S.: "Oxidation of Phenols".

BRITISH INSTITUTE OF RADIOLOGY (in the Reid-Knox Hall, 32 Welbeck Street, London, W.1), at 8 p.m.—Symposium on "Physical, Biochemical and Therapeutic Aspects of Volume Dose".

Friday, November 17

SOCIETY OF CHEMICAL INDUSTRY (PLASTICS GROUP) (at the Chemical Society, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Discussion on "Polymer-Plasticiser Interaction" (to be opened by Dr. R. F. Tuckett and Miss E. M. Frith).

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 5 p.m.—Vice-Admiral Sir John A. Edgell, K.B.E., F.R.S.: "Ocean Passages, Depths and Currents—the Work of the Hydrographic Department in Peace and War".

INSTITUTION OF MECHANICAL ENGINEERS (at Storey's Gate, St. James's Park, London, S.W.1), at 5.30 p.m.—Dr. H. E. Wimperis: "Research and Development in Aeronautics" (Thirty-first Thomas Hawksley Lecture).

INSTITUTION OF ELECTRICAL ENGINEERS (MEASUREMENTS SECTION) (at Savoy Place, Victoria Embankment, London, W.C.2), at 5.30 p.m.—Mr. G. E. Moore: "Planning the Future Electricity Meter".

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS (in the Lecture Theatre of the Mining Institute, Newcastle-upon-Tyne), at 6 p.m.—Mr. J. S. Thompson: "In Search of Efficiency".

CHEMICAL SOCIETY (in the Royal Technical College, Glasgow), at 7.15 p.m.—Mr. R. P. Bell, F.R.S.: "The Value of the Resonance Concept in Chemistry".