

J, K, 2-, 4- and organised embryo sac respectively, note the presence of starch grains. L, L.S. embryo sac showing free nuclear endosperm. M, L.S. endosperm from micropylar region showing progressive wall formation, and cytoplasmic nodules and heterogeneity. N, Portion of endosperm enlarged from M. showing heterogeneity in nuclear size. O Endosperm cell from mature seed, note thick and sinuate cell wall and calcium oxalate crystals. P, Q, L.S. part of integuments at early and late megasporophyte mother cell stage respectively. (ca, cytoplasmic nodules; emb, embryo; end, endosperm; es, embryo sac; ii, inner integument; K, calcium oxalate crystal; nu, nucellus; oi, outer integument; sg, starch grains; vb, vascular bundles.)

(Fig. 1, O). The formation of nodules in the cytoplasm and heterogeneity in the nuclei of developing endosperm is reported for the first time in Flacourtiaceae.

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SHORT SCIENTIFIC NOTES

Dipole Moments of Some Isomeric Ethylphenols

The dipole moments of some isomeric ethylphenols (*viz.*, *o*-, *m*- and *p*-ethylphenols), which are not reported in the literature earlier as far as known to us, have been measured in dilute benzene solution at 450 KHz and at 30° C and are presented in Table I. The dielectric constants

TABLE I

Substance	Dipole moment (Debye)
<i>o</i> -Ethylphenol	1.57
<i>m</i> -Ethylphenol	1.69
<i>p</i> -Ethylphenol	1.78

of a number of solutions of different concentrations of solutes in benzene were measured with the help of a modified 'Advance' Q-meter¹ and the dipole moment was thus evaluated from these values by the method suggested by Higasi² and subsequently modified by Balkrishna and Srivastava³. Molecular association is also expected in these compounds through hydrogen bonding; and dipole moment values are helpful in assessing the degree of molecular association in them. The values of dipole moment are in increasing order from *o*- to *p*-ethylphenol which suggests that molecular association may be strongest in *p*-ethylphenol.

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¹⁹⁵Pt and the Core-excitation Model

Core-excitation model has been satisfactorily applied to explain the electromagnetic properties of the low-lying energy levels of a few odd mass spherical nuclei^{1,2}. In the present investigations the applicability of the model to ¹⁹⁵Pt nucleus is tested. Details of the calculations were already reported^{1,2}.

The low-lying levels of ¹⁹⁵Pt nucleus can be considered as arising out of coupling of *p*_{1/2} neutron to the first excited 2⁻ state of ¹⁹⁴Pt core. In these calculations the following theoretical values are taken.

$$g_c = Z/A = 0.4 \quad g_p = 1.28 \text{ Schmidt value } (\mu/1) \\ (\frac{1}{2} \parallel \Omega_p \parallel \frac{3}{2}) = 27.6 \text{ (taken from the literature}^3)$$

A² is adjusted to 0.98 (nearly equal to unity which is the requirement of the applicability of the core-excitation model) to get the best fit. The required expressions for $\frac{1}{2}^+$ ground state are derived^{1,4} and

used. In Table I, the theoretically estimated values and the experimental values are given. It can be seen that there is satisfactory agreement between theory and experiment⁵. Thus the electromagnetic properties of the low-lying energy levels of ¹⁹⁵Pt can be explained within the framework of core-excitation model.

TABLE I

Electromagnetic properties of the low-lying energy levels of ¹⁹⁵Pt

	Theory	Experiment	Transition energy (keV)
BE2 (5/2 → 1/2)	0.35	0.38	129
BM1 (3 2 → 1/2)	0.14	0.14	99
BM1 (5/2 → 3/2)	0.13	0.09	30
$\mu_{1.2}$	0.6	0.6	

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The Kinetics of the Bromination of Aromatic Compounds—Part V *

Previous papers¹⁻⁴ dealt with a detailed kinetic study of the bromination of some aryl-alkyl ethers in dry and aqueous acetic acids. The study has now been extended to other aromatic compounds. In this communication we are reporting the kinetic results for the bromination of acetanilide in dry acetic acid.

Acetanilide (Bush sample) was recrystallised from alcohol (m.p. 113° C). Other details of the experimental procedure have already been described². Values of the third order rate constant k_3 for the acetanilide-bromine reaction were evaluated from the slopes of straight lines obtained by plotting $1/(a-x)^2$ against t . (The symbols and equation used have been explained²). Runs were carried out at 18°, 26°, 34° and 42° C. At each temperature reproducible values were obtained for k_3 . Thus at 26° C the values of k_3 from two different runs were 4.90 M⁻² Sec⁻¹ and 4.68 M⁻² Sec⁻¹. Using at least two concordant values of k_3 at each

temperature, the value of E, the Arrhenius activation energy, and the "Probable Error" in E were determined by the method of least squares⁵. It was found that k_3 could be expressed by the equation

$$k_3 = 2.4 \times 10^6 \times e^{(-7500 \pm 140/RT)}$$

Other parameters determined for the reaction, with concentrations expressed in mole/litre, were

$$\Delta S^\ddagger_{26^\circ\text{C}} = -29.4 \text{ e.u. ;}$$

$$\Delta G^\ddagger = 16.4 \text{ kcal/mole.}$$

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Sterilisation of Sporogenous Tissue in *Bursera delpechiana* Poiss.

Bursera delpechiana Poiss. (Burseraceae), a tall shrub, yields the highly valued "Oil of Linaloe" from its fruit, leaf, stem and root¹ and is cultivated for this purpose in Mysore State. Although, this exotic has been introduced in India rather recently, the plant is gaining its industrial importance. The oil finds use in perfumery and cosmetics.

Bursera delpechiana is a dioecious plant, bears staminate and initially hermaphrodite flowers on separate individuals². The development of male gametophyte in staminate flower is normal which after cytokinesis produces microspores with $2n = 12$ chromosomes^{2,3} but in initially hermaphrodite flower the anthers become sterile at an early stage of the development.

It has been observed that young anthers soon after become four-lobed. A young anther lobe in transverse section shows an epidermis, the cells of which undergo cutinisation sooner or later over the entire surface, and is followed by endothecium, the middle layer being absent. The cells of endothecium lack fibrous thickenings and the nuclei remain surrounded by scanty cytoplasm. The tapetum which is of considerable physiological significance⁴ in providing nourishment to the developing sporogenous cells is not well formed in this species. On account of this, the nutritive function is gradually taken over by the sporogenous cells

themselves, which gradually become sterile and as such do not go through meiosis. Thus the initially hermaphrodite flowers become pistillate. Complete sterilisation of sporogenous tissue occurs at or even before the binucleate stage of the development of embryo-sac. The spontaneous male sterility would be helpful in the future cross-breeding programme of the species.

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A New Fruit-Rot Disease of Pomegranate

During summer 1971, the authors observed severe damage of pomegranate (*Punica granatum* L.) fruits due to a fruit rot disease in and around Ludhiana.

The disease was characterized by discolouration of fruits from fruit-end portion or sometimes from the side. After few days, discoloured area became brown to black. The infection patch enlarged and mostly half or sometimes whole fruit showed rotting within a week. Towards the infected area the fruit coat shrivelled and gave a dry-rot appearance. Half rotten fruits could be seen attached with the peduncle which ultimately fell down. At later stage, globular to spherical perithecia-like bodies developed on the surface of infected portion but spores were not observed.

Isolation from the infected fruits yielded a species of *Glomerella*. In culture media, only *Colletotrichum* state of the fungus was grown. The white mycelial growth developed on potato dextrose agar (PDA) slants, which later turned pinkish after 5-6 days due to abundant sporulation of the organism. Acervuli had numerous hyaline, one-celled oblong to cylindrical conidia, measured $13-17 \times 5-7 \mu$.

On the basis of their characters the fungus was identified as *Glomerella cingulata* (Stonem.) Spauld and V. Schrenk (*Colletotrichum* State).

The isolate was purified by single spore isolation and pathogenicity was proved by using spore and mycelium suspension of a week-old culture. Injured as well as uninjured fruits showed infection within 5-8 days. Uninjured fruits took a little longer period for disease development. Ripened fruits were found more susceptible than immature ones.

Other fruit rot diseases of pomegranate have been reported due to *Aspergillus foetidus*² and *Phomopsis*³ sp. Chandra and Tandon¹ have recorded the occurrence of *Colletotrichum gloeosporioides* on the leaves of pomegranate. However, the present investigation records the association of *G. cingulata* with rotting of pomegranate fruits in the Punjab.

The culture of the fungus has been deposited in C.M.I., Kew, England (I.M.I. 163564).

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On the Fungicidal Properties of VFI Tablets

Agar bits of actively growing cultures of *Rhizoctonia bataticola*, *Helminthosporium oryzae*, *H. gramineum*, *Aspergillus niger*, *Alternaria tenuis* and *Colletotrichum gloeosporioides*, which are important plant pathogens, were exposed to vapour action of VFI tablets by the method described by Dharam Vir and Gaur¹. However, in this experiment, two tablets were kept in each plate since it has been observed that the efficacy of VFI tablets diminishes gradually with the passage of time period². Various fungal pathogens were exposed to vapours of VFI tablets for a continuous period of three weeks and five replications were kept for each treatment. Suitable checks were maintained for all the pathogens. After exposure to the vapours, the fungal agar bits were transferred aseptically to potato-dextrose agar slants to study if the pathogens have actually been killed or vapours are just fungistatic in nature. The observations revealed that the treated fungal cultures failed to grow on potato-dextrose-agar showing thereby that the vapours emitted by VFI tablets are

fungicidal in nature. The untreated fungal cultures, which served as checks, exhibited normal growth when transferred to P.D.A. slants.

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Palaeoecology of Lameta Formation at Jabalpur (M.P.)

The occurrence of a gasteropod band (30 cm thick) in the Lameta Formation of Jabalpur District throws new light on the palaeoecology of these beds. A collection by the author of about 70 shells of *Vivipara normalis* (Hislop), a freshwater gasteropod was made from the Mottled Nodular Bed at Chui Hill, about 0.25 km from the Dinosaur Bone Bed of Bara Simla Hill, Jabalpur.

The presence of such a large number of gasteropods in a band of distinctive lithology draws attention to the sedimentation and stratigraphic history of the Lameta Formation at Jabalpur.

The evidence in favour of a non-marine origin is three-fold. Firstly, at the base of the Lameta Formation there is a well-developed terrestrial vertebrate fauna^{1,2}. Secondly, clay nodules in the Mottled Nodular Bed are here interpreted as clay masses that formed part of the stream channel-bank and were originally eroded by contemporary streams, 'balling up' as they travelled downstream. Thirdly, the presence of the gasteropod band with its fine sediments, homogeneous lithology, uniform thickness, relatively greater lateral extent and absence of clay nodules suggests that at the time a small lake had developed at the site of the present Chuli Hill.

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REVIEWS AND NOTICES OF BOOKS

Tidal Power. Edited by T. J. Gray and O. K. Gashus. (Plenum Publishing Corporation, 227, West 17th Street, New York, N.Y. 10011, U.S.A.), 1972. Pp. x + 430. Price \$ 28.00.

Forms of perennial dynamic energy wherever found in Nature have from time immemorial attracted the ingenuity of man to put them to practical use. The flowing water and the blowing wind inspired the discovery of the water mill and the wind mill in the historic past. Nor did the energy of the restless tides fail to attract his attention. Tide mills have been known to have existed as early as the 11th century, along the Atlantic Coast of Europe, notably in Great Britain, France and Spain, some of which are believed to be still in operation.

Development of tidal power schemes for practical generation of electricity, as against hydel and thermal powers, has been impeded because of the higher cost involved in them. But in the present context of rapid advances in engineering and technology, the ever increasing demands for more

energy, the increasing costs of even conventional types of power installations and not the least of all, the growing awareness of the depletion of fossil fuels in the not distant future, all these have led to renewed attention to harnessing the tidal sources for generation of power.

The first pilot project at La Rance (France) completed in the mid-60's has been operating successfully since then. Another experimental station with up-dated construction technique has been put into commission in 1969 at Kislaya Guba in U.S.S.R. Intensive investigations have been carried out on behalf of the Canadian government in the last few years on the tidal power possibilities in the Bay of Fundy between New Brunswick and Nova Scotia, Canada.

These projects and investigations have contributed valuable experience and have shown the feasibility of using tidal power as a source of energy. Similar studies have been carried out in other countries also such as Alaska, Argentina, Netherlands, U.K. and U.S.A.